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IoT Based Temperature Monitoring and Mask Scan Entry System: A Review

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ABSTRACT

The novel coronavirus (covid19) is declared by World Health Organisation (WHO) and the global pandemic has impacted every aspect of life. It affected the industries and economy of major sectors of the whole world and the Internet of Things (IoT) devices make no exception in it. The COVID-19 outbreak has lead to a revised growth forecast for the global economy. Hence to control the spreading virus and to inhibit resurgence of infections, social and technological measures have been implemented towards virus tracing, tracking, etc. The role of IoT in existing digital healthcare infrastructure management has been discussed on how IOT can impact COVID-19 and future pandemics. It is evolving from a conventional healthcare system through which infective can be treated and monitored more easily. Since the pandemic started, there has been a rapid effort in different research communities to exploit a wide variety of technologies to fight this worldwide threat, and IoT technology is one of the explorers in this area.

Keywords-- BDN, E-Health, BloXroute, IoT, Pandemic, WHO

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IoT has been adopted in smart cities as an infrastructure key since the introduction concept of a smart city. The IoT is the interconnection between the physical object or things that are attached with sensors and software to gather and deliver information among them and primary servers with the least human meditations. IoT services can provide the remote data collection and monitoring of patients in quarantine has made it a critical aspect in fighting the spread of virus pandemics. Adaptation leading to the evolution of IoT may include modification to the way IoT devices such as mobile phones and drones collect data, changes to IoT management platforms to meet policy requirements, and innovations by researchers to IOT technology to effectively manage a virus pandemic [1].

The first step to detect covid is by scanning for fever. Also, we need to monitor every person for the mask. We have temperature checking for every entrance for scanning but manual temperature scanning has a lot of disadvantages. Any person will not be provided entry without a temperature and mask scan. The only person having both conditions is instantly allowed inside.

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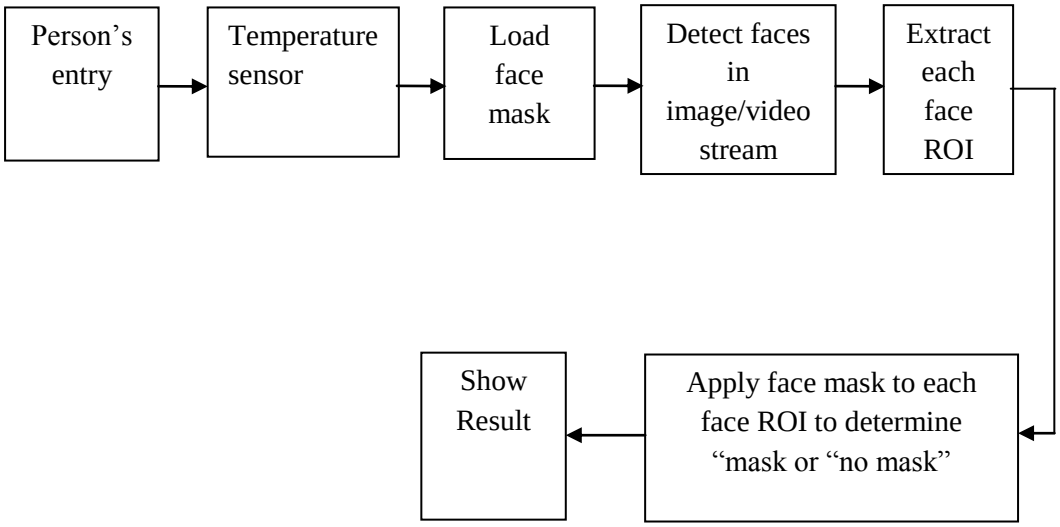

Figure 1: *IOT based temperature monitoring and mask scan entry system.*

The above Figure 1 block diagram is of "Iot Based Temperature Monitoring Mask Scan Entry System". In this block diagram, it consists of two sections first is of temperature monitoring and second is of face mask detection in this system phases and individual step for building a covid-19 face mask detector with computer vision and deep learning using python and tensor flow. If the person temperature is low then it will proceed to the next step and if the person temperature is high then the person will not goes into the next phase once the face mask detector is trained we can then move on to loading the mask detector performing the face detection and then classify each phase as with mask and without a mask. A face mask detection data set consists of with mask and without a mask, our goal is to train a custom deep learning model to detect whether the person is or is not varying a mask and person's temperature [5].

RESULT

The presented design should be checked at the beginning by the simulation to look at its achievability and confirm the steady quality of a control technique that was said over. For approving the system tentatively, the testing stage was focused on logical interims of the software to guarantee that all statements are tried and a functional interim is carried out within the tests to identify the errors [6-7]. It also keeps up that the defined input will create real outcomes that are coordinated with the required ones. Each program and models level testing has been integrated and performed. The current

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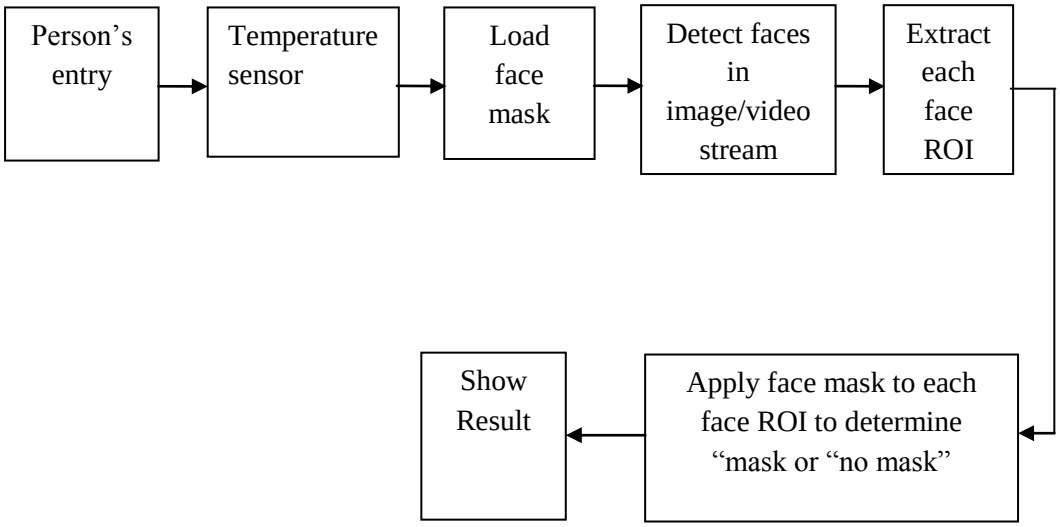

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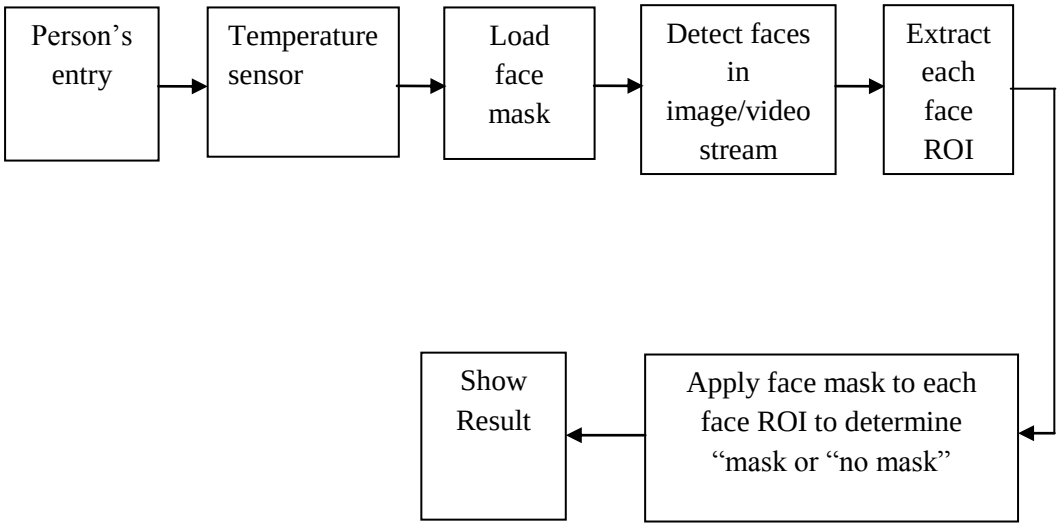

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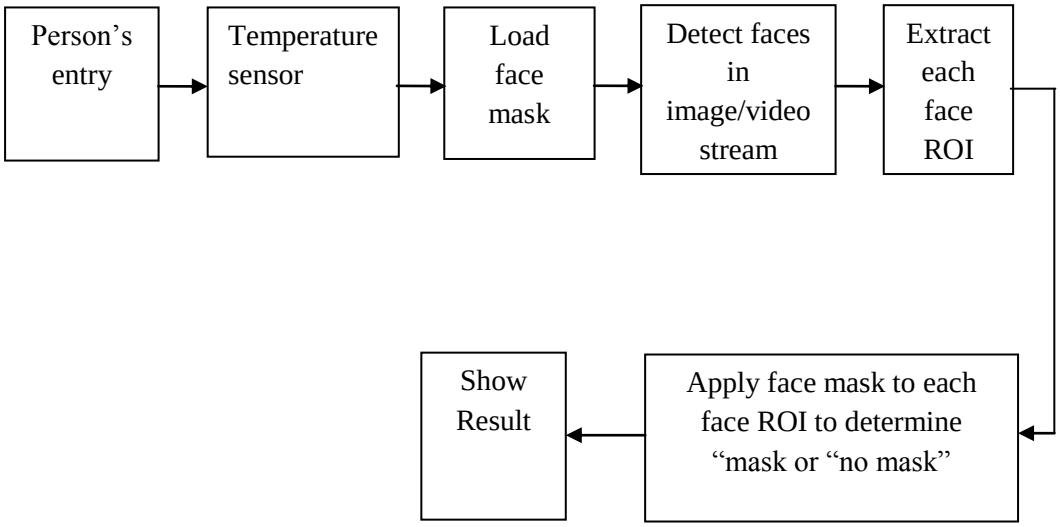

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IoT Based Temperature Monitoring and Mask Scan Entry System: A Review

Aliya Zaki[1], Shireen Ara[1], Vaishnavi Akkewar[1], Ritika Chouhan[1], Mohammad Nasiruddin[2*]
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ABSTRACT

The novel coronavirus (covid19) is declared by World Health Organisation (WHO) and the global pandemic has impacted every aspect of life. It affected the industries and economy of major sectors of the whole world and the Internet of Things (IoT) devices make no exception in it. The COVID-19 outbreak has lead to a revised growth forecast for the global economy. Hence to control the spreading virus and to inhibit resurgence of infections, social and technological measures have been implemented towards virus tracing, tracking, etc. The role of IoT in existing digital healthcare infrastructure management has been discussed on how IOT can impact COVID-19 and future pandemics. It is evolving from a conventional healthcare system through which infective can be treated and monitored more easily. Since the pandemic started, there has been a rapid effort in different research communities to exploit a wide variety of technologies to fight this worldwide threat, and IoT technology is one of the explorers in this area.

Keywords-- BDN, E-Health, BloXroute, IoT, Pandemic, WHO

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IoT has been adopted in smart cities as an infrastructure key since the introduction concept of a smart city. The IoT is the interconnection between the physical object or things that are attached with sensors and software to gather and deliver information among them and primary servers with the least human meditations. IoT services can provide the remote data collection and monitoring of patients in quarantine has made it a critical aspect in fighting the spread of virus pandemics. Adaptation leading to the evolution of IoT may include modification to the way IoT devices such as mobile phones and drones collect data, changes to IoT management platforms to meet policy requirements, and innovations by researchers to IOT technology to effectively manage a virus pandemic [1].

The first step to detect covid is by scanning for fever. Also, we need to monitor every person for the mask. We have temperature checking for every entrance for scanning but manual temperature scanning has a lot of disadvantages. Any person will not be provided entry without a temperature and mask scan. The only person having both conditions is instantly allowed inside.

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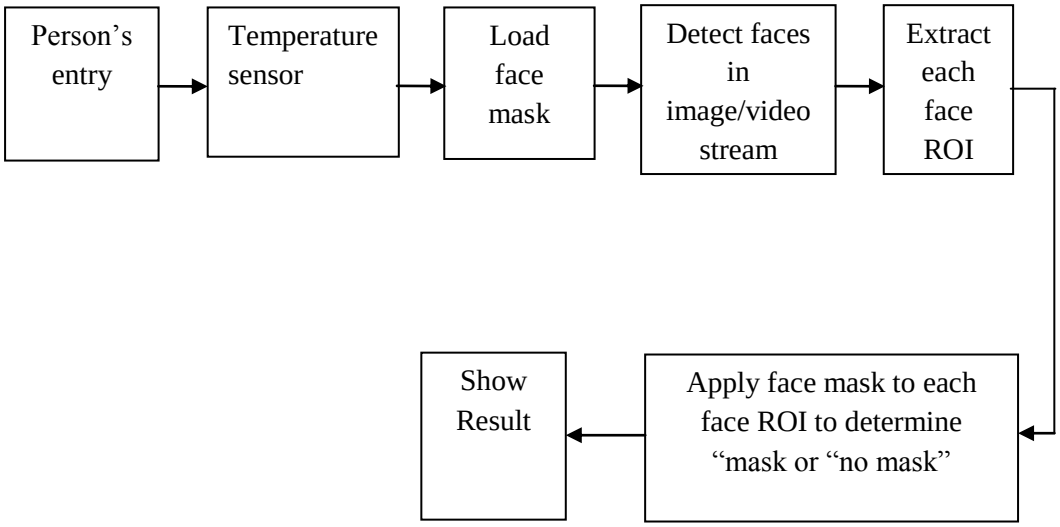

Figure 1: *IOT based temperature monitoring and mask scan entry system.*

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RESULT

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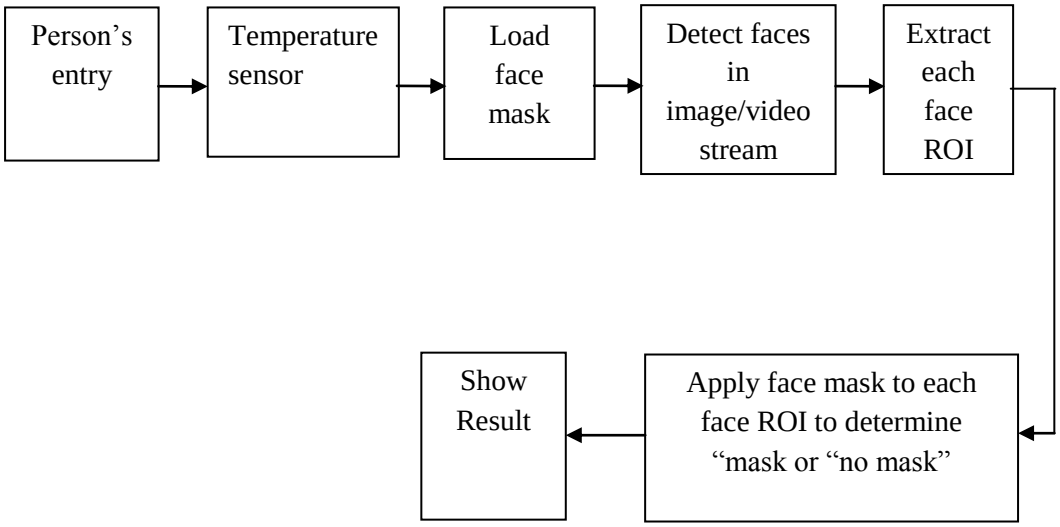

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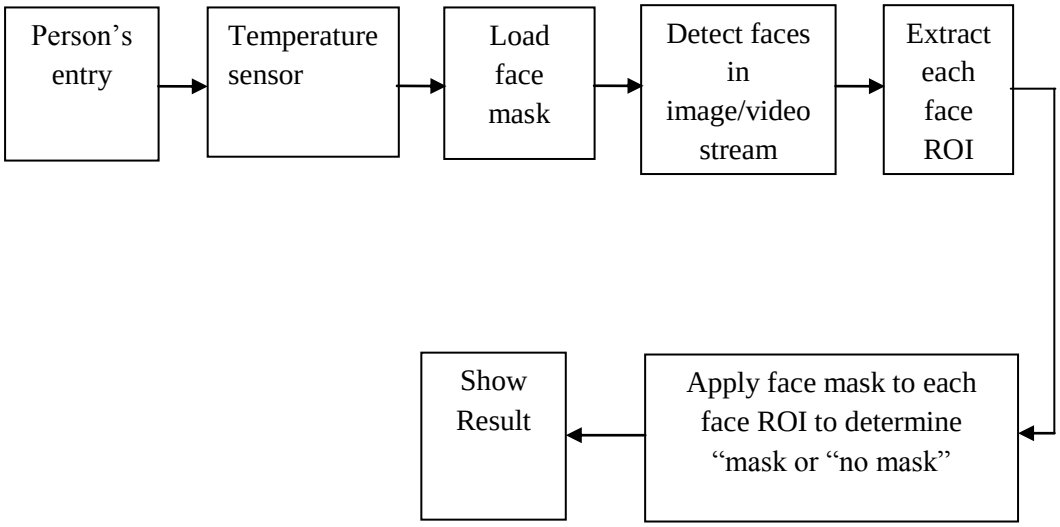

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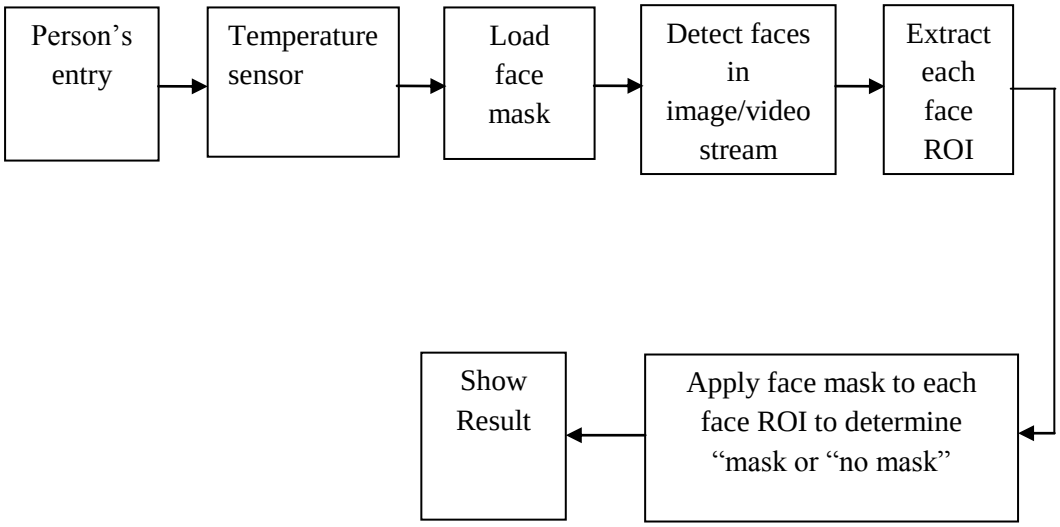

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IoT Based Temperature Monitoring and Mask Scan Entry System: A Review

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ABSTRACT

The novel coronavirus (covid19) is declared by World Health Organisation (WHO) and the global pandemic has impacted every aspect of life. It affected the industries and economy of major sectors of the whole world and the Internet of Things (IoT) devices make no exception in it. The COVID-19 outbreak has lead to a revised growth forecast for the global economy. Hence to control the spreading virus and to inhibit resurgence of infections, social and technological measures have been implemented towards virus tracing, tracking, etc. The role of IoT in existing digital healthcare infrastructure management has been discussed on how IOT can impact COVID-19 and future pandemics. It is evolving from a conventional healthcare system through which infective can be treated and monitored more easily. Since the pandemic started, there has been a rapid effort in different research communities to exploit a wide variety of technologies to fight this worldwide threat, and IoT technology is one of the explorers in this area.

Keywords-- BDN, E-Health, BloXroute, IoT, Pandemic, WHO

INTRODUCTION

IoT has been adopted in smart cities as an infrastructure key since the introduction concept of a smart city. The IoT is the interconnection between the physical object or things that are attached with sensors and software to gather and deliver information among them and primary servers with the least human meditations. IoT services can provide the remote data collection and monitoring of patients in quarantine has made it a critical aspect in fighting the spread of virus pandemics. Adaptation leading to the evolution of IoT may include modification to the way IoT devices such as mobile phones and drones collect data, changes to IoT management platforms to meet policy requirements, and innovations by researchers to IOT technology to effectively manage a virus pandemic [1].

The first step to detect covid is by scanning for fever. Also, we need to monitor every person for the mask. We have temperature checking for every entrance for scanning but manual temperature scanning has a lot of disadvantages. Any person will not be provided entry without a temperature and mask scan. The only person having both conditions is instantly allowed inside.

LITERATURE SURVEY

1. Gerhard P. Hancke, October 12, 2020, 2020, "IOT in the wake of COVID 19: A survey on contribution, challenges & evolution". Due to different IoT technological challenges, this paper proposed the development of new forms of arrangement of sensors and different IoT techniques. Hence for advanced analysis, this article has presented healthcare IOT management before and now during the survival of COVID-19 [1].
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3. M. N. Mohammed, Halim Syamsudin, Prof. Dr. Mohammed N. Abdulrazaq on 08 April 2020. **"**Novel COVID 19 detection & Diagnosis system using IOT based smart helmet". An innovative real-time early detection of coronavirus and monitoring system using a smart helmet which integrated with thermal imaging system has been developed. The smart helmet can also detect high body temperature in the crowds and send the measured data to be displayed on a phone application [3].
4. Gurlove Singh, Amit Kumar, "Face detection and recognition system using digital image processing", published in 2020. In this paper, while recognizing any individual, the most important attribute is faced. It serves as an individual identity of everyone and therefore faces recognition helps in authenticating any person's identity using his characteristics. The whole procedure for authenticating any face data is subdivided into two phases, in the first phases, the face detection is done quickly except for those cases in which the object is placed quite far, followed by this second phase is initiated in which the face is recognized as an individual [4].

BLOCK DIAGRAM

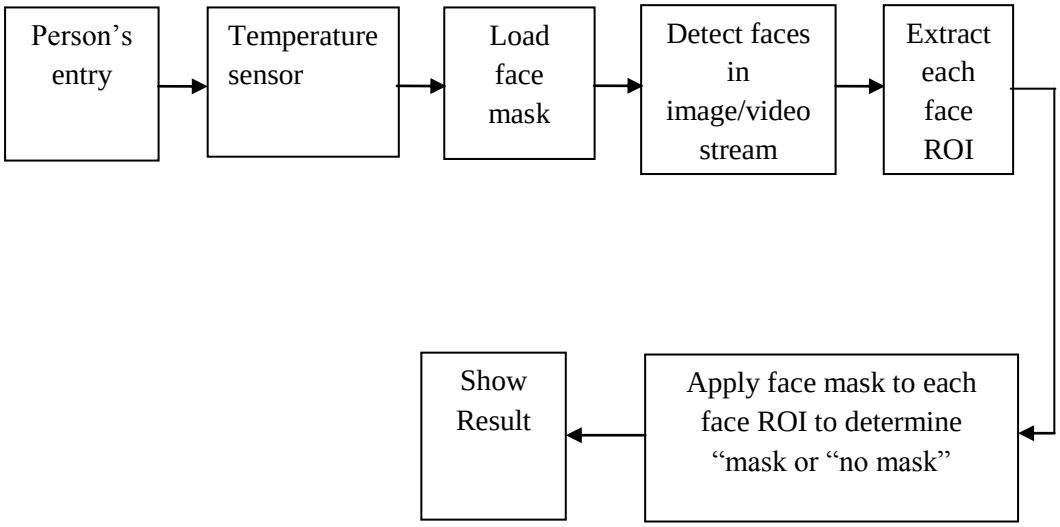

Figure 1: *IOT based temperature monitoring and mask scan entry system.*

The above Figure 1 block diagram is of "Iot Based Temperature Monitoring Mask Scan Entry System". In this block diagram, it consists of two sections first is of temperature monitoring and second is of face mask detection in this system phases and individual step for building a covid-19 face mask detector with computer vision and deep learning using python and tensor flow. If the person temperature is low then it will proceed to the next step and if the person temperature is high then the person will not goes into the next phase once the face mask detector is trained we can then move on to loading the mask detector performing the face detection and then classify each phase as with mask and without a mask. A face mask detection data set consists of with mask and without a mask, our goal is to train a custom deep learning model to detect whether the person is or is not varying a mask and person's temperature [5].

RESULT

The presented design should be checked at the beginning by the simulation to look at its achievability and confirm the steady quality of a control technique that was said over. For approving the system tentatively, the testing stage was focused on logical interims of the software to guarantee that all statements are tried and a functional interim is carried out within the tests to identify the errors [6-7]. It also keeps up that the defined input will create real outcomes that are coordinated with the required ones. Each program and models level testing has been integrated and performed. The current

innovation concerns with applicable kind of thermal imaging frameworks for detection an increase of body temperature as well as surveillance process.

CONCLUSION

In this IOT based Temperature monitoring and mask scan entry system; we detected fever and mask and displayed them on the LCD. For pandemic management, we adopted IOT along with different hardware, software, data analysis, and ethical conditions. The spreading of the coronavirus gives so much attention and awareness among people nowadays which becomes a big latest issue all over the world. One of the very common symptoms of the coronavirus is the high temperature of a person/people [1].

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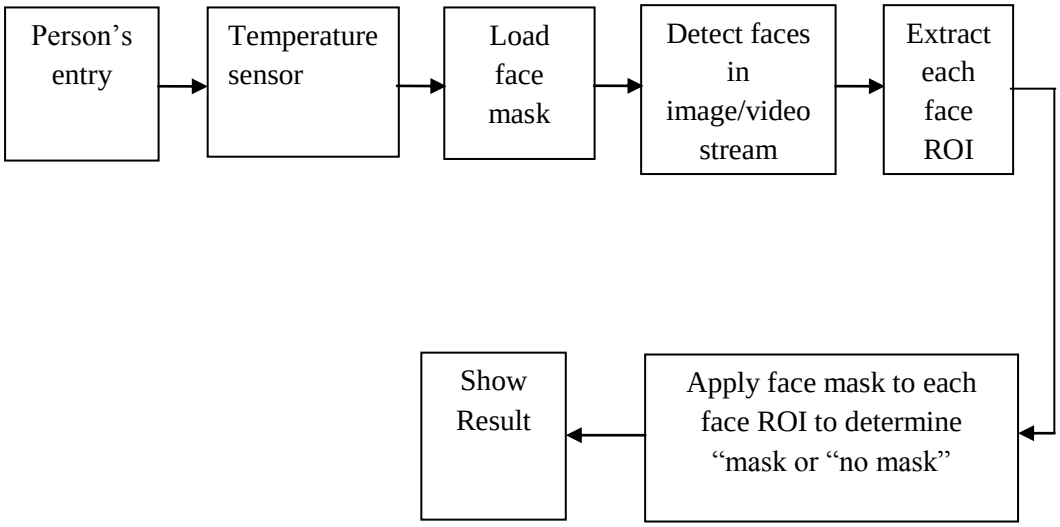

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COVID DATA ANALYSIS AND DETECTION

Bhuwaneshwari Kanojiya[*1], Sana Khan[*2], Jagruti Doifode[*3], Shubhangi Barapatre [*4], Chiya Ramteke[*5], Prof. Farheena Sheikh[*6]

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ABSTRACT

Covid (Coronavirus) is making alarm everywhere on the world with quickly developing cases. There are different datasets accessible which gives data of overall affected data. Coronavirus has influenced all provinces with huge number of cases with variety of numbers under death, endure, affected. In this venture we are utilizing informational index which has region shrewd subtleties of cases with different joined highlights names. Information examination and Coronavirus location project give answer for information investigation of different regions on different time and making model for endurance and passing cases. It is standout to distinguish and anticipate pandemics of a giant sort. The Covid sickness 2019 (Coronavirus) pandemic, which began in Wuhan China, has effectively affected the worldwide local area and has overburdened progressed medical care frameworks all through the world. The current fast and dramatic ascent in the quantity of patients has required proficient and speedy expectation of the conceivable result of a contaminated patient for fitting treatment utilizing man-made intelligence procedures. The information examination uncovers a positive relationship between patient's sex and passing, and furthermore shows most of influenced patients.

Keywords: Coronavirus, Image Augmentation, X-Rayimages, CT Scan images.

I. INTRODUCTION

The healthcare industry is a vast industry that requires real time collection and processing of medical data. Moreover, the problem of data handling requires real time prediction and dissemination of information. Major actors such as physicians, vendors, hospitals, and health-based companies have attempted to collect, manage, and revive data with the aim of using it to enhance medical practices. Thus, to increase the efficiency, accuracy, and workflow healthcare industries needs to manage such complex data. Coronavirus disease 2019 (COVID-19) is a virus of the Corona virus family and the source of a respiratory illness outbreak throughout the world that originated in Wuhan, China. Studies show that Covid-19 has clinical characteristics akin to the SARS-CoV. The dominant symptoms include fever and cough, while gastrointestinal symptoms are uncommon. Infectedby similar viruses, i.e., MERS Corona Virus (2%) and SARS Corona Virus (1%). Therefore, there is a possibility of non-febrile patients being missed by a surveillance mechanism with a primary focus on detecting fever. The initial patients infected by COVID-19, reportedly indicated an association with a large seafood and animal market that demonstrated an animal-to-person spread. Per contra, a burgeoning number of patients have not displayed any association with the animal markets, revealing the fact of human-to-human transmission of COVID-19. This pandemic has been declared a global health emergency and is spreading at an alarming rate.

OBJECTIVES:-

- Given the unfortunate health crisis that the globe is currently facing, innovation Mission is actively involved in multiple initiatives to help deal with the crisis.
- By collecting data from kaggle dataset pre-processing is performed and data analysis is performed on dataset.

II. METHODOLOGY

The proposed framework considered contribution of the X-beam pictures to recognize COVID-19. Above all else, this framework changed pictures from RGB over to grayscale and recognized the district. of interest (ROI) by eliminating the undesirable districts. Moreover, the framework considered two element extractors: histogram- arranged inclinatio. To begin with, the HOG strategy was utilized to extricate an element vector from the X-beam COVID-19 dataset. At that point the technique was utilized to remove another element vector from similar pictures. These two highlights were intertwined and utilized as the contribution to prepare the grouping model. The quantity of highlights removed by one procedure was not enormous enough to precisely

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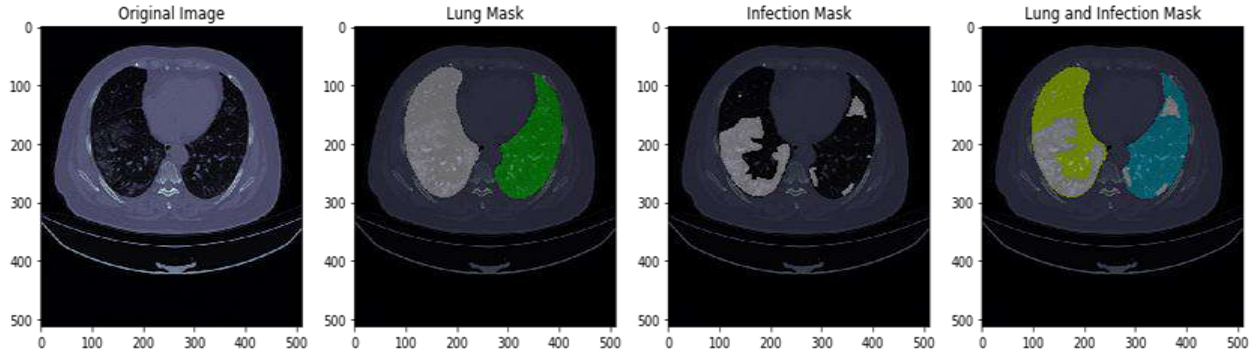
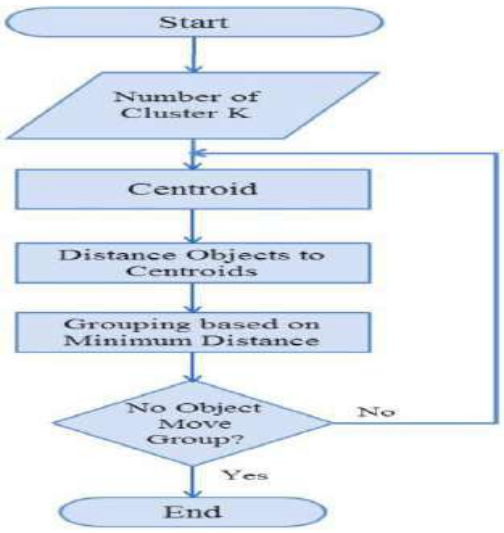
distinguish COVID-19 Nonetheless, the combination approach of separating highlights by two distinct strategies could give countless highlights for exact ID. Combination was considered as a connection between the two individual vectors in this unique situation. Spot influenced and inferior quality X-beam pictures alongside great quality pictures were utilized in our test for directing tests. In the event thatpreparation and testing are performed with as it were chosen great quality X-beam pictures in an ideal circumstance, the yield exactness might be found higher. Nonetheless, this doesn't address a genuine situation, where the picture data set would be a blend of both great and low quality pictures. Consequently, this methodology of utilizing diverse quality pictures would test how well the framework can respond to such genuine circumstances. An altered anisotropic dispersion sifting method was utilized to eliminate multiplicative spot commotion from the test pictures. The use of these procedures could adequately defeat the impediments in input picture quality. Then, the component extraction was done on the test pictures. At last, the classifier played out a grouping of X-beam pictures to recognize if it was COVID-19.

III. MODELING AND ANALYSIS

This segment incorporates a concise outline of the relative multitude of segments utilized in the framework. The dataset utilized is got from Kaggle "Novel Covid 2019 Dataset". The dataset has been assembled from different sources including the World Wellbeing Association and John Hopkins College. Be that as it may, this dataset has been pre-handled further by us to address the issues.



- It is vital to examine the transmission development ahead and foresee the future events of the transmission Fever, hack, cold, weariness, body agony, and disquietude were the most widely recognized manifestations that were seen in patients whose information is accessible in this dataset. In simultaneous, best in class numerical models are picked dependent on AI for a computational cycle to foresee the spread of the infection.



Programming-

- MySQL
- Python

IV. RESULTS AND DISCUSSION

- We have utilized the pre-handled dataset to prepare various ML arrangement models.
- The models included in this study include: K-Means, Decision Tree, and Random Forest Classifier.
- Since the dataset we utilized can be an imbalanced dataset, we will utilize F1 Score as the essential measurement for examination.
- Therefore, Boosted Random Forest algorithm is the best performing model for better performance on the dataset.

Table 1. Number of images in normal and COVID 19 categories used in training, validation, and testing phases without data augmentation.

Data sets	Numberofimages		Ratio of Normal to the COVID-19Images
	Normal	COVID-19	
Training	2489	1584	1.57
Validation	70	70	1.0
Testing	622	395	1.57

To support the framework created for shrewd COVID-19 acknowledgment, this work utilized a sum of 5090 chest X-beam pictures for preparing, testing and approval, as demonstrated in Table 1 without information increase. In this investigation, the appropriation of the information was covered to relieve the information disequilibrium issue. The approval pictures were taken from the preparation set, however the testing set was taken prior to preparing This examination utilized an aggregate of 2489 ordinary and 1584 COVID-19-positive pictures for the preparation reason. For the testing reason, 622 ordinary pictures and 395 COVID-19-positive pictures were utilized. These testing pictures were not considered in the preparation dataset. This system moreover contained 70 endorsement pictures for both conventional and COVID-19 classes. These approval pictures were taken from the preparation informational collection. Three measurements, specifically exactness, explicitness and affectability, were utilized to quantify the exhibition of the framework produced for programmed COVID-19 discovery from the chest X-beam pictures. Four diverse execution boundaries, in particular evident positive (TP), genuine negative (TN), bogus positive (FP) and bogus

negative (FN), were utilized to register the measurements as characterized by Equations (20)– (22).Exactness (ACC) = TP + TN

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Throughout the assessment, the proposed strategy required named test information to approve its anticipated yield. The disarray framework addresses a general framework execution. The framework can't distinguish 27 COVID-19 energy pictures and accurately recognizes 1952 COVID-19 inspiration pictures out of 1979 pictures. The framework can't effectively distinguish 40 typical pictures and accurately recognizes 3071 ordinary pictures out of 3111 pictures

V. CONCLUSION

We have made Optional Backwoods region assessment, with F1 Score on the Coronavirus patient dataset and Inconsistent Woodland calculation, with F1 Score on the Coronavirus patient dataset by applying arranging information. It analyzed data in this study has revealed that death rates were higher. Also, male patients had a greater death rate compared to female patients, majority of affected patients are aged between of 20 and 70 years.. We have used modern tools like Python and MySQL to implement the project. During the development of this project we understood the importance of individual responsibility, coordination among, individual and team work while project development and management. While presenting our project in progress seminars we

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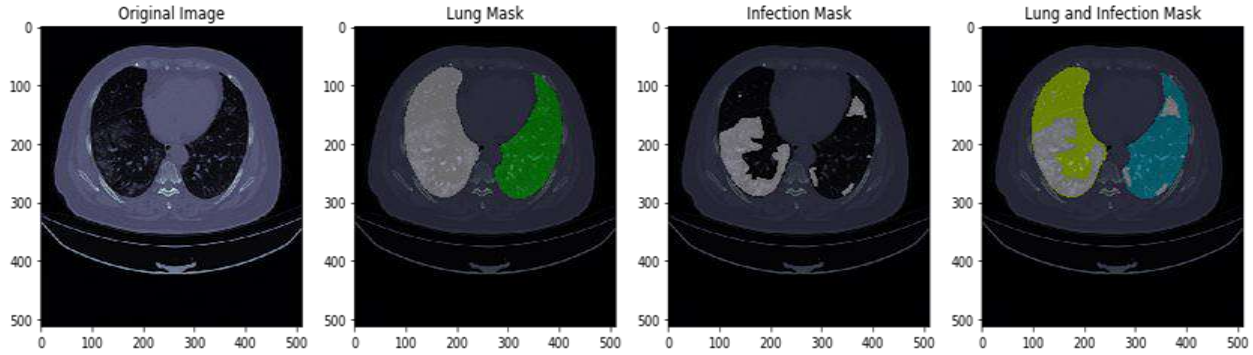

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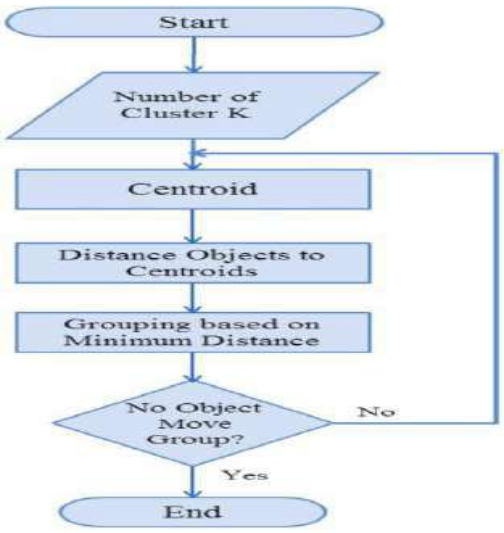

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Applying Event Sourcing in Online Facilitation Tool

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***Abstract*: Online facilitation systems are Widely used by many industries to solve conflicts, perform brainstorming, explore ideas and domains can be fulfilled. While During a facilitation if the conversation is side-tracked, the facilitator may find it difficult to bring back the main topic in limelight. But facilitation knows the point where the online discussion got side-tracked. So if the facilitator somehow reverts all the responses of which are added after the point from where the conversation got side-tracked and gets back to the state where the conversation was going good. Then it would lead to a productive Conversation. That's where Event Sourcing comes into play. Which will help to achieve the objective of going back to the conversation. That is Getting the previous state back. This article will discuss Event Sourcing which we would implement Simply on facilitation tool and could help better have productive conversation online.**

***Keywords*: event sourcing, online facilitation, temporal pattern.**

1. Introduction

Event Sourcing was first proposed as a pattern by Vernon Vaughn while studying and extending Eric Evans Domain Driven Design. The application of event sourcing becomes very hard when there are lots of states in a system.

2. Application

A common example of an application that uses Event Sourcing is a version control system. Such a system uses temporal queries quite often. There are various areas where event sourcing can be used

A. Decision Making

Event sourcing can help us to achieve temporal patterns. It's not just that we wanted to know the state of the world, but also the state of the world a month ago. This would help us to understand how the environment was earlier. Which then could be studied to help make better decisions in the future.

B. Recreation of State

Event Sourcing will help not only to trace the past but also go back to a particular state and to experience the environment of the past. In software whenever a bug appears it's hard to reproduce the exact error Because the software would probably have many states. So with event sourcing we can go back to the state when that error happened which will give developers a lot of insights which could help them to solve the issue.

Not all systems require event sourcing. There are different strategies to implement event-sourcing in a System. This article will show a very basic implementation of it in a facilitation tool.

3. Online Facilitation Tool

When people started to work remotely, they started to face various challenges, one of which is solving conflicts. People working on projects often get into conversations related to the topic. So this eats up all the precious time of the team which could be spent on developing the project. Various online facilitation tools are developed which could help to ease the conversations among the team. And a facilitator could easily facilitate the conversation making it short & productive.

Digital facilitation is a modern approach to organizational development that combines traditional live workshops with real-time virtual communication and asynchronous virtual collaboration. As a facilitator, it allows you to bring a large group of people together to collaborate on complex learning programs and organizational development processes.

4. Analysis

To implement event source we had to modify an existing system which seems an overload but is probably a one - time effort. The idea is basically to store not only data but also the actions. It is better to keep those event objects separate from the main database. The extra data that needs to be stored is the action itself and the time when that action is performed. A no sql database is recommended for the implementation.

In the facilitation tool there are some questions that are provided by the facilitator and facilitator facilitates the discussion around those topics. The member then adds their response. We can implement the event sourcing around the responses, so that we can re-create the state of responses of a particular time. As mentioned we need to store the action with the data, so simple actions from the responses would be

ADD RESPONSE: To add a response to a particular topic.

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UPDATE RESPONSE: To update the response.

DELETE RESPONSE: To delete the response.

Table 1
Database for event sourcing

Time	Data Type	Operation	Data
1622971900521	Response	ADD	Obj{}
1622971913906	Response	DELETE	Obj{}

These are basic actions. look for table 1, which shows the event source database for the response whenever a response operation occurs. We store it like for Add operation:

ADD-RESPONSE;

DATA_TYPE: RESPONSE

Time: When the action had happened.

Data: The actual response object itself.

This way we would store all the states of the responses. When we want to recreate any state of responses. By querying all the data by a particular point and performing the operation one by one. We would reach any state of the responses

5. Result, Discussion and Conclusion

In this study we were able to create a simple model for event-sourcing taking an online facilitation tool as an example.

The use of event sourcing in the facilitation tool would help give great control to the facilitator in any discussion and have the power to bring a conversation back on track.

Event sourcing could help to analyze the thinking of members in a facilitation and could be used for other Business tools as well.

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WORKERS SAFETY MONITORING AND ALERTING SYSTEM

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ABSTRACT

Workers Safety Monitoring and Alerting System using helmet that is able to detect hazardous events in the mines industries and construction site. With reference to the development of helmet, we have considered three main types of hazards such as Air Quality, Helmet Removal and Collision. Suppose, if the workers has met with an accident then the alerting message will be sent to the frequently used contacts with reference to the location (using GSM), Alcohol detectors are commonly required by the law enforcement. The MQ-3 sensor is used in the project to detect the alcohol level. By using smart helmet, the accidents can be detected. The alcohol sensor recognizes the alcoholic substance in the workers/miners breath. If there is any alcohol senses or accident occurs, then the GPS in the helmet will send the location of the accident place to main server of the nearby hospitals or the main department of the workers.=

Keywords: Alcohol detector, microcontrollers, Vibration sensor, GSM module, Alerting System, LCD display.

I. INTRODUCTION

In earlier days, the accident ratio was high due to the fact that people were working in coal mines without helmet and had lack of awareness of usage of helmet. As a result the death rate incrementally raised. The problem addressed was the improvement of a helmet in order to ensure more safety awareness between miners. When working with a noisy equipment, being aware one's surroundings can sometimes be challenging. Wearing the helmet can reduce the risk of severe injury by 79% and the risk of death by 43%. In consideration with mine industries, miners tend to remove some of their safety gear because it is too heavy, warm or uncomfortable to work with. The idea of developing this work comes from our social responsibility from society. The key to controlling such accidents is the prediction of outburst by implementing sensors and microcontrollers and to generate an alarm system before critical atmospheric level. A continuous monitoring is necessary which again requires some effective and accurate sensing system. To overcome this we introduce a smart helmet system made of discrete components which checks whether the miner consumes alcohol or causes any accident during work. It provides an early warning, which will be helpful to all miners present inside the mine to save their life before any casualty occurs. This system is highly beneficial for rescue and protection of miners. This helps map the current location of workers through the entire mining site. Moreover each worker helmet circuit is integrated with a panic/emergency button. This button when pressed shows an emergency sign over the IOT web interface about the worker emergency. However, miners generally do not remove their helmets. Presently mining safety helmets only have the purpose of protecting the miner's head against potential hazardous bumps.

II. METHODOLOGY

The methodology are in the following steps given below:

- Wearing Helmet
- Alcohol Sensor(detects)
- Vibration sensor(detects)
- LED lights(Red or Green)
- Message request & respond
- Updates in Website
- Rescue team to appear

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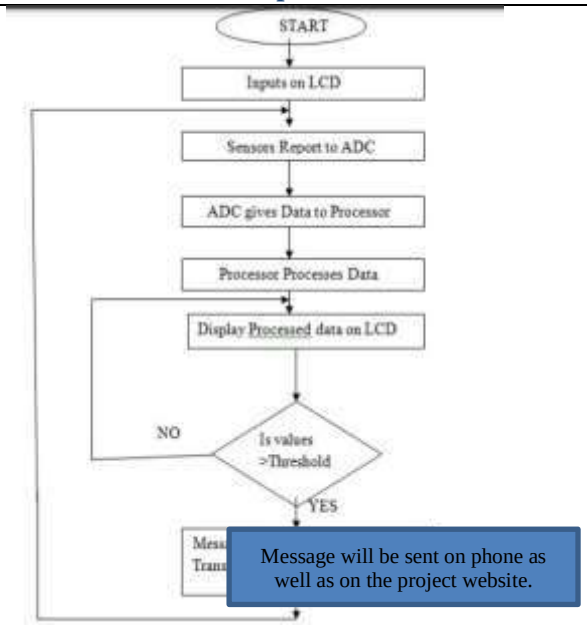
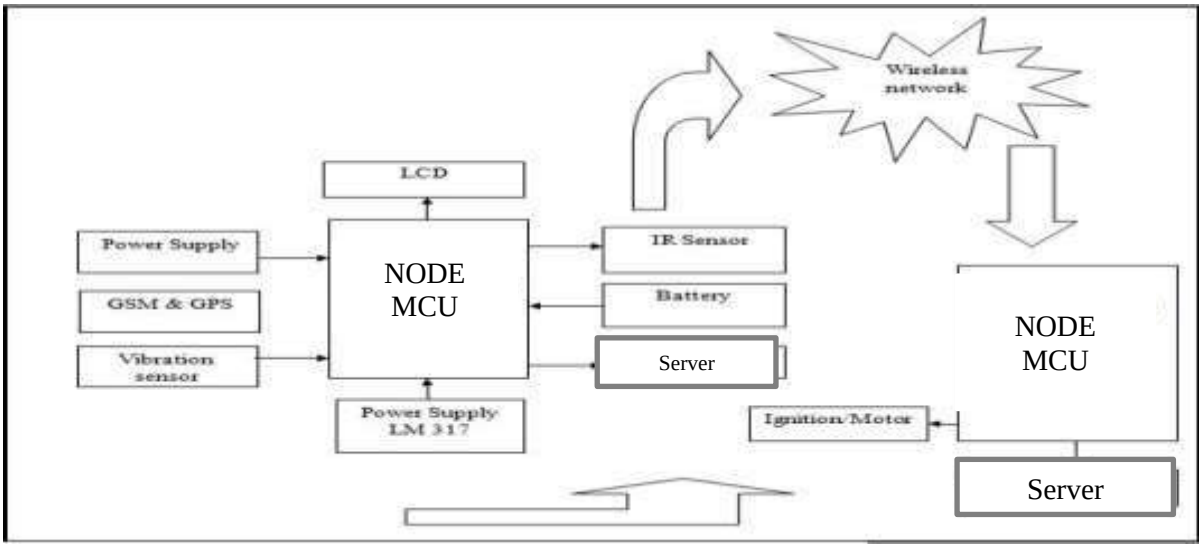


The System is implemented in two sections. Where the first section is our Hardware device (Helmet) used for all the sensors which are connected with RF transceiver, which detects temperature, humidity, gas, pressure to sense the worker's environment and the LED indicator to display the condition of workers. On the other hand, the second section is based on software(control room section) which have IOT and GUI system. LED and LCD are used to convey the status of the worker whether he is safe or in danger. While Wi-fi or Bluetooth does not support to underground signals, so we have overcome with these problems by using GSM module. GSM module is used to send the message and configured in Node Red with JavaScript code



Buzzer is also provided, if miner is safe then he can manual switch off the buzzer to resist the rescue team. GUI was created by Node Red and the GPIO of the Raspberry Pi are used to trigger the buzzer. The command register stores the data of LCD, the command register used for an instruction given on the LCD. The data is in the form of ASCII value of the characters displayed on LCD. According to that danger senses and Buzzer starts for 15-20sec, convey the message to the higher authorities and updates status in the web page.

III. MODELING AND ANALYSIS

The main parameter used for the implementation of the system are concentration of gas molecules measured which helps in the detection of alcohol. This module is made using Alcohol Gas Sensor MQ3. MQ3 is a low cost semiconductor sensor which can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. It's conductivity increases as the concentration of alcohol gas increases. MQ3 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, etc. This alcohol sensor is suitable for detecting alcohol concentration on your breath. The second most important module is the vibration sensor which shows

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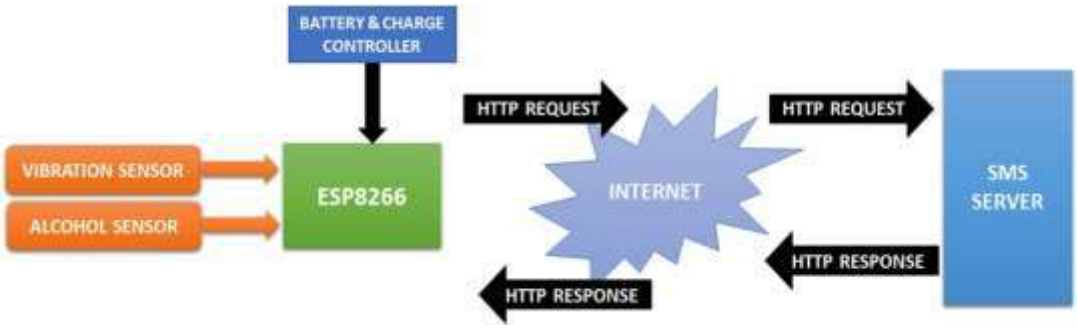
output with the help of LED indicators, when the sensor detects any vibration beyond the threshold. Thing speak provides channels to retrieve the data by the IOT technology. Each channel includes 8 types of field for any data, 3 location fields and 1 status field. Once the data is allocated it is stored for the future analysis. These stored values are used to detect the hazards before they happen. By these we are providing the information of each personnel so that we can help them out to save their lives. The system requirement and all the components required for the project can be easily made available for the project's implementation. These project will offer security and alert to all workers working in the coal mines,various production industries and plants.



IV. RESULT AND DISCUSSION

All the components are assembled and tested successfully. The circuit is designed in such a manner that when miner wears the helmet shows active status on LCD display and server page. The safety helmet alarms the miners and higher authorities if there is alcohol consumption , accident happens by buzzing an alarm. If an hazardous situation occurs the GSM module sent SMS to prevent further injuries.

V. EXPERIMENTAL RESULT

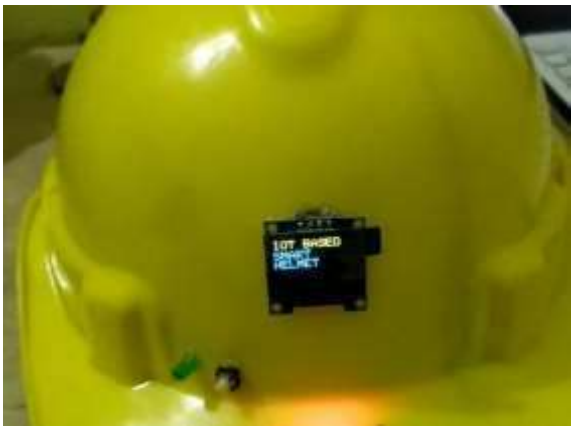


Fig.(c.1)

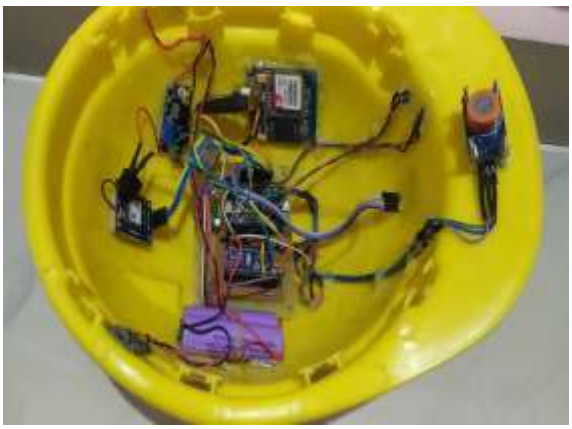


Fig.(c.2)

Fig (c). Experimental setup

Fig (d).Alcohol detection test

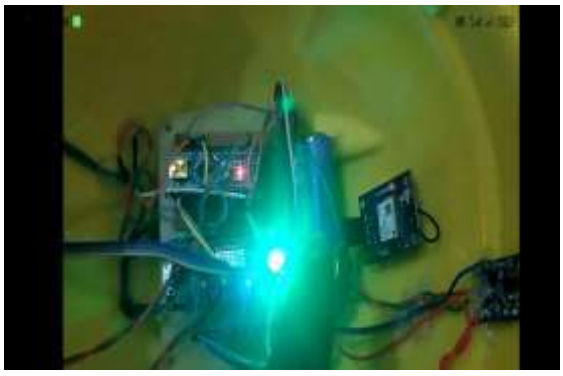


Fig (e).Accident detection test

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As shown below Fig.(f) and Fig.(g) shows that , Initially every helmet it has an helmet ID for a fixed value. In the mining, the miners can take up and wear any of the helmets from the store room, every working day while miner picks up a helmet, his ID will be attached to the helmet. Now the helmet will be configured to work according to the range specified in his user ID.

Fig(f).Server site data

Fig(g).Export to excel

Login page

Home page

Current status

SMS

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Themes

Logout module

VI. CONCLUSION

The design and the implementation of the smart helmet were discussed. The Safety Helmet will provide smart solutions based on using a microcontroller, GSM, GPS modules, and a group of sensors that locate the worker's position and send a conditional SMS if there is any risk of life to the higher authorities.

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Design Engineering

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Analysis of Transmission Congestion Management System Using Static Var Compensator (SVC) by Power World Simulator's software

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Abstract

Privatization and deregulation will not only increase competition in the electricity market, but will also result in increased output and consumption. This is likely to put additional strain on the transmission system, clogging it up. As a result, congestion management is a fundamental issue in transmission management. The purpose of this work is to develop an analysis tool for the power market in order to address the problem of congestion management. The tool establishes a connection between the Power World Simulator and other professional software tools for computing power flow. The tool analyses power flow data and performs batch processing on large case studies using the IEEE 30-bus system to simulate the electricity market and validate the proposed method. The results demonstrate that when Static Var Compensator is included, the amount of re-dispatched power significantly decreases, resulting in an optimal operating point that is closer to the one influenced by market settlement. Additionally, it is established that Static Var Compensator is a viable option for congestion management, both technically and economically.

Keywords Optimal power flow (OPF) Congestion management, Transfer capability, Distributed generation, Flexible AC Transmission Systems (FACTS), Series compensation Static Var Compensator Congestion

1 Introduction

Restructuring and regulation of the electricity industry may enable the transmission open-access scheme to achieve maximum external power transfer using existing facilities. Congestion management is critical during both the operation and planning stages of a mission to alleviate bottlenecks in transmission. Two considerations, namely transmission management and transmission losses, must be made in light of transmission open access. Congestion increases the cost of electricity transmission. Congestion management is a cost-effective method of enhancing electricity transfer on a broad scale. Congestion in the transmission network refers to limitations

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in the flow of electricity through the network. When open access occurs, all of the limitations become magnified when the electricity restructuring environment is considered [1].

Congestion typically occurs when the state of the grid is determined by one or more violations of the network or plan constraints that govern how the network grid operates in the conventional state or under any one of the contingency cases specified in a set of specified contingencies. Congestion occurs when the transmitted power exceeds the transmission line's power limit or capacity. Congestion is always undesirable in a power network. It will compel producers to set different prices for different segments of the market, resulting in market distortions caused by congestion. Another disadvantage of congestion is the high stakes involved in market exploitation by competitors [1]. This results in a sharp increase in prices in some areas, excess power, and a decline in competition.

This article discusses the Static Var Compensator and how it can be used to determine the optimal location for congestion management in highly competitive power markets. FACTS device locations are determined by the system's static and dynamic characteristics. A sensitivity-based approach is proposed for determining the optimal location of the Static Var Compensator (SVC). To alleviate transmission line congestion, an optimization-based method for determining the location of Flexible Alternating Current Transmission System (FACTS) devices was investigated [2].

Flexible Alternating Current Transmission System devices make use of power system technology that has been developed and applied. These devices are intended to regulate power flow and improve system stability. The optimal allocation of Flexible Alternating Current Transmission System (FACTS) devices, on the other hand, remains a critical issue to resolve. The purpose of this work is to determine the optimal location for a Static Var Compensator, a type of FACTS device, in order to maximise power stability by controlling bus voltages. The Static Var Compensator (SVC) is capable of rapidly generating and dissipating reactive power in order to adjust the voltage across a connection. By altering the bus voltages, the system's power flows will also be altered. As a result, the system's power flow can be fixed until it approaches stability [1].

Overloads and congestion on transmission lines are the primary issues confronting the power system's operation. However, the reorganised power system's consequences of this problem include unexpected cost increases in certain areas, an increase in market power, and a reduction in market competition [1].

The optimal power flow framework (OPF) is used in this article to assist in resolving the congestion problem in a deregulated electricity market. Additionally, transmission lines are decongested through the use of the Static Var Compensator method. After detecting congested lines, the TLR sensitivity of all buses is determined; the bus with the highest TLR sensitivity is observed and SVC is applied accordingly. IEEE 30-bus system is used to simulate the market, and the proposed method's performance is evaluated. The simulation is performed using POWER

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WORLD SIMULATOR, and the results indicate that when a Static Var Compensator is included, the voltage profile of a congested bus improves significantly, thereby reducing congestion. Thus, it can be concluded that SVC is a technically and economically viable option for congestion management.

2 Background

The entity that will monitor the reliability of the power system and coordinate the power supply.]. as a wholesale electricity marketIn the current deregulation environment in the United States, the most popular energy pricing model is based on the concept of node (spot) pricing, which extends the MCP described above to different nodes (Emíp) noe-se. price energy according to where the energy is extracted or injected into the network. The spot price is based on the principle that unitary energy has different prices at different points in the network. space in the different network. space in the different network. transmission and transmission congestion.

In most markets, GENCOS and ESCO are competing to enter the ISO regulated market. The market equilibrium price (MCP) is obtained by overlapping the supply bids in the price increase order and the price increase demand bid and the demand bid. This market clearing process is called a bid auction. double side

There are many entities in today's deregulated electricity market [4]. the market on behalf of the plant owners and enters the energy pool through a bidding process for economic dispatch. Transmitter (TRANSCOS): Construction and maintenance of the transmission network. guarantee the economic dispatch. all as system entities. Distributor (DISCOS): Owns and operates local distribution facilities

A possible definition of the electricity market is the continuation: "The electricity market is a system that uses bids of supply and demand to determine the purchase and sale of electricity [7]

Flexible Alternating Current Transmission System devices have been developed and implemented in the power system as a result of rapid advancements in the field of power electronics. FACTS devices can be used effectively to increase system constancy and control power flow. Nowadays, FACTS devices are used to enhance the capabilities of transmission systems and to assist with the power system's oscillation damping problems [2].

The two primary considerations when utilising FACTS devices today are the ability to control power flow in transmission systems and the enhancement of steady-state stability in transient power systems. The article discusses the power flow control capabilities of FACTS devices [2].

However, coordination of FACTS devices in the power system is occasionally an open issue. As a result, this work also investigates the optimal coordination of FACTS devices in a bus system.

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The purpose of this project is to determine the Static Var Compensator's performance in terms of improving the voltage profile in the transmission system. Additionally, this project is expected to identify the effects of varying the bus Q voltage setting on the SVC and to investigate the optimal coordination for the SVC's integration into a transmission system [2].

Several advantages of utilising FACTS devices in transmission system applications include the following:

I. Power flow control: The primary function of FACTS devices is to optimise power flow in order to meet system power requirements, resolve emergency situations, and so on.

II. Lower generation costs: Increases efficiency and lowers generation costs.

III. Enhancement of dynamic stability: an additional FACTS function. Enhances transient stability, power oscillation damping, and voltage stability.

IV. Increases the transmission line's loading capacity: FACTS devices can be used to meet short-term or seasonal demand, thereby increasing the line's capacity.

V. Providing reliable and secure tie-line connections: By lowering the cost of generation, interconnection requirements can be reduced as well. As a result, tie-line connections between adjacent regions are possible.

VI. Reduced reactive power flow: Transmission lines can thus carry more active power while reducing reactive power flow [3, 6].

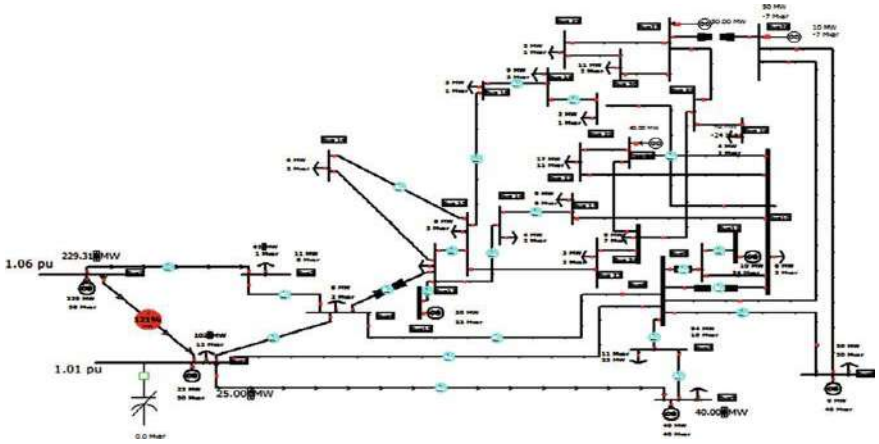

Fig. 1 Line diagram of IEEE 30-bus test system before SVC

Qk=input('Enter Qk value between -100 and 100MVAR =');

Q=Qd+Qk; mpc.bus(k,4)=Q;

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The data can now be retrieved in MATLAB by entering the command 'results = runoff' and also specifying the bus SVC [6, 7].

1 Methods of Congestion Management

The transmission line i-j that carries power as shown in Eq. 1, Pij is a function of the magnitude of the voltages Vi, Vj, the line reactance Xij, and the phase angle of the transmitting and receiving end voltages δi– δj.

$$P_{ij} = \frac{V_i V_j}{X_{ij}} \sin(\delta_i - \delta_j)$$

4.1Load Curtailment by TLR Sensitivities

Sensitivity to Transmission Line Relief (TLR) and Power Transfer Distribution Factors (PTDFs) can be thought of as having an inverse relationship [3]. TLR sensitivities and PTDFs are used to determine a line's sensitivity to load curtailment. PTDFs determine the sensitivity of a component's flow, such as a transmission line, to a single power transfer. On the other hand, TLR sensitivities determine the sensitivity of the flow on a single monitored element to a variety of different system transactions. Thus, the sensitivity of a single monitored element can be determined using TLR sensitivities to various power transfer rates [3, 5].

The TLR sensitivity values for the most congested line at each load bus are considered when determining the required load curtailment to alleviate transmission congestion. The TLR sensitivity for a congested line i–j is Sijk at a bus k and is find out by

$$S_{ij}^{k} = \frac{\overline{\Delta P_{ij}}}{\Delta P_k}$$

At the transmission line i – j, the excess power flow is given by

$$\overline{\Delta P_{ij}} = P_{ij} - \overline{P_{ij}}$$

Here

Pij is an actual power flow through transmission line i–j,

Pij is a flow limit of transmission line i – j at the bus k, and the new load Pnew k can be calculated by

$$P_k^{new} = P_k - \frac{S_{ij}^{k}}{\sum_{i=1}^{N} S_{ij}^{l}} \overline{\Delta P_{ij}}$$

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where Pnew k = load at bus k after curtailment Pk = load at bus k before curtailment Sl ij = sensitivity of power flow at bus k on line i–j due to load change N = total number of load buses.

The effect of a single MW power transfer is proportional to the TLR sensitivity, which means that the greater the TLR sensitivity, the greater the effect of a single MW power transfer. Thus, at the load bus, the loads that must be curtailed in order to overcome transmission congestion on the congested line i j are determined by the TLR sensitivity values.

This method is used in systems where load curtailment is a critical component of achieving (N – 1) secure configurations [3, 7].

5Concept of Optimal Power Flow

The primary goal of an optimal power flow (OPF) problem is to determine the optimal setting of control variables in a power system network in order to maximise an objective function while adhering to operating and physical constraints such as generation and load balance, bus voltage limits, power flow equations, and active and reactive power limits. In general, the OPF problem can be expressed as [4].

The OPF problem that POWER WORLD SIMULATOR can solve is a 'smooth' OPF with no discrete variables or controls. The objective function is the total cost of real and/or reactive generation. These costs can be expressed as polynomials or as piecewise linear functions of the generator's output. The issue is as follows:

$$\min_{P_g, Q_g} \sum f_{1_i}(P_{gi}) + f_{2_i}(Q_{gi})$$

Such that

$P_{gi} - P_{Li} - P(V, \theta) = 0$ (active power balance equations)

$Q_{gi} - Q_{Li} - Q(V, \theta) = 0$ (reactive power balance equations)

$S_{ij}^{f} \leq S_{ij}^{max}$ (apparent power flow limit lines,from side)

$S_{ij}^{t} \leq S_{ij}^{max}$ (apparent power flow limit lines, to side)

$V_i^{min} \leq V_{min} \leq V_i^{max}$ (bus voltage limits)

$P_{gi}^{min} \leq P_{gi} \leq P_{gi}^{max}$ ((active power generation limits)

$Q_{gi}^{min} \leq Q_{gi} \leq Q_{gi}^{max}$ ((reactive power generation limits)

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The costs of active and reactive power generation for generator I at a given dispatch point are denoted by f1i and f2i. Both f1i and f2i are polynomial or piecewise linear functions. The problem can be stated more succinctly as follows [4].

POWER WORLD SIMULATOR is a collection of codes for solving the optimal power flow problem in both alternating current (AC) and direct current (DC) modes. Each has a standard version that is as follows:

$$\min_{x} f(x)$$

Subject to

$$g(x) = 0$$
$$h(x) \leq 0$$
$$\min \leq x \leq \max$$

Flow Case Study on IEEE 30-Bus

Fig. 1 illustrates the line diagram of an IEEE 30-bus system created with Power World Simulator. Certain lines have been observed to be congested, as illustrated in Fig. 1. As a result, we determine the TLR sensitivity of each bus, as listed in Table 1.

It demonstrates that bus 2 has a higher TLR sensitivity than other buses, and that bus 5 has a higher TLR sensitivity than other buses. To begin, we apply SVC to bus 2 and observe the voltage profile depicted in Fig. 2. Table 1summarises the branch's power. Second, we apply SVC to bus 5 and inspect the voltage profile shown in Figure 2, as well as the branch power shown in Table 2. It has been observed that after implementing SVC, the voltage profile of that particular bus improves and congestion is reduced by approximately 80%.

Table 1 After Static Var Compensator (SVC) for IEEE 30-bus system

Branch no.	From number	To number	Before SVC MVA rating in%	After SVC MVA rating in %
1	1	2	121.2	89
2	1	3	61.4	69.3
3	2	4	26.8	18.2
4	2	5	57.1	43.6
5	2	6	28.5	20.1
6	3	4	15.0	10.6
7	4	6	9.3	9.9

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8	4	12	13.0	13.8
9	5	7	22.1	17.8
10	6	7	42.6	35.9
11	6	8	21.6	21.2
12	6	9	6.7	6.2
13	6	10	3.3	3.7
14	6	28	22.4	23.6
15	8	28	10.6	10.7
16	9	10	18.5	19.1
17	9	11	24.9	24.9
18	10	17	8.3	8.3
19	10	20	9.7	9.6
20	10	21	25.2	25.8
21	10	22	16.2	16.6

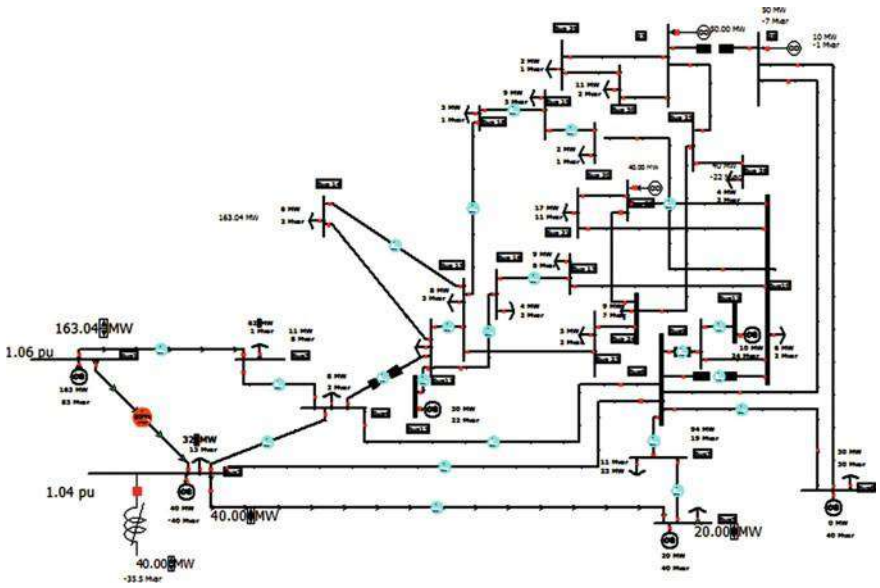

Fig. 2 Single line diagram of IEEE 30-bus test system after SVC at bus 2

7Conclusion

The Static Var Compensator (SVC) is considered as a first solution in this paper because it has been demonstrated to be an efficient method of managing congestion in the economic load market. The application of a Static Var Compensator (SVC) to assist in congestion management is found to benefit the system in terms of congestion resolution. Contracts that are more or less identical to the originally planned schedule are highly valued by both power distributors and consumers. The analysis is performed on an IEEE 30-bus network. The TLR sensitivity is determined here, as well

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as the location of the Static Var Compensator (SVC) for congestion resolution and verification of the simulation results. It has been observed that based on simulation results on various systems, there is a strong possibility of optimising the location of Series Compensation and relieving congestion. The optimal location of Series Compensation to alleviate congestion is both technically and economically advantageous. The SVC location on bus 2 results in improved congestion management on the IEEE 30-bus system. When it comes to series compensation, location is more important than anything else. The Power World Simulator verifies the results.

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Different Pricing Parameters And Simulator Used For Competitive Power Market

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Abstract : Transmission pricing for trade offs in power market is proposed. Different pricing parameters is an essential provision in simulator associated with congestion, re-dispatch and facilitate techno-economical analysis of trading philosophy with background calculations performed by optimized power flow package and front-end software with Graphic User Interface facilities. The online pricing simulator will be analyzing the transmission pricing based on certain pricing indices with optimization tools working in tireless fashion to readjust the biddings and contract handling making on line power trading very effective. The eight transmission pricing schemes are being evaluated .The proposed approach has been tested on IEEE14 Bus and on IEEE 30 Bus system using MATLAB simulation program to illustrate the different results derived among the pricing schemes. This paper will prove beneficial for power trading parties involved in power transaction for techno-economic analysis with chosen indices as an added facility available on line.

Keywords : Optimal Power Flow (OPF), Transmission pricing, Open Access.

1. Introduction

Throughout today's unbundled power systems, it is assumed that the transmission system is a natural monopoly, and therefore, it should be regulate compensate for the revenue requirements of the owners of transmission system and encourage its future expansion, transmission pricing schemes should be designed fairly. Also the schemes must aim to achieve the objectives of maintaining system security by encouraging proper operation and maintenance of exiting and investment in new facilities. In this paper, based on a simple economic principal, a novel method for allocation of the fixed cost of transmission system to agents using these facilities is developed. This method introduces the concept of critical capacity of a line and considers

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congestion in the transmission system to allocate the share of the transmission system revenue requirement that each agent has to provide. Identifying and charging the agents who cause congestion is very important as it sends the correct economic signal to transmission network users. This is a novel feature of these method, thus making it most suitable for systems where congestion does occur.[1-2]

Transmission pricing of electricity is a basic ingredient of the competitive power market that are currently being developed world wide. Several methodologies have been implemented or proposed for the allocation of all or part of the existing network cost to the users of transmission system (consumers & generators) . Some of them (postage stamp , contract path , MW – mile , etc.) are based on "extent of use " paradigm , while others are based on incremental transmission pricing paradigm.. The methods described in detailed & analyzed in this paper , which are addressed to allocate the entire cost of a network among all the network users on the same basis . This approach is preferable in the competitive power markets with full open transmission access[3-4].

This paper presents an overview of transmission pricing methodologies under open access. Transmission costs involves both technical & regulatory issues, & as a result, the methods available in the literature differ in their definition & major of the "extent of use" of transmission resources. The cost of basic transmission services corresponds primarily to the fixed transmission cost i.e. also referred as the transmission capacity cost or existing system cost are embedded transmission facility cost. Electric utilities traditionally allocate the fixed transmission cost among the users of firm transmission service based on Postage-Stamp Rate & Contract Path methods.

MW – Mile methodology may be regarded as the first pricing strategy proposed for the recovery of fixed transmission costs based on the actual use of transmission network. In this method charges for each wheeling transaction are based on the measure of transmission capacity use . This is determined as a function of the magnitude, the path & the distance travelled by the transacted power . Since the charge for basic transmission service is usually the largest component of the overall charge of transmission services, a considerable amount of research effort has focused on the development of usage-based cost allocation schemes & various implementations of MW – Mile methodology have been proposed in the literature .

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The primary objective of this paper is to provide a summary of recent techniques used for designing fair & equitable access for the recovery of fixed transmission costs. Numerical examples are provided to compare the results using different methods. In the original MW-Mile methodology , the usage of transmission facilities is measured by absolute flow values , & the transmission facility costs are allocated in proportion to the ratio of flow magnitude contributed by a particular transaction & the sum of absolute flows caused by all transmission users . The following equation may give a more general expression of MW-Mile rule [5-6].

Transmission line pricing is related to open access policy in deregulated electricity market. Fixed costs in transmission is referred as embedded transmission facility cost. This cost can be interpreted as operation, maintenance and planning of transmission system. It resembles to sharing of communication networks by different service providers. Such market players are charged for power transaction over the allocated part of transmission. The advent of liberalization of the electricity market in Europe has seen the growth of cross-border trading of energy. Transmission line pricing is a major issue in open access faced by the electric power industry. Transmission providers will be required to offer the basic transmission service in conjunction with a number of mandatory and/or voluntary ancillary services. Basic transmission service along with ancillary services, such as operating reserves, regulation, load following and voltage control, are the functions necessary for maintaining the reliability of the system and undertaking commercial transactions across the grid .

The cost of the transmission services corresponds primarily to the fixed transmission cost. Electric utilities traditionally allocate the fixed transmission cost among the users of firm transmission service based on Postage-Stamp Rate and Contract Path methods.

In the postage-stamp rate method, transmission users are not differentiated by the “extent of use” of transmission facilities but charged based on an average embedded cost and the magnitude of transacted power. Contract path method, on the other hand, assumes that the transacted power would be confined to flow along an artificially specified path through the involved transmission systems. Accordingly, the transaction will be charged a postage-stamp rate that may be calculated either separately for each of the transmission systems or as a grid average. In reality, however, the actual path taken by a transaction may be quite different from the specified contract path thus involving the use of transmission facilities outside the contracted systems.MW-Mile methodology is regarded as the first pricing Strategy related to recovery of fixed transmission

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costs based on the actual use of transmission network. In this method charges for each wheeling transaction are based on the measure of transmission capacity use. This is determined as a function of the magnitude, the path and the distance traveled by the transacted power. Since the charge for basic transmission service is usually the largest component of the overall charge, lot of research effort has focused on the usage-based cost allocation schemes, and various implementations of MW-Mile methodology have been proposed in the literature.

Allocation of ancillary services is a rather complicated problem. Unlike the basic transmission service, the cost of ancillary service often involves several cost components. For instance, the cost of operating reserve may involve capacity cost, energy cost and opportunity cost. Moreover, the costs of some ancillary services may vary greatly as a function of time, location, and level of system load. Although some newly proposed cost allocation methods can determine the contributions to real power losses and reactive power support from individual users, very few publications are available for the allocation of regulation, load following and operating reserves. These ancillary services are usually distributed among the transmission users in proportion to their scheduled/metered generation or demand. The primary objective of this paper is to provide a pricing simulator with more facilities for designing fair and equitable access fees for the recovery of fixed transmission costs. Real-time congestion pricing strategies associated with transmission constraints in a competitive electricity market are also included. Numerical case study is provided to facilitate the proposed pricing methodologies.

In the restructured electricity market, transmission company plays a vital role due to its involvement in the determination of charges for transmission pricing. In the traditional regulated power market, pricing have accounted for a small portion of the overall transmission network capacity usage. However, recent trends are stimulated renewed interest in pricing of transmission or distribution facilities of a system to transmit power of and for another entity. It is also states that, pricing is the use of some seller to buyer involving transmission network of a third party. Transmission cost is due to re-dispatching of generators and transmission losses [7-8] Transmission pricing is carried out:

1.To recover the capital and operating costs

2.To encourage efficient use and investments.

3. To provide equal opportunity to all users.

4. To offer a simple and understandable price structure.

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5.To easy implementation.

This paper analyses all eight pricing methodologies. Previously all these methods have been evaluated [7] but best method for pricing is not identified. Particularly, in this paper, we have tested pricing methodologies under various load conditions and Moreover, it is clear that Unused reverse MW-Mile method gives minimum pricing method even when the load changes. The proposed has been tasted on IEEE 14 bus and IEEE 30 bus system using MATLAB simulation programs. The working flow charts of eight pricing method has been presented in this papr. We have done the calculation in an optimal Power Flow solution. A Graphical representation of the allocation obtained by this method which is given in figures.

2. TRANSMISSION PRICING

This section provides principles for transmission pricing. Although transmission costs represent only about 2 percent of an investor-owned utilities' operating expenses, they are nonetheless important. Workable competitive power markets require ready access to a network of transmission and distribution lines that connect regionally dispersed end-users with generators. Because power flows at one location impact electric transmission costs across the network, transmission pricing may not only determine who gets access and at what price but also encourage efficiencies in the power generation market [8].

Transmission constraints can prevent the most efficient plants from operating. These constraints also can determine the location of generation that affect the amount of power losses for transmission. Transmission prices that ignore these concepts will produce an inefficient system. Transmission pricing that considers transmission constraints (congestion pricing) should encourage the building of new transmission and/or generating capacity that will improve system efficiency.

2.1 Pricing Options

Costs categorized as Congestion Cost and Transmission Line Pricing, can either be assigned directly to users causing the congestion or shared among all users. If the transmission system becomes congested so that no more power can be transferred from a point of delivery to a point of receipt of power, thus more expensive generation may have to operate on one side of the transmission than the other. For a competitive market, regardless of the form of transmission pricing utilized, this would result in a difference in generation prices between the two locations.

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(If any low cost power generated on one side of a constraint could be sold at the higher price on the other side of the constraint, assuming the difference is more than the transmission cost, in the absence of the congestion.) The differences in electricity prices is the "economic price of transmission", which is related to the congestion cost and cost of losses. For such absence of congestion pricing for transmission service, the "economic rents" would represent a windfall to the generation suppliers that are able to sell through the congested interconnection. Hence, transmission prices will recover congestion rents from suppliers who are able to complete transactions through the constrained interface[9-10].

There are various ways to allocate revenues from congestion pricing. For example in California, such type of revenues are used to reduce the access fees that all transmission customers pay. Another proposal thought is to create a system of transmission congestion contracts. These would establish set of rights to either make power transfers or receive compensation for the inability to do so through redistribution of congestion rentals to the holders of transmission congestion contracts.

This paper evaluates the following eight transmission pricing algorithms:

a) Postage Stamp;

b) MW-Mile (original);

c) Unused absolute MW-Mile;

d) Unused reverse MW-Mile;

e) Unused zero counter-flow MW-Mile;

f) Used absolute MW-Mile;

g) Used reverse MW-Mile and

h) Used zero counter-flow MW-Mile.

a. The Postage Stamp Method

One of the traditional methods is the postage stamp method (PS), also known as the rolled-in method [12]. According to this method, the network usage from the side of a transaction is measured by the magnitude of the transaction Pi , without taking into account how the transaction affects the power flows over the various lines in the network[7]. The amount to be paid by transaction is:

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$$PS_i = K \frac{P_i}{\sum_{j=1}^{n} P_j} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots [1]$$

where

K : the total cost to be covered by the market participants

PSi : the amount charged to participant according to the postage stamp method

Obviously, since the postage stamp method does not take distances into account, it leads to cross-subsidization of long-distance transactions by short-distance transactions. Despite this fact, this method is widely implemented because of its simplicity.

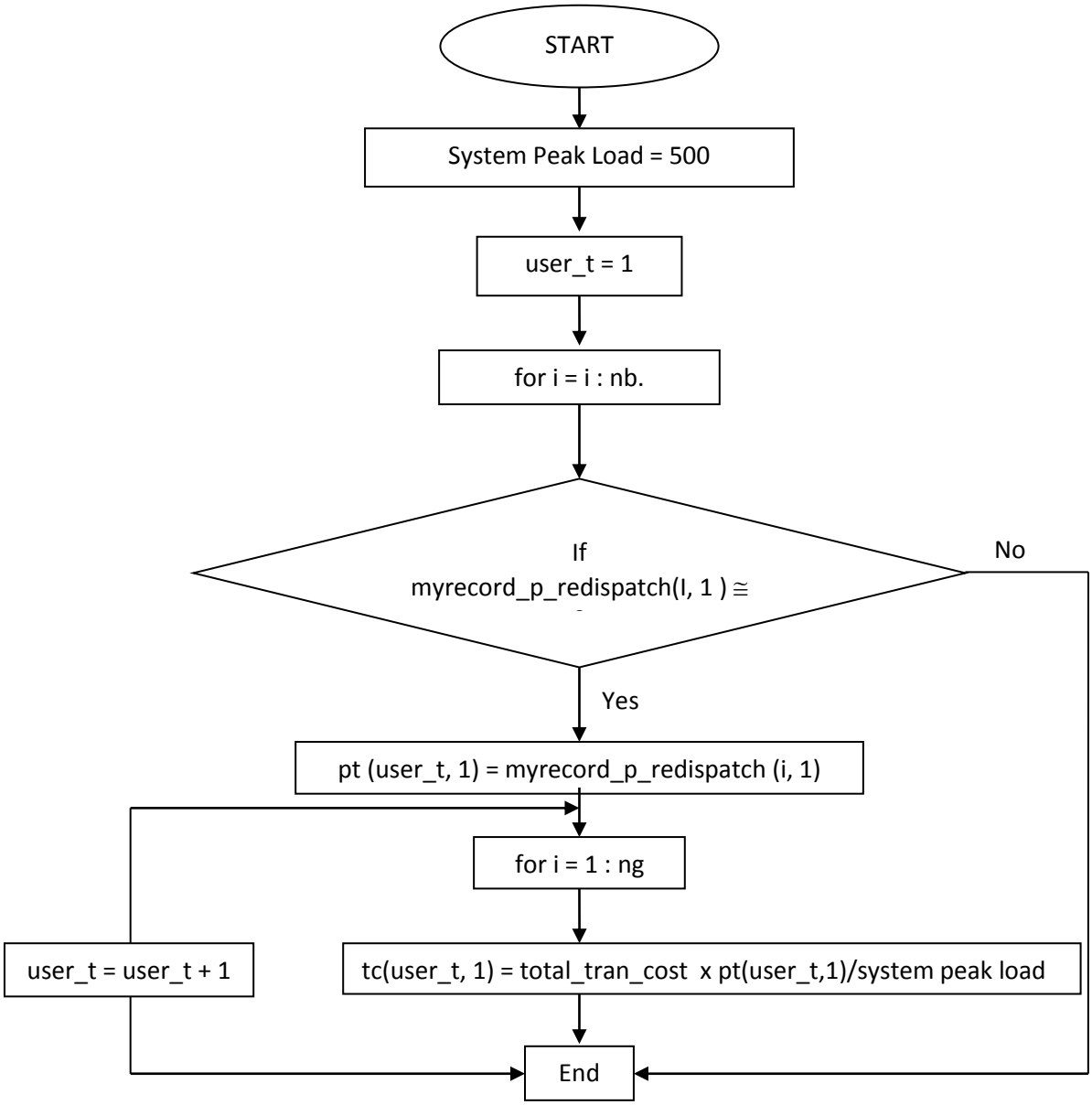

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Fig.1: Flowchart for Postage Stamp Method

b. The MW-Mile Method

MW-Mile methodology may be regarded as the first pricing strategy proposed for the recovery of fixed transmission costs based on the actual use of transmission network. In this method charges for each wheeling transaction are based on the measure of transmission capacity use. This is determined as a function of the magnitude, the path and the distance traveled by the transacted power.

The distance relating transmission-pricing method known as the Mw-Mile method is also a rolled-in- transmission pricing method. Transmission line capacity usage consists of two components: The amount of power transmitted, and the length over which the power is transmitted. In this methodology transmission price is a function of the transacted power. The maximum transaction-related flow on every line is multiplied by the line length & a factor reflecting the cost per unit capacity of the line. The price is proportional to the transmission usage by the transaction. Moreover, the statistical analysis of the wide set of different operating states results shows that each consumer is predominantly supplied by the same set of lines. On this conclusion the transmission service price could be obtained in advance.

A method proposed by Bialek is one of most recognized. Initially, it has not taken into account transmission losses due to assumption that the power flow is same at the beginning & at the end of the branch .As Bialek explained in his papers, his main objective for developing power flow tracing methods has been to use them as a base for transaction based transmission service pricing method in deregulated power systems .MW-Mile method is a typical representative of these methods. There is a difference among methods in this group since some of them are based on contract paths whereas others are based on physical power flows, i.e. physical paths.[11]

In order to achieve a more precise measurement of network usage, numerous methods based on power flow data have been developed. The MW-mile method (MWM) was the first such method to be introduced . In order to determine the cost allocation, the network operator runs a power flow program for each single transaction and calculates the power flow due to this transaction over each system line. These power flows are then weighted by the specific transfer cost Cl of each branch l which is expressed in €/MW. The role of Cl , in the case that a pre-defined amount

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K must be proportionally allocated to the system users, is to differentiate the use of facilities with various costs. Thus, in this case Cl should not be confused with a direct payment, per MW, to the system operator. However, Cl may be indeed interpreted as direct, per MW, payment when other, than proportional share of a pre-defined amount K, allocation form is adapted. This case will be illustrated in a following section. The usage of any branch by transaction i will be:

$$f_{i,l} = C_i \left| P_{i,l} \right| \dots\dots\dots\dots\dots\dots [2]$$

where

fi,l : the usage of branch l by the market participant i

The absolute value in (4.31) denotes that the power flow direction is disregarded. The total system usage fi by transaction i is given by summing over all lines:

$$f_i = \sum_{l=1}^{n_l} f_{i,l} \dots\dots\dots\dots\dots\dots\dots\dots [3]$$

By allocating proportionally the total system cost, the contribution of transaction i will be:

$$MWM_i = K \frac{f_i}{\sum_{j=1}^{n} f_j} \dots\dots\dots\dots\dots [4]$$

where

MWMi : the amount charged to participant i according to the MW-mile method.

When the electricity market operates in an environment of competitive trade then each transaction agent is responsible to pay a part of the power system fixed cost. Similarly to the case of pool market, the form of a coalition between some players can be profitable by the existence of counter flows. Note that the allocation of fixed cost is made for each time interval and not at a peak load moment. Hence, power flows in opposite direction are the motivation for the cooperation between players rather than the difference between players' peak loads and coalition peak load [7].

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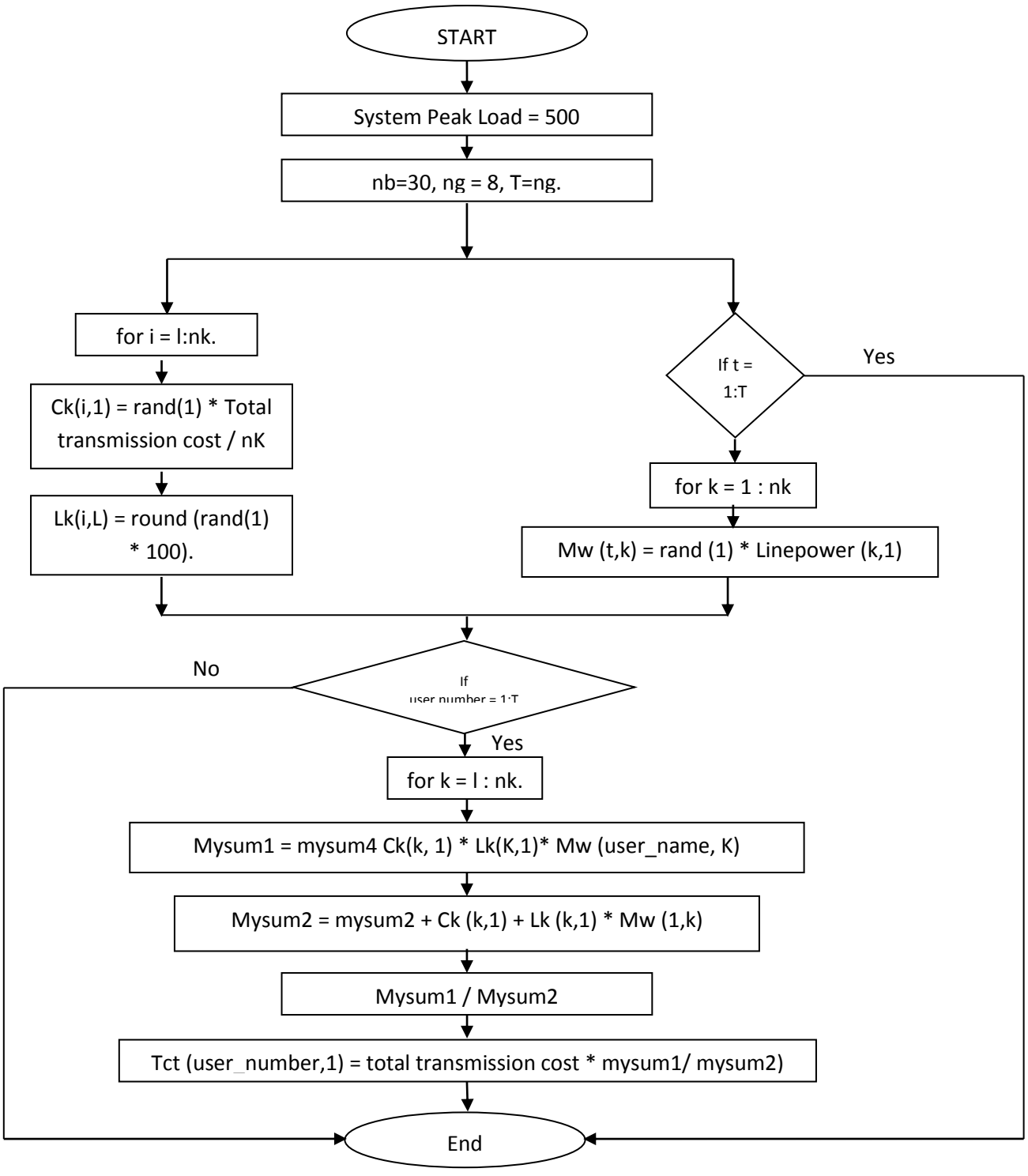

Fig.2: Flowchart for MW-Mile Method

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(*) Unused Absolute MW-Mile Method

The unused absolute MW-mile method charges users based on the power flows they cause, irrespective of the power flow direction, that is, the users who cause counter flows will pay for them, so each user k has to pay [5]:

$$TC_t = \sum_{k \in K} C_k \frac{|F_{t,k}|}{\sum_{t \in T} |F_{t,k}|} \dots\dots\dots\dots\dots\dots\dots\dots [5]$$

where TCt is the cost allocated to network user t, Ck is the cost of line k,

Ft,k is the power flow on line k caused by user t,

T is the set of users, and K is the set of transmission lines.

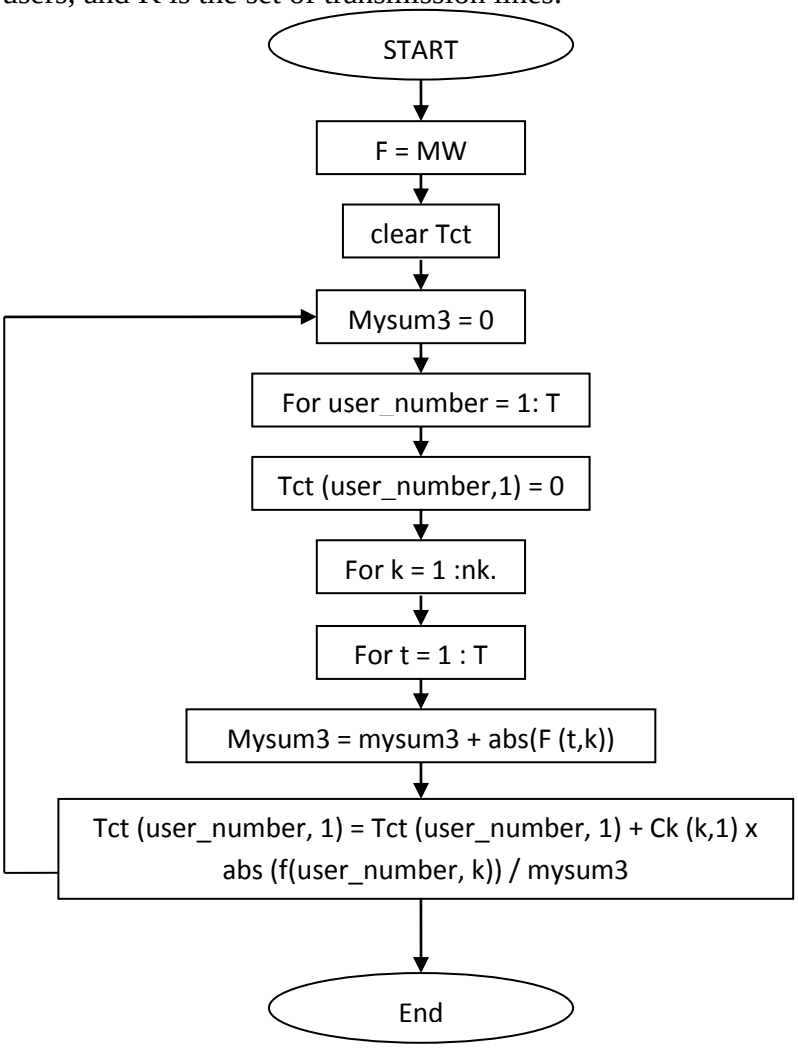

Fig.3: Flowchart for Unused Absolute MW-Mile Method

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(*) Unused Reverse MW-Mile Method

In the unused reverse MW-mile, users get credit for the counter flows they cause. More specifically, the charge for user t is [6]

$$TC_t = \sum_{k \in K} C_k \frac{F_{t,k}}{\sum_{t \in T} F_{t,k}} \dots\dots\dots\dots\dots\dots [6]$$

where TCt is the cost allocated to user t, Ck is the cost of line k, Ft,k is the power flow on line k caused by user t, T is the set of users, and K is the set of transmission lines.

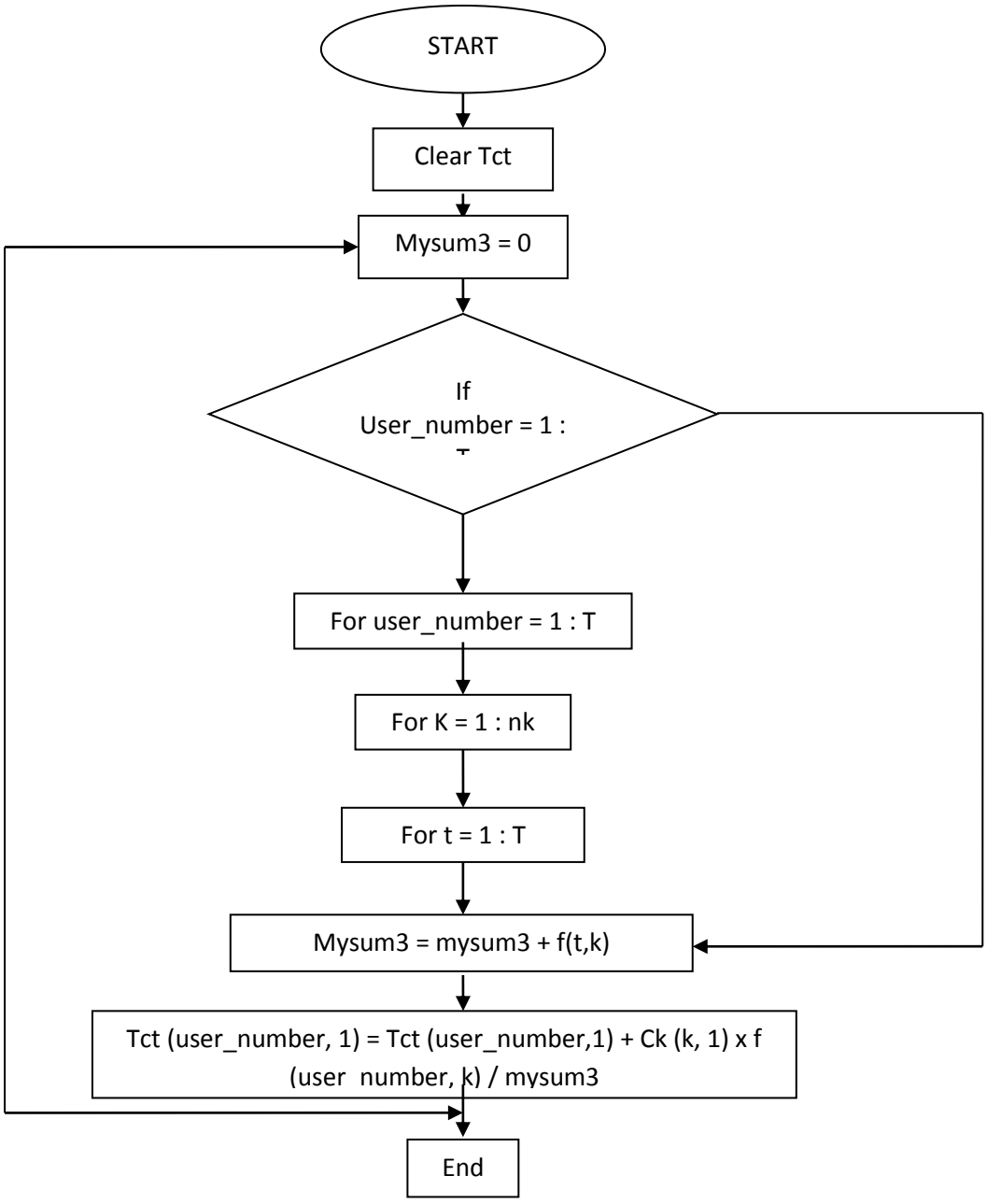

Fig.4: Flowchart for Unused Reverse MW- Mile Method

(*) Unused Zero Counter Flow MW-Mile Method

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The unused zero counter flow MW-mile method charges the users who use the network only in the same direction of the net power flow. So users responsible for the counter flows neither pay any charge nor get any credit for the counter flows. The payments are as follows [7]:

$$TC_t = \sum_{k \in K} C_k \frac{F_{t,k}}{\sum_{t \in T} F_{t,k}}, \qquad \forall F_{t,k} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [7]$$

where TCt is the cost allocated to network user t, Ck is the cost of line k, Ft, k is the power flow on line k caused by user t, T is the set of users, and K is the set of transmission lines.

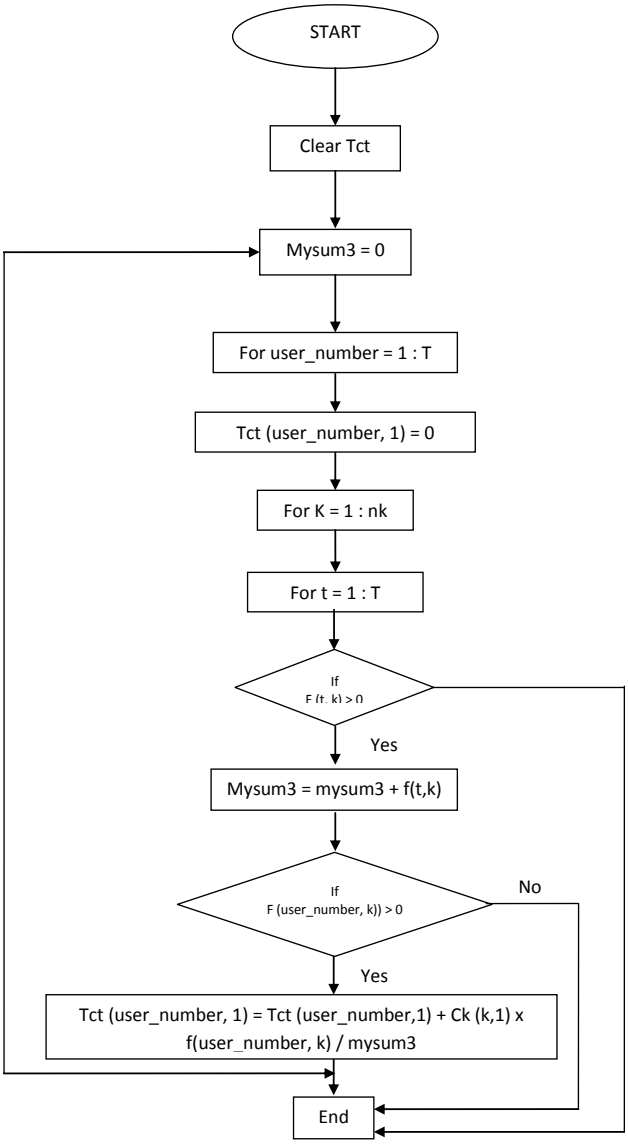

Fig.5: Flowchart for Unused Zero counter flow MW-Mile Method

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(*) Used Absolute MW-Mile Method

In the used absolute MW-mile method, the charge for user t becomes [8]

$$TC_t = \sum_{k \in K} C_k \frac{|F_{t,k}|}{F_{k,max}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots [8]$$

where TCt is the cost allocated to network user t, Ck is the cost of line k, Ft,k is the power flow on line k caused by user t, Fk,max is the capacity of line k, and K is the set of transmission lines.

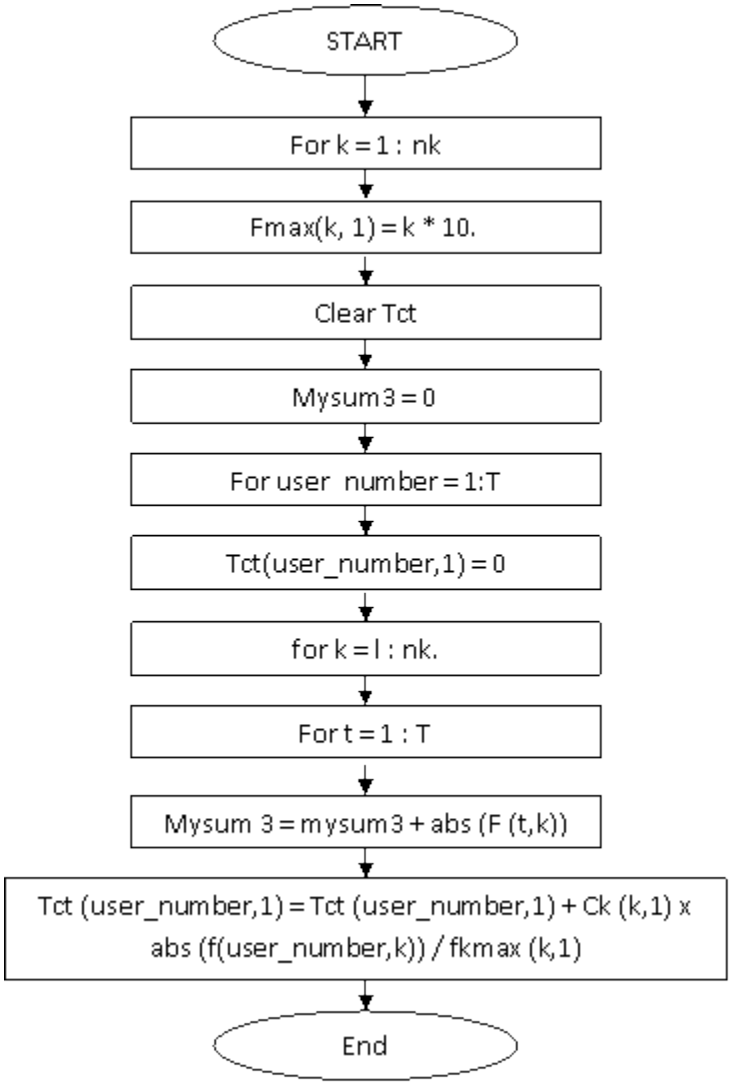

Fig.6: Flowchart for Used Absolute MW-Mile Method

(*) Used Reverse MW-Mile Method

In the used reverse MW-mile method, the charge for user t [9]

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$$TC_t = \sum_{k \in K} C_k \frac{F_{t,k}}{F_{k,max}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots [9]$$

where TCt is the cost allocated to network user t, Ck is the cost of line k, Ft,k is the power flow on line k caused by user t, Fk,max is the capacity of line k, and K is the set of transmission lines.

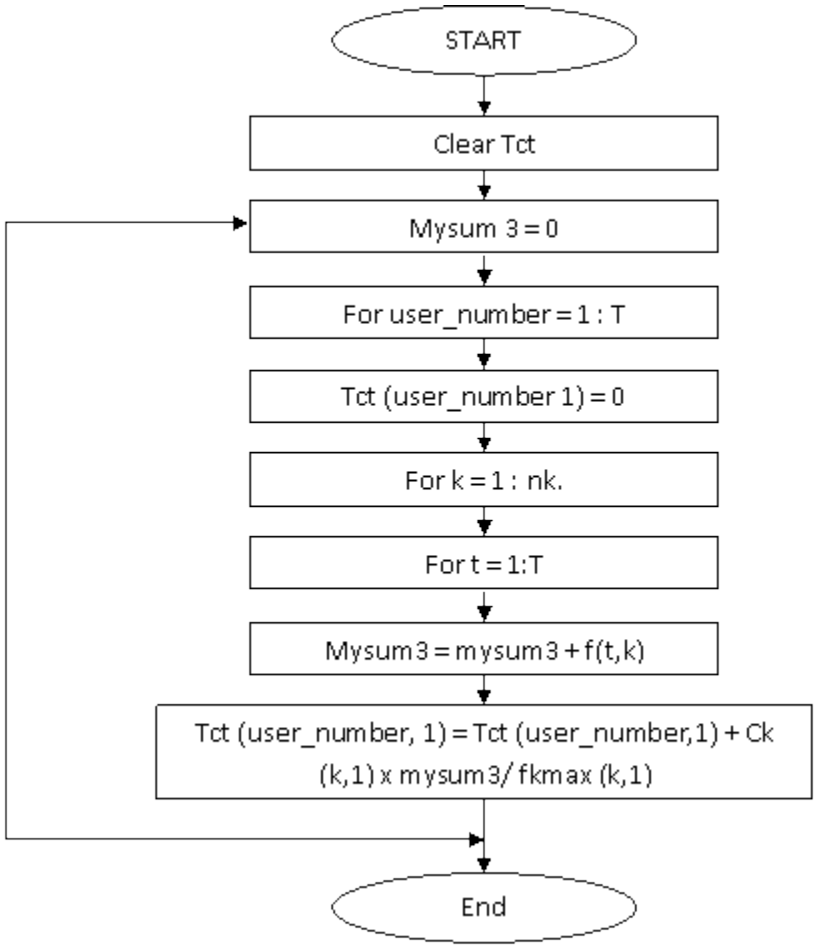

Fig.7: Flowchart for Used Reversse MW-Mile Method

(*) Used Zero Counter Flow MW-Mile Method

In the *zero counter-flow method* (zcf), reverse power flows are not counted so users responsible for the counter-flows do not pay any charge (as happens in the absolute MW-Mile approach) and do not receive any credit like (as happens in reverse MW-Mile method): The payments are as follows :

$$TC_{t,used} = \sum_{k \in K} C_k \cdot \frac{F_{t,k}}{F_{k,max}}, \qquad \forall F_{t,k} > 0 \dots\dots\dots\dots\dots\dots\dots\dots [10]$$

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where TCt is the cost allocated to network user t, Ck is the cost of line k, Ft,k is the power flow on line k caused by user t, T is the set of users, and K is the set of transmission lines.

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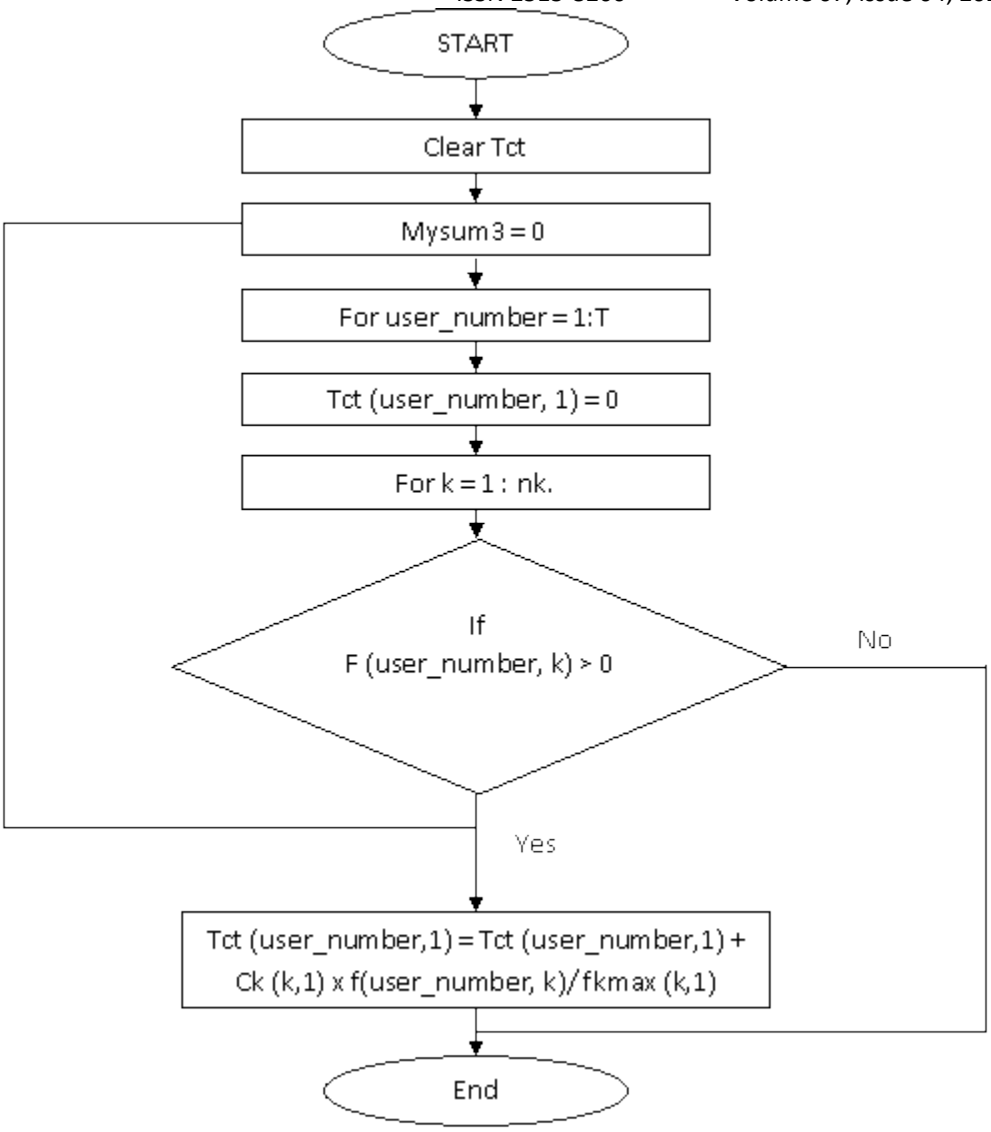

Fig.8: Flowchart for Used zero counter flow MW-Mile Method

3. FEATURES OF SIMULATOR BASED ON CONGESTION MANAGEMENT

The congestion management system was formulated according to a flowchart as shown. Readily available information on the current state of affairs can be found on the FRONT PANEL of associated online website. Here one can find a detailed time related information, an overview of key decisions, introduction of new working methods and modifications related to the dispatch, rates, competitive bidders, technical know-how, transaction details, history etc.

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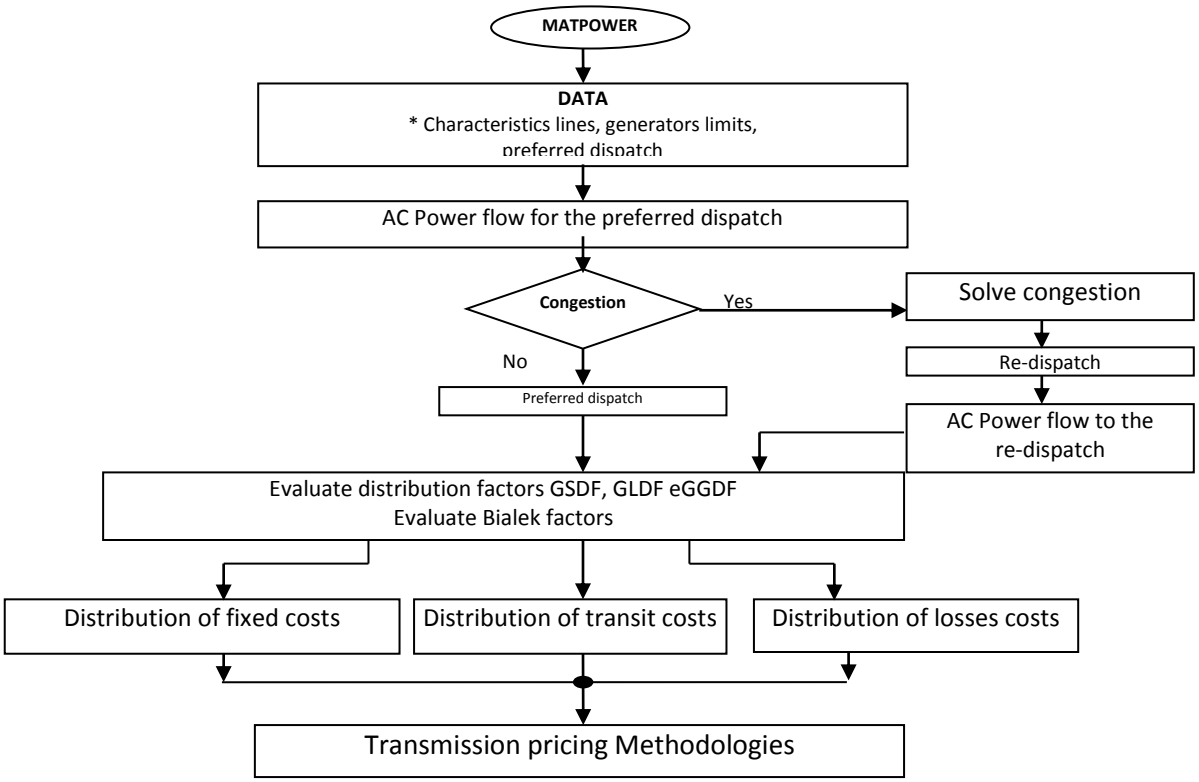

Fig.9: Flowchart for re-dispatch based congestion management.

This flowchart clearly states optimal power flow with and without congestion and calculation of performance and cost parameters thereafter.

4. Results of Transmission Pricing Parameters for IEEE 14 bus Case Study

The single line diagram of IEEE-14 bus test system is shown in Fig.10. The system consists of 5 synchronous generators. Associated flow results along with Transmission Pricing are given in Figures and Table as shown below. Table 1 and 2 gives the idea about initial dispatch and re-dispatch value. which is given in Fig.11 it also gives their differences. Result indicates that the difference in load demands at generator bus , whereas difference at other buses are zero. Table 3 provide the contribution of each generator and each load to the line flows under all methods. It illustrate the different results and characteristics between the pricing schemes for each pricing method. The obtained results are shown in Fig 12.This figure gives the solution for the minimum power transaction problems. Unused reverse Mw-mile method gives the minimum price. Fig.12, Fig.13 and Fig.14givesTransmission Pricing based on different pricing methods at Generator Buses tested under three conditions like on actual load, 5% increase in load and 10 %

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increase in load. Tabular representation is given in table 3,table 4 and table 5 Analysis is that Unused reverse Mw-mile method gives the minimum price under three different load conditions. The results indicates that the unused MW-mile method will be the preferred for calculating the transmission pricing. Numerical examples are provided to compare the results using different pricing methodology. At the End of the paper, a case study is carried out to access the effectiveness of the methodology developed.

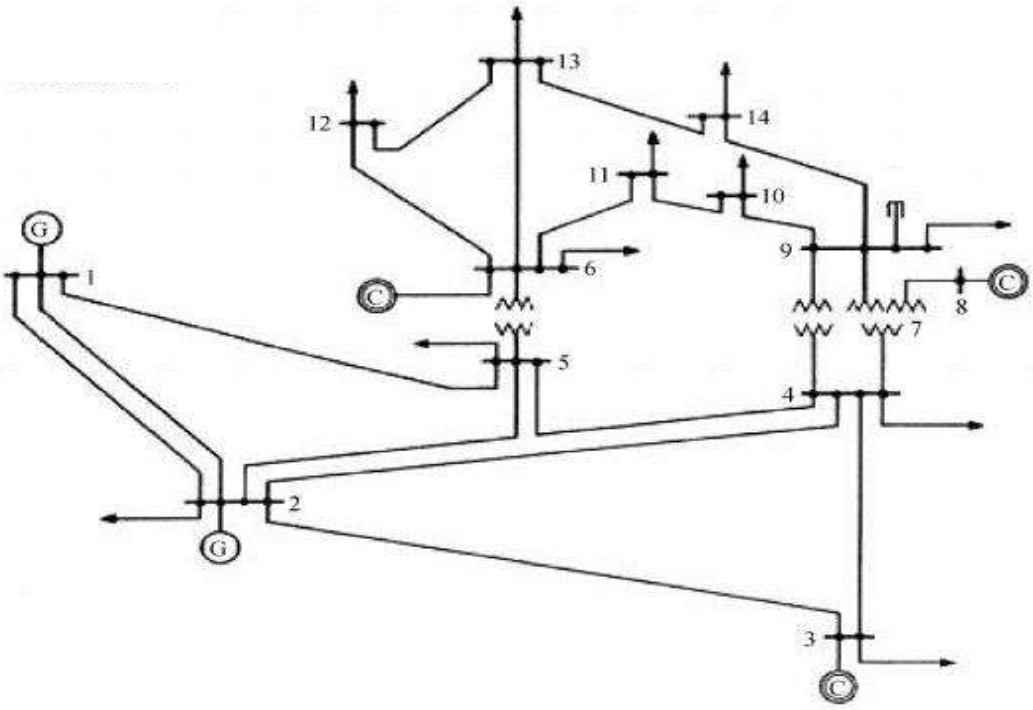

Fig 10. Single Line Diagram of IEEE 14 bus test system

Table 1 : Congested lines for Initial Dispatch

Line	Maximum Capacity	Expected line flow capacity	Actual Line flow
1	90	81	84.1196
2	50	45	45.0642

Table 2 : Re-Dispatch (MW)

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Line	1	2
OPF	112.5	62.5

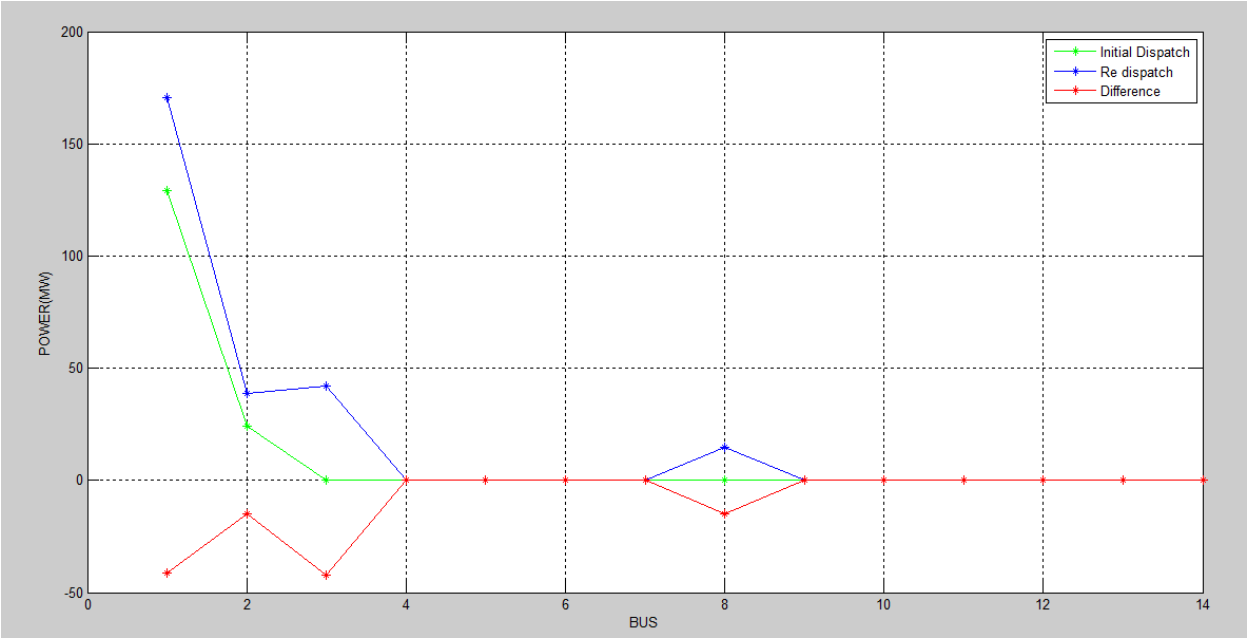

Fig 11. Difference in Initial power flow and Re-Dispatched Power at All Buses in Power System.

Table 3 : Tabulated Transmission Pricing based on different methods when load demand is actual

	G1	G2	G3	G4	G5
Postage Stamp	40970	9279	10118	10000	3559
MW-Mile (original)	39595	35331	31248	26098	24000
Unused absolute MW-Mile	2383	2918.7	1761.3	999.2	1116.8
Unused reverse MW-Mile	2252.7	2546.8	1574.7	813.8	1011.8
Unused ZCF MW-Mile	2325.7	2754.1	1678.8	917.5	1071
Used absolute MW-Mile	29682	35987	21614	10307	11661
Used reverse MW-Mile	28380	32898	20065	8582	10477
Used ZCF MW-Mile.MW	29031	34443	20840	9444	11069

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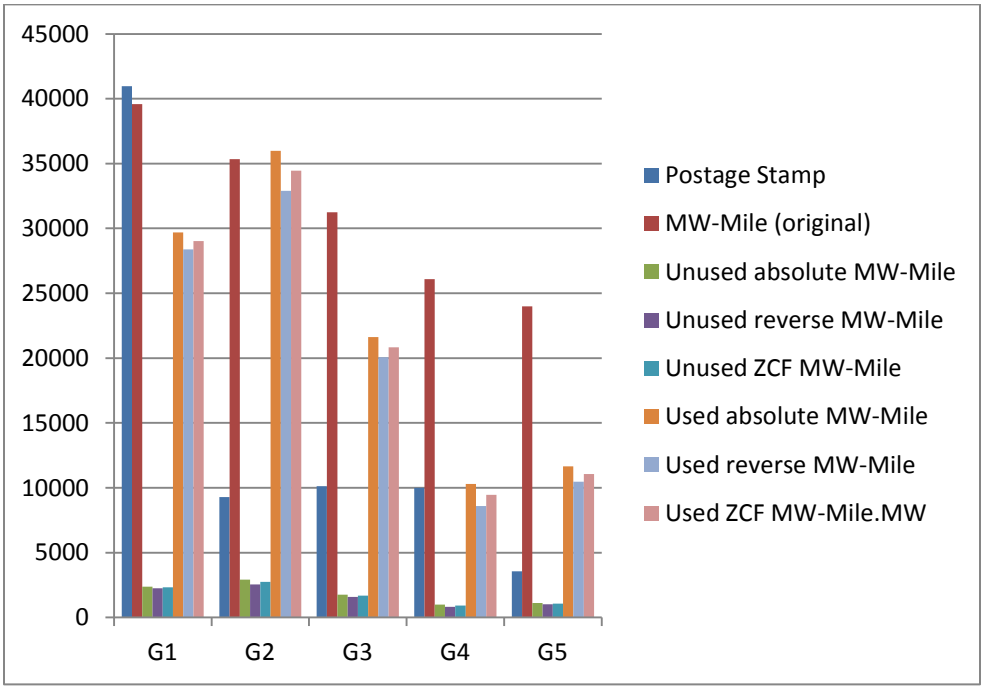

Fig 12. Transmission Pricing based on different pricing methods at Generator Buses when load demand is actual

Table 4 : Tabulated Transmission Pricing based on different methods when load demand increased by 5%

	G1	G2	G3	G4	G5
Postage Stamp	35031	9774	13524	38	5150
MW-Mile (original)	24617	27234	26431	24104	24000
Unused absolute MW-Mile	2159.8	2992.7	2178.6	1226	1156.2
Unused reverse MW-Mile	2018	2778.9	1891.6	1161.2	1165.8
Unused ZCF MW-Mile	2095.4	2895.2	2047.7	1196.8	1161.1
Used absolute MW-Mile	27494	40258	26630	14402	13246
Used reverse MW-Mile	25824	38209	23793	13404	12922
Used ZCF MW-Mile.MW	26659	39233	25212	13903	13084

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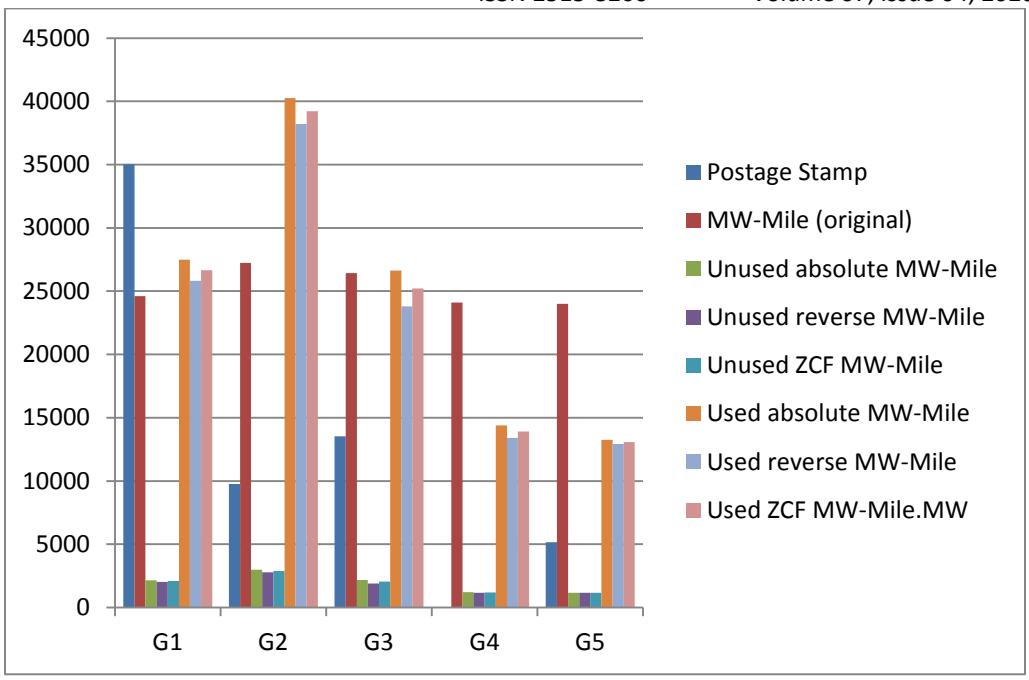

Fig 13. Transmission Pricing based on different pricing methods at Generator Buses when load demand is increased by 5 percent

Table 5 : Tabulated Transmission Pricing based on different methods when load demand is increased by 10 %

	G1	G2	G3	G4	G5
Postage Stamp	36521	9650	12676	8	4758
MW-Mile (original)	25130	26014	26047	24904	24000
Unused absolute MW-Mile	1221.7	1528.8	1405	1214.9	1060.3
Unused reverse MW-Mile	1025.3	1363.3	1259.5	914.1	785
Unused ZCF MW-Mile	1137.3	1458.6	1343	1085	941.4
Used absolute MW-Mile	1233.8	1576.9	1407.2	1165.4	1008
Used reverse MW-Mile	10489	13857	12449	9088	7830
Used ZCF MW-Mile.MW	11414	14813	13260	10371	8955

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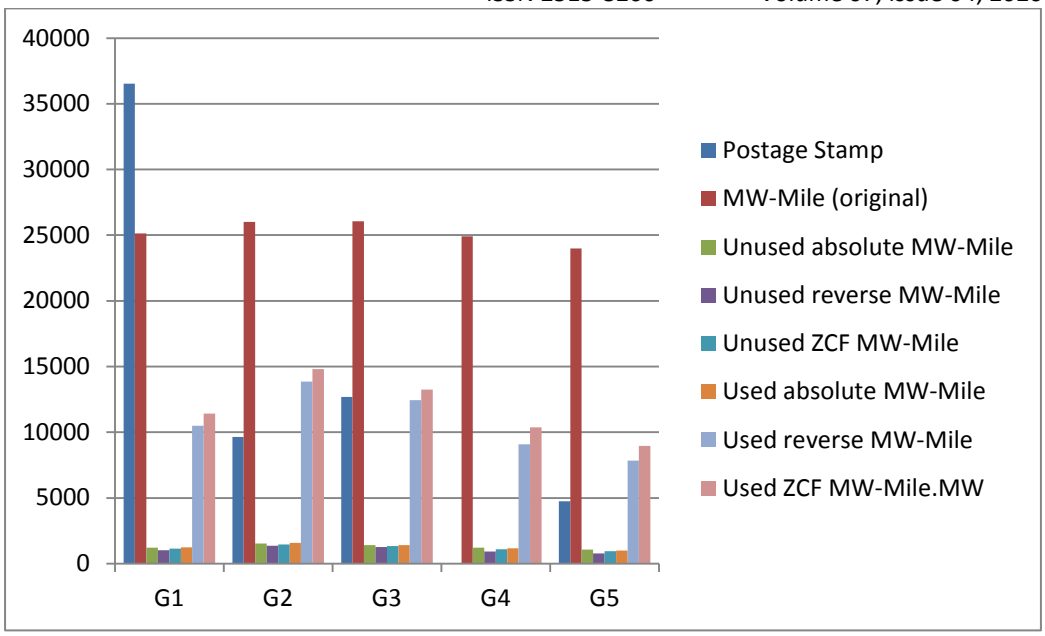

Fig 14. Transmission Pricing based on different pricing methods at Generator Buses when load demand increased by 10 percent

5. Results of Transmission Pricing Parameters for IEEE 30 bus Case Study

The single line diagram of IEEE-30 bus test system is shown in Fig. 15. The system consists of 8 synchronous generators and the system has 21 load points. Associated flow results along with Transmission Pricing are given in Figures and Table as shown below. Table 6 and 7 gives the idea about initial dispatch and re-dispatch value which is given in Fig.16 it also gives their differences. Table 8 provide the contribution of each generator and each load to the line flows under all methods. It illustrate the different results and characteristics between the pricing schemes for each pricing method. The obtained results are shown in Fig 17 This figure gives the solution for the minimum power transaction problems. Unused reverse Mw-mile method gives the minimum price. Fig.17, Fig.18 and Fig.19 gives Transmission Pricing based on different pricing methods at Generator Buses tested under three conditions like on actual load, 5% increase in load and 10 % increase in load.. Tabular representation is given in table 8,table9 and table10. Analysis is that Unused reverse Mw-mile method gives the minimum price even if the load changes. Numerical examples are provided to compare the results using different pricing methodology. The both the case study, result indicates that unused reversed MW-mile method for transmission pricing is most suitable method.

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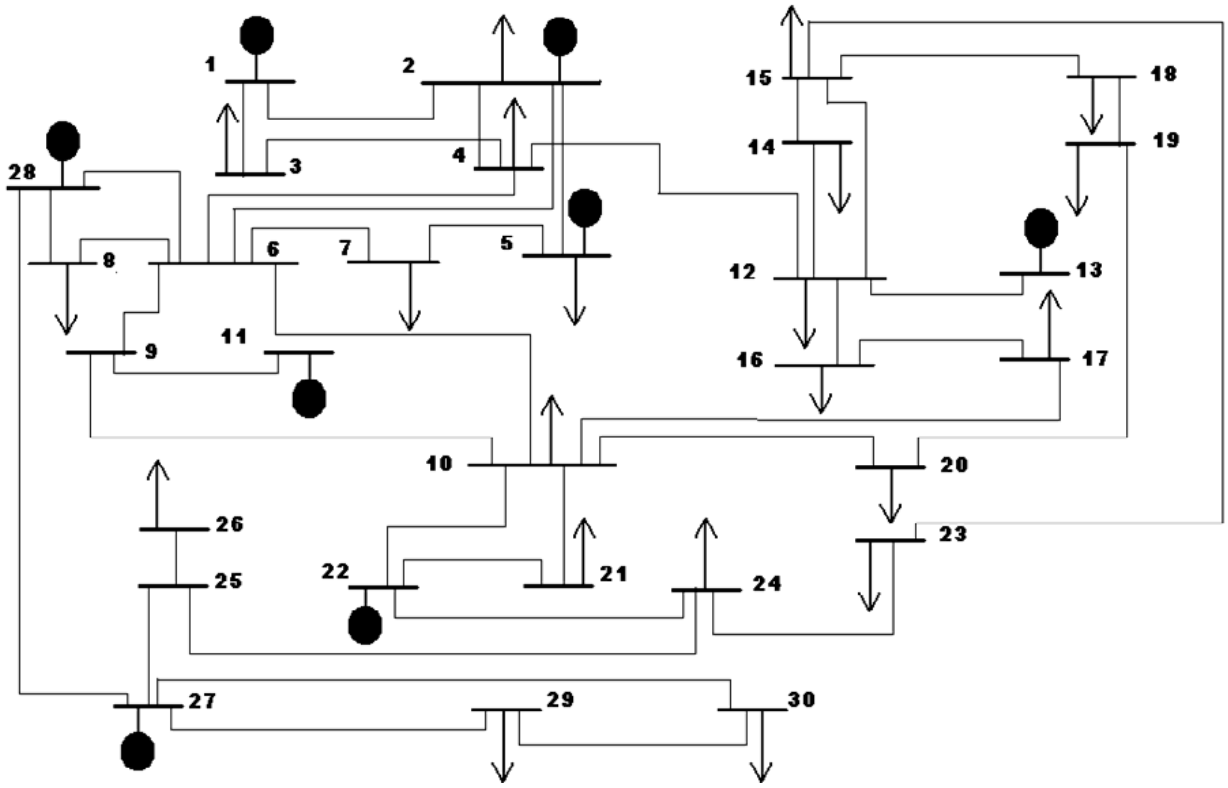

Fig 15. Single Line Diagram of IEEE 30 bus test system

Table 6 : Congested lines for Initial Dispatch

Line	Maximum Capacity	Expected line flow capacity	Actual Line flow
1	50	45	46..5290
2	20	18	19.9822
5	30	27	29.9942
9	30	27	29.9986
13	30	27	29.9867
16	30	27	29.9937

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Table 7 : Re-Dispatch (MW)

Line	1	2	5	9	13	16
OPF	62.5	25	37.5	37.5	37.5	37.5

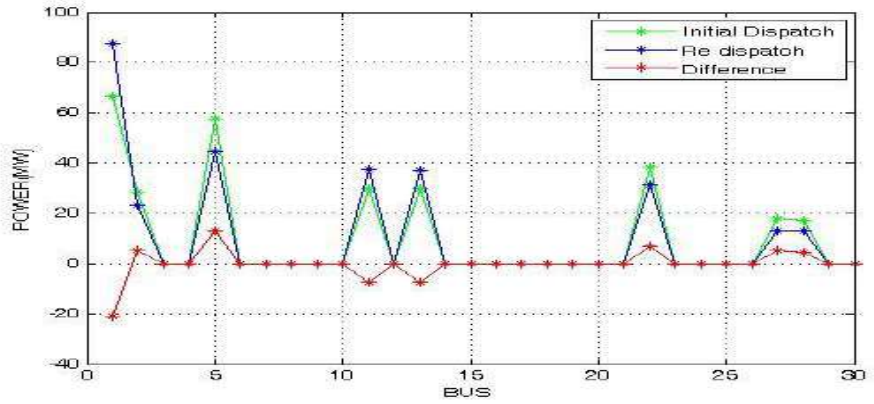

Fig 16. Difference in Initial power flow and Re-Dispatched Power at All Buses in Power System.

Table 8 : Tabulated Transmission Pricing based on different methods when load demand is actual

	G1	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**
Postage Stamp	20997	5604	10734	8994	8950.3	7523.3	3075.7	3099.8
MW-Mile (original)	21331	15188	16821	16530	13748	15726	15281	15000
Unused absolute MW-Mile	589.5813	412.3119	620.2634	648.5309	505.0881	497.0704	583.4231	617.1611
Unused reverse MW-Mile	383.8171	232.9476	462.0951	437.2383	207.2587	405.2488	372.4666	431.5599
Unused ZCF MW-Mile	509.6929	346.8107	558.7132	571.6908	391.3002	464.1904	500.2527	544.28
Used absolute MW-Mile	7390.8	4227.4	8604.3	8376.5	5988.5	5880.5	7871.4	7995.3
Used reverse MW-Mile	5761.1	2859.9	7357.9	6865.3	3921.3	5066.8	6296.8	6541
Used ZCF MW-Mile.MW	6775.9	3543.6	7981.1	7620.9	4954.9	5473.7	7084.1	7268.1

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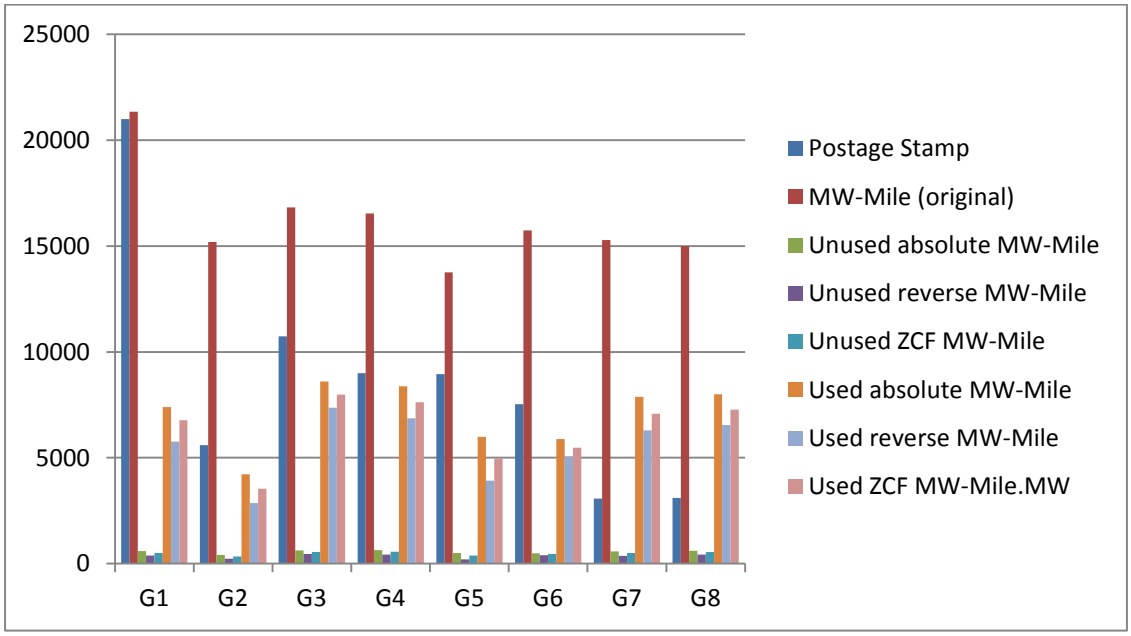

Fig 17. Transmission Pricing based on different pricing methods at Generator Buses when load demand is actual

Table 9 : Tabulated Transmission Pricing based on different methods when load demand is increased by 5 percent

	G1	G2	G3	G4	G5	G6	G7	G8
Postage Stamp	12449	4897	4581	10041	8551	6442	2772	4000
MW-Mile (original)	16605	13673	15297	13342	14134	13814	14098	15000
Unused absolute MW-Mile	636.7614	436.2361	556.2223	448.5456	549.5277	452.9673	402.9293	608.5664
Unused reverse MW-Mile	459.1329	345.5692	357.1428	214.4553	438.843	232.4698	240.5095	438.523
Unused ZCF MW-Mile	574.8072	404.968	491.1864	359.2046	505.1005	371.4457	345.4204	548.3159
Used absolute MW-Mile	80054	55514	53600	55208	66210	48018	35194	63597
Used reverse MW-Mile	6793.6	4740.3	4166.7	3928.1	5641.5	3199.7	2452.4	5212.6
Used ZCF MW-Mile.MW	7399.5	5145.8	4763.4	4724.4	6131.2	4000.7	2985.9	5786.1

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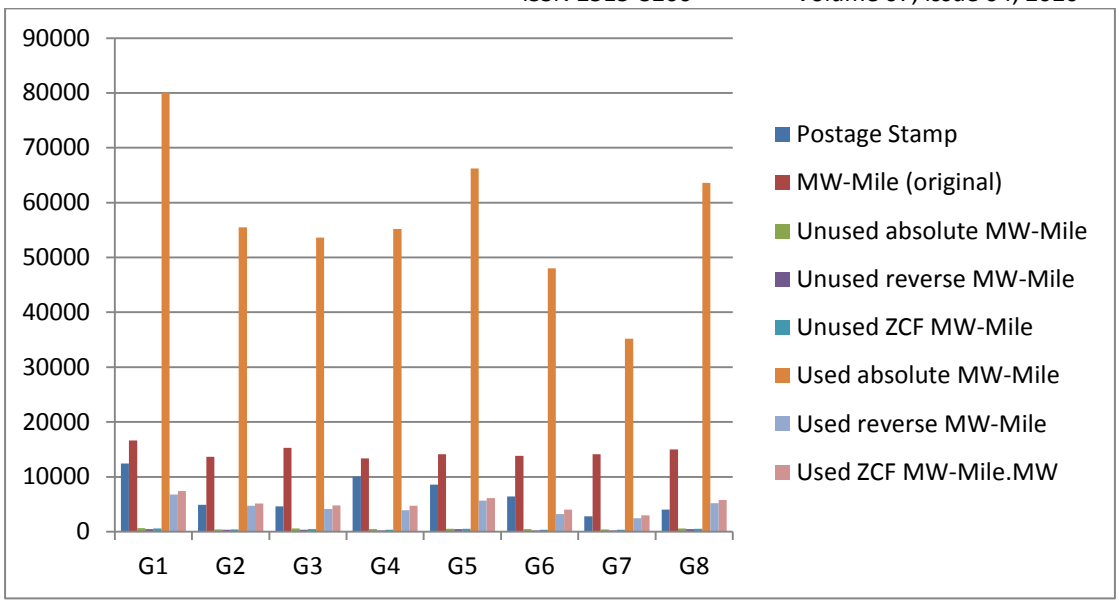

Fig 18. Transmission Pricing based on different pricing methods at Generator Buses when load demand is increased by 5 percent

Table 10 : Tabulated Transmission Pricing based on different methods when load demand is increased by 10 percent

	G1	G2	G3	G4	G5	G6	G7	G8
Postage Stamp	22215	18925	17966	14988	15213	14613	15249	15000
MW-Mile (original)	20615	15541	15059	14373	14474	14511	14678	15000
Unused absolute MW-Mile	10022	4690	5842	6844	6364	8202	8641	7210
Unused reverse MW-Mile	912.4293	402.0945	487.3463	551.7121	554.7381	715.7953	718.1917	595.8288
Unused ZCF MW-Mile	975.9226	448.5462	554.5674	640.3852	613.3504	785.6229	815.6329	678.3815
Used absolute MW-Mile	13617	4580	6340	8238	7656	10330	11837	8993
Used reverse MW-Mile	12969	4008	5579	7368	6944	9603	10848	8039
Used ZCF MW-Mile.MW	13293	4294	5960	7803	7300	9966	11343	8516

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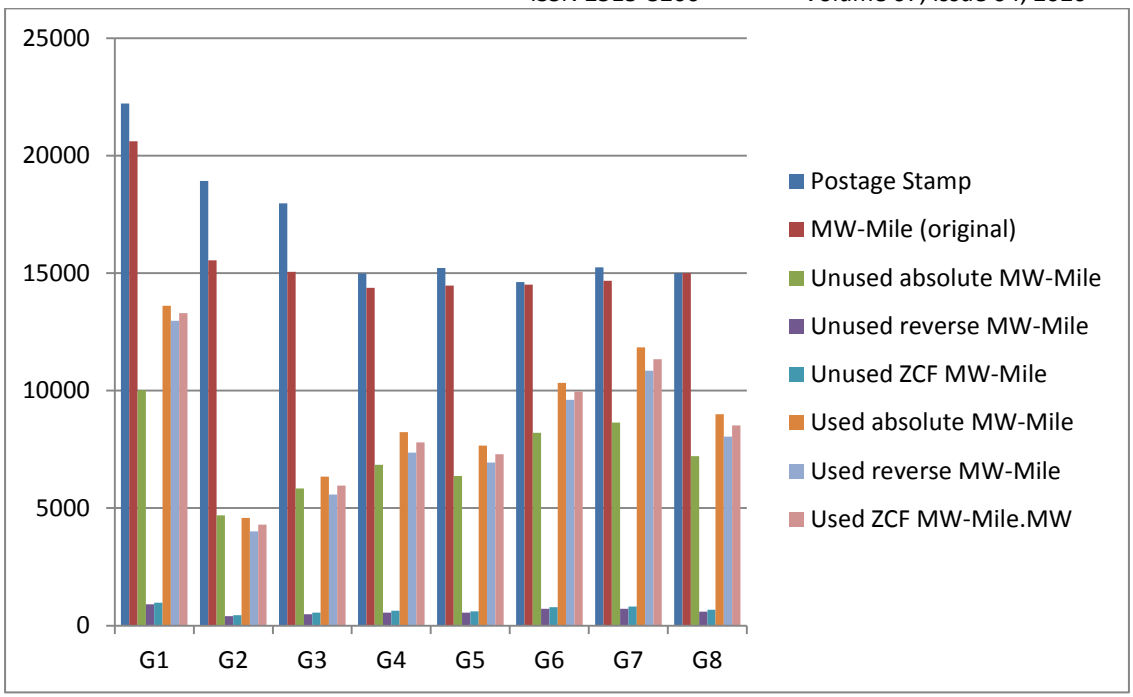

Fig 19. Transmission Pricing based on different pricing methods at Generator Buses when load demand increased by 10 percent

6. Conclusion

This paper presents computation of different transmission pricing for a case study of standard IEEE 14 bus and IEEE 30 bus system as an integral part of simulator built for deregulated power trading. Features of simulator include in depth analysis of various pricing schemes, management scheme and effect of Re-dispatch with optimal power flow constraint to relieve congestion. The programmed simulator offers a set of methods to calculate the allocation of these costs by the loads and generators and re-dispatch criteria. The trading philosophy with contracts based on different pricing can be negotiated in techno-economical way. In this paper we presented a case study based on the IEEE 14 and IEEE 30 bus network. Several congestion situations and transactions along with pricing both in the pool and bilateral contracts were analyzed and pricing based re-dispatch congestion management with economics as integral part proved to be effective as a temporary solution. MATPOWER calculation gets economical boost with such strategy. All the methods have been tested for all the pricing methods on IEEE 14 bus and IEEE 30 bus system. The methods were implemented in MATLAB, while optimal power flow was also used for the purpose of the method's evaluation. In this paper eight transmission pricing methodologies have been evaluated. Moreover, it is clear that Unused reverse MW-Mile method

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gives minimum pricing method even when the load changes. However, this pricing method are able to fulfill transmission pricing objectives: economic efficiency non-discrimination, transparency and cost coverage and can be also applied to large power system.

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Design and Implementation of Low-Cost Solar Powered Bird Repellent Technique for Prevention of High Economic Crops

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ABSTRACT

There is the most important downside in agricultural countries from domestic birds as a result of they're a significant threat within the field of agriculture inflicting injury to economic field crops, storage homes and additionally change of state human life areas. The foremost common persecutor birds in Bharat are House crows, Common starling, Jungle starling, Brahminy oscine, White cheeked Luscinia megarhynchos, etc. so as to distract these birds away, several ancient strategies like simulacrum models, Hawk kites, colored lights, Lasers, Flashes, Chemicals etc. are used that today don't appear terribly effective. an efficient bird deterrent technique i.e., star powered hearable Bird bird-scarer has been developed. totally {different completely, different} sounds because of that different species of birds get frightened were additionally noticed and studied. The testing of the bird-scarer was performed for regarding one month in August 2015. All major species of birds were tested however the most focus was on Crows as they're the most important injury inflicting bird species in Bharat. There are twenty-two ordinarily legendary predator sounds from birds like Eagle, Owl, Falcon etc. were tested and it had been discovered that the sound from Falcon was the foremost effective to intimidate Crows yet as alternative species. One most significant observation was that the success of the bird-scarer chiefly depends on the predator sound kind, its volume, quality, frequency and its repetitive nature.

Keywords : Audible Scarer, Solar Powered Scarer, Predator Sound, Pest Birds.

I. INTRODUCTION

The farmland with fresh planted and sowed seeds sometimes destroyed by the birds, that are majorly done by the house crows, common mynah, jungle mynah, white cheeked Luscinia megarhynchos are the foremost common kinds of the bird that have an effect on the sector at larger rate.

The employment of bird deterrence are majorly at the business sites like airports, business buildings, money

sites, etc. usually the bird tends to manoeuvre additional far away from the decision supply and also the entire uncomfortable space with the employment of signalling bird image ,catastrophic crop loss occurred in several African countries among nearly a pair of decades (1955 to well into the 1970's) from the extremely gregarious Quelea birds periodic attacks, because of that this various management live adopted.

The researchers adopted an environmentally friendly bird protection technique like unhear able. whereas seeking the protection of human issues from avian menace, thus on preserve the role of birds in world environmental balance. to judge objectively the result of unhear able on birds, some studies are disbursed. The threat expose by birds to economic crops within the farms or at storage facilities needs the readying of an efficient bird deterrent in such locations. plenty of makes an attempt are created to develop winning bird deterrent systems with solely a couple of achieving desired results. Ultrasonic frequency vary from 15-25 kilohertz is understood to be worrisome to birds and a tool operative at that vary was developed.

II. METHODS AND MATERIAL

This project requires following equipment- Solar panel Figure 1, Mp3 player and amplifier Figure 2, battery, pendrive, cardboard tubes, MFD board, wires. Overview – Soldering all making the structure on which this assembly is to be held. This is done by making a stand of cardboard tubes on a hard base made on a tin box filled with sand for further support and balance. Placing electrical components in it and then finishing by properly fitting all things together. Lastly experimentation, whole setup is to be placed on the test field and testing with different ultrasonic sounds for repelling birds from the field is to be done. The electrical components together in a manner shown in the Figure 3 block diagram.

Figure 1: Solar panel

Figure 2: Mp3 player and amplifier

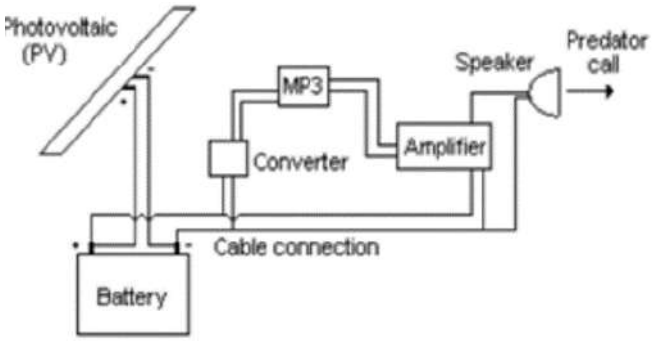
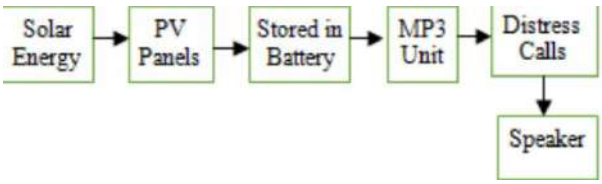


Figure 3: Block diagram

III. WORKING

Photovoltaic panel converts star beam radiation into DC electricity throughout the day. Battery is charged by PV panel and therefore the voltage is hold on during this device. The domestic bird's predator's calls area

unit loaded during a pendrive by employing a laptop and fed to Mp3 player. The operating voltage of battery, electronic equipment and speaker is 12V, however the MP3 wants 1.5V. so as to cut back the voltage from twelve to one.5V for MP3, a convertor is employed. The electronic equipment will increase the amplitude (predator's calls level) for electro-acoustic transducer. The sound is created by the speaker that repels the birds from that space Figure 4.



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IV. CONCLUSION

Once we manufacture our device successfully, it should give following results – Efficiency of bird repellence should be greater than or equal to the existing bird repellent devices. It should not harm birds and in addition to that it also should not disrupt human life. Overall cost of manufacturing should be lowest possible as compared to other bird repellent available in the market.

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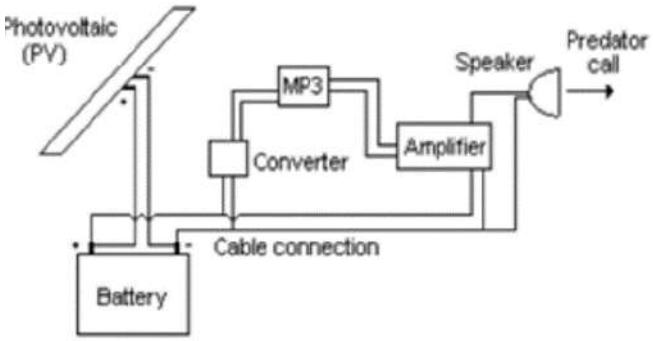

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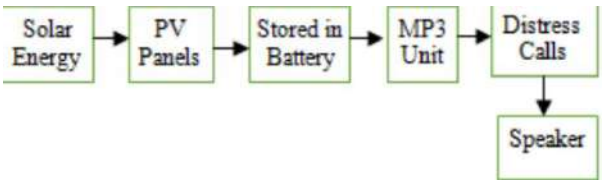

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Re-dispatch and Application of FACTs for Transactions Allocation in Deregulated Electricity Markets

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Abstract: - In the current scenario, transmission cost allocation is one of the significant difficulties arises due to the expansion in power exchanges in transmission open access looked by electric energy area. The proposed method calculates transmission cost allocation by considering bilateral & multilateral transactions. The transmission cost allocation approach in the proposed method derives from equivalent bilateral which states that a small amount of every generator provides with each request in consistently and separated manner. The influence of power flow in network via all lines due to a transaction is measured by power flow solution. This paper discusses the congestion problem in the deregulated electricity market using an optimal power flow (OPF). The transmission lines are uncongested using re-dispatch method and then taxes are calculated for the establishment of the flexible A.C. transmission systems (FACTS) devices in the transmission network to reduce taxes. The excellent location of FACTS device can be identified by the bus on which highest T. The result indicates that the combination of TCSC and SVC incredibly discount the measure of re-dispatched power which provides optimal operating point nearer to the market settlement. Hence, TCSC and SVC gives convenient option to block the execution of transmission estimation utilizing approaches and calculate the transmission price.

Key-Words: Congestion Management, FACTS devices, OPF, Transmission Pricing, TCSC, electricity market

1 Introduction

The tremendous advancement in airways and telecommunication industries, electric utilities have adopted the idea of deregulation. From last few decades, transmission and dissemination authorities are vertically coordinated for government irrespective of expenditure and revenue from operation of power system. Deregulation of power system is generally defined as reformation of system and fiscal incentives organized by government to run power industries [1]. The open access to the power system in terms of power generation and distributions arises a tight competition in the cooperate market. Different organizations in the market generate, transmit and distribute the power at very competitive prices. The idea of enhancing operations with respect to expenditure and revenue are the important part which the organization can trust [2]. The contract is made in advance to maintain coordination among generation and distribution companies.

During the power delivery implementation, it is important to analyze transmission loading patterns may vary with the proposed patterns. Transmission system operator (TSO) need to assure the proper open admittance for transmission administrations to all members of operational market [3]. Sometimes, congestion may occur in transmission network when producers and consumers of electricity have a tendency to exchange power beyond the operation limit. A Congestion management [4-5] plays core role in transmission system to avoid violation of operation limit. The Transmission cutoff points may relate either to a part of gears that limit points power stream in actual terms, or to operational furthest reaches that can neglect. Transmission limits may relate either to a part of equipment that reduces power flow in physical terms, or to operational limit that can disobey. Violating transmission constraints reflects in the businesses of the power network in a diversity of the cost of electrical power [6-8]. The primary objective is to control generator output so that the system remained stable with no limit violation and at the least cost. However, in a deregulated environment, the objective is to set up a set of rules that provides sufficient supervision over manufacturers and users to support an adequate standard of a power system in both limited (real-time application) terms and long (transmission and generation system) while maximizing market productivity [9-11]. We could treat congestion in a transmission scheme in several respects such as.

- Load Shifting.
- Generation Re-dispatch.
- Contracts curtailment.

Flexible AC transmission systems (FACTS) are a recent technology started in last two decades, and practice over the world. The IEEE presents FACTS as a power electronic-based system and other stationary equipment that can improve controllability, build power transmission efficiency [12]. Presently, power producers and system operators all over the world face growing needs for bulk power transmission, reasonable-cost power distribution and greater accuracy, to some measure; such issues are being relieved by the growing technology of FACTS [13]. We could connect FACTS either in series or in shunt with the power system or indeed in an associated pattern to give compensation for the power system. Variable series capacitors, phase shifters and consolidated power flow controllers as the most needed. The efficiency of TCSC installation in a congested transmission system to build up energy flow criteria and to support location marginal prices at fair standards is verified FACTS devices can be employed to reduce the power flow which arises in many benefits like losses diminished [14], stability margin increased etc. Because of such factors of FACTS, incorporating it into the congestion management becomes further and further prominent. Fast power flow management is the central function of FACTS devices, which can serve to bring about the above intentions [15]. FACTS devices regulate the system by switching or controlled shunt compensation, series compensation, or phase shift control. These devices produce a further adaptation to changing operational conditions and increase the management of existing systems. Thyristor-Controlled Series Capacitor (TCSC) and Static Var Compensator (SVC) are two mainly emerging FACTS devices that flexibly control line impedance and susceptance, separately [16-17]. We have used TCSC and SVC in this study to develop energy security margin and line congestion alleviation.

Figure 1 lists the suitable methods employed in CM. The light-shaded methods are consistently regarded as remedial methods, which let the market function as if there are no restraints and allow it to the TSO to accept actions to protect system surveillance. By increasing the cost of the congested part of the network to weaken traffic to alleviate the overpopulation, the heavy-shaded methods are so called pricing methods.

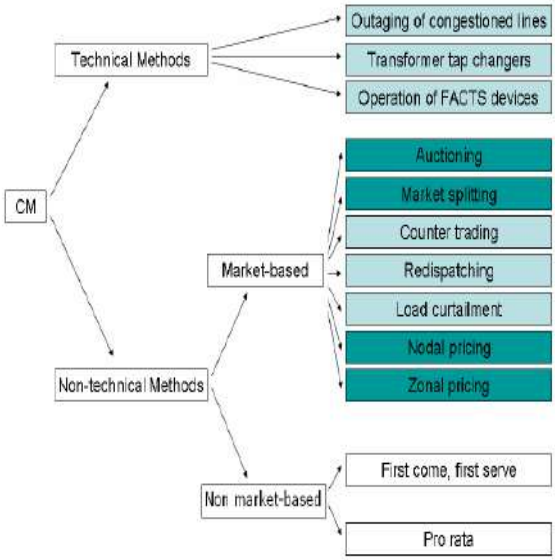

Fig.1 Congestion management methods

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All results of congestion situations vary in their manner. They all show a limited solution to the market issue, which would not be acceptable to as a great- term solution. Transmission expansion in a faster expanding environment would be a bold solution if it is accompanied with an economic gain that would appeal to lenders. Moreover, system reliability and surveillance would be built up as the system increases. In the proposed work re-dispatch technique is employed to cut down the congestion. Re-dispatch technique as a low-cost approach can be employed as a solid solution for development of excellent power flow problem by incorporating FACTS devices and diminishing the congestion and taxes. In this study, a remedial solution for congestion control by using TCSC AND SVC has been discussed. The FACTS devices aid the system congestion relief while taxes are decreased progressively as easily as transmission losses reduces. Analyzing the results with and without FACTS devices confirms that these devices are useful for great time congestion control and diminishing the taxes. The transmission services pricing issue has been an interesting ongoing field of investigation. One of the most popular method for transmission pricing is the postage stamp method, which gives the correct cost for providing energy regardless of the distance and power track. This method retrieves the transmission cost. The MW-Mile method is a pricing procedure that can examine the actual state of power System. In this way, transmission cost is designated based on extent

of operation of the transmission grid by each purchaser.

2 Algorithm for Congestion Management

Nevertheless, because of transmission line capacity constraint, any generators cannot increase and deliver power to the consumers. We can define this condition as congestion. When low-cost generator is constricted to provide its power, the higher cost per unit will increase generation to match the load requirement. In this condition, total generation cost goes up and civil interest will be decreased. Recently, there has been increasing concern in dealing with congestion control using FACTS devices. Effects of these devices' service in increasing load capability and removing congestion [8]. In solving congestion problem using FACTS devices, both industrial and cost-effective applications have to be organized. Adequate data should hold these studies, i.e. positions of FACTS devices, generation cost. For that infer, this study introduces an approach which can provide best possible solutions relating those data. Having these solutions, one can make the strongest solutions for an effective utilization [9]. We have implemented this approach to deal with power system issue. This study concentrates on FACTS allocation for congestion control. Then, IEEE 30 bus is needed to check the recommended method. The initial objective is to reduce generation cost, and to put the line flow within the transmission system capacity set to avoid transmission congestion. The second objective is to drop the taxes by using FACTS devices an SVC and the third objective is to determine transmission pricing techniques [10-11]. The benefit obtained from FACTS is considered as the distinction between taxes with FACTS and without FATCS. The costs are measured for each line and we illustrate procedure in fig. 1.

2.1 Re-dispatching

The market is achieved without the restraints of the transmission system. If the congestion arises, the ISO re-dispatches and achieves in such a manner that congestion diminishes. This will lead to the ISO purchasing power from excessive cost ranges. The generators in the nominal cost ranges will be called for to adjust downwards. Since the ISO is purchasing power at an excessive cost and closing it at a cheaper cost, it acquires a cost. The net cost obtained by the ISO is a manifestation of the congestion charge and is a warning for finance. The ISO directly commands generators to up control or down regulate without the value of the market.

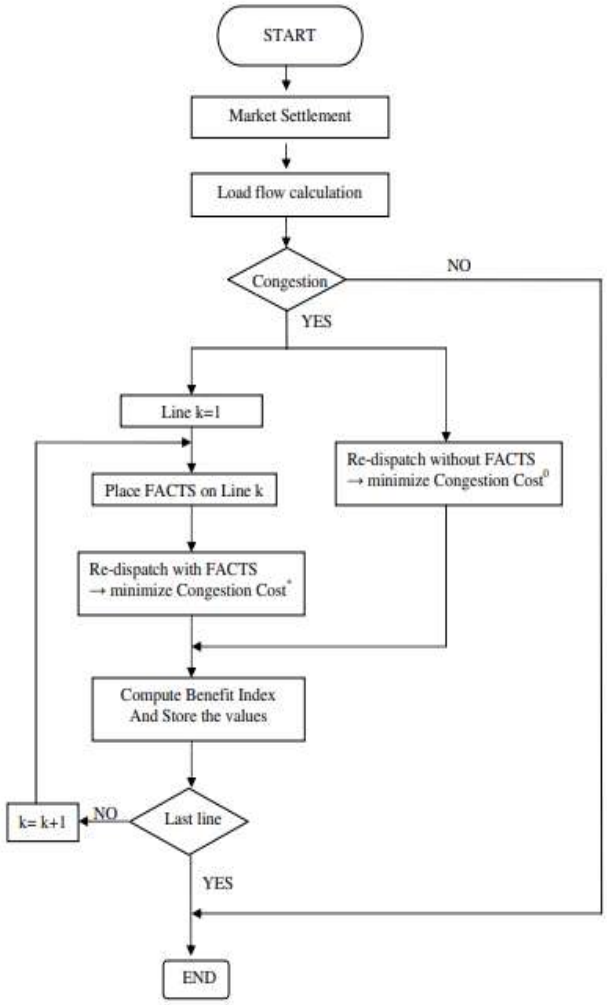

Fig 2. Flow chart for procedure of choosing optimal location of FACTS

3 Results of Transmission Pricing Parameters for IEEE 14 bus Case Study

Results gained by implementing the proposed approach to the IEEE 14-bus renumbered test system are given in this section. Fig. 4 illustrates the single line diagram of the test system. Table IA and IB show the basic operating condition and regulated bus data of the network. The participation factors of generators are adopted to deal to their initial MW. Loads are considered to be autonomous of bus voltages (pi=qi=0) and increased consistently to verify the strength limit. Table II is the system condition at the security limit obtained by a mechanism in [14]. TCSC and SVC were adopted to develop security margin and energy profile of the operation. The voltage magnitude limits of regulated buses are set to 1 and 1.1 pu for lower and upper bounds.

TABLE IA
ESTIMATION OF INITIAL OPERATING CONDITION OF THE 14-BUS RENUMBERED NETWORK

Bus Number	Voltage		Bus Power	
	Mag (pu)	Ang	P (MW)	Q (MVAR)
1	1.08	0	0	0
2	1.08	0	157.7	0
3	1.08	0	214.1	0
4	1.08	0	98	0
5	1.09	0	0	0
6	1	0	167.8	31.6
7	1	0	102.9	54.9
8	1	0	0	0
9	1	0	57.8	16.8
10	1	0	19	5.8
11	1	0	53.5	7.8
12	1	0	16.1	6.6
13	1	0	27.3	5.8
14	1	0	25.4	10

Note: Buses 1 to 5 are Regulated Bus

TABLE IB
REGULATED BUS DATA

Bus	MVAR Limits		MW Limits	
	Min.	Max.	Min.	Max
2	-50	100	0	200
3	-50	100	0	300
4	-50	100	0	200
5	-6	40	0	0

Both lines and load buses are initial candidates of optimization strategy to locate TCSCs and SVCs. The problem solution has been identified after running SA with a consolidation of SQP method, so as given in Table III, eight TCSCs and two SVCs have been established. With this excellent solution for deployment of TCSC and SVC, SM improves from 0.0209 to 0.1605. Also, as expressed in Table IV, without TCSC and SVC, lines 4-11 and 4-13 will be overloaded using base load from Table IA. Using TCSCs and SVCs in Table III, line congestion has been taken out for lines 4-11 and 4-13 as stated in Table IV. The calculation of objective work during development process is given in Fig. 5. Because of the capability of SA, the development strategy has come to the overall greatest solution by running a zigzag convergence line and departing from the local smallest.

TABLE II
SYSTEM CONDITION AT VOLTAGE STABILITY LIMIT WITH AND WITHOUT TCSC / SVC

Bus Number	Voltage Mag (pu)		Bus Power			
	Without TCSC / SVC	With TCSC / SVC	Without TCSC / SVC		With TCSC / SVC	
			MW	MVAR	MW	MVAR
1	1.08	1.08	32.16	49.24	49.77	87.83
2	1.08	1.08	161.07	81.6	187.84	66.13
3	1.08	1.08	218.68	-10.79	255.02	-18.5
4	1.043	1.036	100.09	100	116.73	100
5	1.09	1.09	0	24.69	0	18.12
6	0.994	0.991	171.27	32.25	199.78	37.62
7	0.974	0.975	105.03	56.04	122.51	65.36
8	1.05	1.061	0	0	0	0
9	1.013	1.038	59	17.15	68.82	20
10	0.996	1.034	19.39	5.92	22.62	6.91
11	0.982	1.011	54.61	7.96	63.7	9.29
12	1.006	0.994	16.43	6.74	19.17	7.86
13	1.003	0.971	27.86	5.92	32.5	6.91
14	0.972	0.965	25.93	10.21	30.24	11.91

SM without TCSC/SVC 0.0209
SM with TCSC/SVC 0.1605

TABLE III
THE AMOUNT AND LOCATION OF TCSC AND SVC

TCSC location		SVC location	Line compensation by TCSC in %	SVC susceptance in pu
Initial bus	Final bus	Bus Number		
1	2	10	-55.2483	0.5
2	7	13	-35.4469	-0.25
1	7	-	-63.9508	-
4	11	-	15.71141	-
4	12	-	-67.1885	-
9	10	-	-64.7189	-
10	11	-	-65.0804	-
12	13	-	-62.5375	-

TCSC: Negative means capacitive and positive means inductive
SVC: Negative means inductive and positive means capacitive

TABLE IV
COMPARISON OF LINE POWERS BASED ON DATA IN TABLE IA WITH AND WITHOUT TCSC / SVC

Line Number	Initial bus	Final bus	Power Limits (MW)	Lines Active Power (MW)	
				Without TCSC/SVC	With TCSC/SVC
1	2	3	150	100.74	115.27
2	3	6	150	111.45	96.33
3	1	2	150	39.95	69.35
4	2	7	150	109.12	117.05
5	2	6	150	108.68	84
6	1	7	150	71.04	102.65
7	6	7	150	9.8	18.55
11	4	11	60	62.04	54.36
12	4	12	45	20.13	28.98
13	4	13	45	46.19	37.56
16	9	10	45	14.05	21.18
17	9	14	45	5.26	5.88
18	10	11	45	5.01	1.65
19	12	13	45	3.54	11.95
20	13	14	45	21.02	20.5

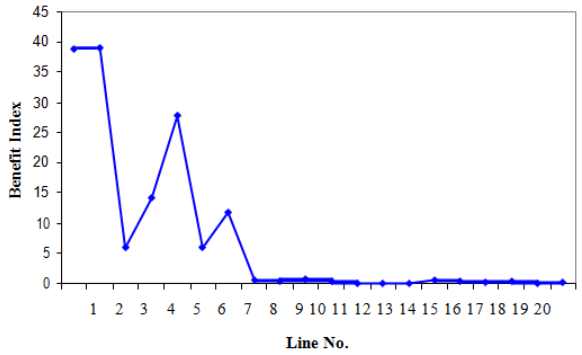

Fig 3. Placement of FACTS

4 Conclusion

Re-dispatching of generation in a network with persistent congestion may be referred to as a small-term solution. The great-term solution may be to upgrade congested aisles, develop new transmission systems, or run the prevailing infrastructure more by FACTS devices. Owing to the poor installation times, resilience to power flow regulation and contraction of prices over the years FACTS devices are becoming prevalent. Commercial pressures on achieving higher profits from existing assets represent a significant aspect of FACTS. Using series compensation FACTS can reduce congestion. In the other market models it has been demonstrated that FACTS can cut down the value of re-dispatched power and the cost of bottleneck. Placement these devices in the network can estimate for most net pay. Whilst FACTS are employed in this study for congestion control, we need them for development of effective operation of the network by extending the margins for transient stability and voltage stability. The economic appraisal for placing FACTS has merely affected the static problems, but we should have it in perceiving that new advances are achievable.

The dispatch schedule after re-dispatch has been excellent from a practical situation of consideration and the N-0 condition. We have demonstrated both the 14 bus and 32 bus structures for N-1 principle. Contingency analysis is a powerful part of system surveillance. An AC load movement is the standard medium to run for the contingency analysis, but because of the limited speed of the calculations and the enormous volume of situations to be investigated, we need the DC flow. This study includes a unique combinatorial transmission pricing method. Being honest and integrating various transmission services costs in the estimating process are of its principal aspects.

After applying FACTS Device as a TCSC AND SVC, this study presents computation of transmission pricing for a case review of standard IEEE 9 bus and IEEE 14 bus system as an essential part of simulator developed for deregulated power trading. Here the FACTS device location considered economic saving function, so we can work out that with aid of TCSC AND SVC congestion gets reduces, taxes are reduces also it cut down the transmission pricing. Formulation can make clear the legitimacy of the method, examine the usage tax & offer correct economic incentive for productive operation, supply & future progress of transmission network. We get the congestion cost saving depending on the time span that TCSCs served. The results indicated that in one line removal process the cost saving figure is 1,081.93 $/hr. In two lines removal process, we got the reimbursement rate to be 1,138.93 $/hr. We got the reimbursement rate in generation reduction process to be 1,074.43 $/hr.
Study results show using TCSC, in congested network, may be more valuable than SVC. The amount of used TCSCs in situations of probability analysis appeared in four TCSCs. Different quantities of SVCs were employed depending on the probability situation.

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E-Waste Bin for Disinfection and Waste Management of Masks

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ABSTRACT

The corona virus pandemic has shook the entire world and the major precautionary measure for this is to wear masks. The demand and supply of these masks has increased drastically, with majority of population using surgical three, two or one ply masks which is generally thrown after its use. The first thing that is in contact with the masks is nose and mouth of the person wearing it. These masks are becoming carrier of the virus due to improper disposal methods used. Until the masks are not disinfected they are not safe to be disposed in dumping yards. There are many rag pickers who enter the dumping yards to collect recyclable wastes or the person who collects the garbage from individual homes become people of high risk to the exposure of this virus. The proposed work presents a novel approach to eliminate this problem by employing a smart electronic bin which has a disinfection section which will disinfect the masks using UV-C lights and then it will be dumped into the bin installed just below the unit. This bin has a level sensor which will monitor the level of waste in the bin and whenever it gets full, it will notify the concerned authority on his mobile using Blynk app. The Blynk app interface is designed to present the status of level of waste in the bin.

Keywords : E-bin, masks disposals, covid-19 waste management

I. INTRODUCTION

Waste collection has always been a major problem in city areas as the dustbins are full or the public dustbins overflow but the workers don't collect and drop this garbage in the main dumping yard. There should be a provision to automate the process and notify the department and concerned authority to the sensor network which will help to identify the work of garbage collection each day. In this paper the author has presented a way to monitor the level using sensor and notify through GSM technology[1]. In this paper the author has proposed a wireless sensor network to monitor the status and notify the user through both GSM and internet based technology[2]. Using GSM technology at each node will be a tedious

process and costly process, rather it would be better to connect the bins in a wireless networks as nodes and location of each node should be annotated while installation of that bin in that area[3]. This would reduce the cost of the hardware drastically and make the work more economically and technologically feasible. In cases where the bin has to be relocated, the annotations can be updated easily thereby making it easy to use and update as well. The corona virus pandemic has brought about a very high rise in use of masks by individuals and majority of them use disposable masks like the one two or three ply masks. Corona virus has been proved to spread through surface contact and these masks can become potential carrier of the virus as they are the most exposed to nose and mouth of a person. Earlier it was suggested to dispose these masks separately in plastic bags to contain the risk of spread of virus. But the use of plastic bags is not the solution to this problem rather it would increase the problems of waste management. There are many ways suggested to deal with this waste but economical feasibility and technological feasibility is essential. An important parameter to be monitored at this point of time is to disinfect the masks at the same place so that there is no carrier of surface contact of these viruses. The existing system requires a garbage collector to collect garbage from individual homes. This increases the risk of these personnel to the virus, the up-gradation of this system is needed. Lack of disposal management of biomedical waste.

- Health threat to cleaners
- Health threat to general public
- Chances of virus spread to graveyard cleaners due to PPE kits being discarded in huge quantities at these places.

II. METHODS AND MATERIAL

Disinfection

The UV-C light has been proved to kill the covid-19 virus hence is a very suitable choice for disinfection of surfaces and objects. The disinfection of the masks is very important because it can be a potential carrier of the virus. The range of UV light should be in UV-C for disinfection.

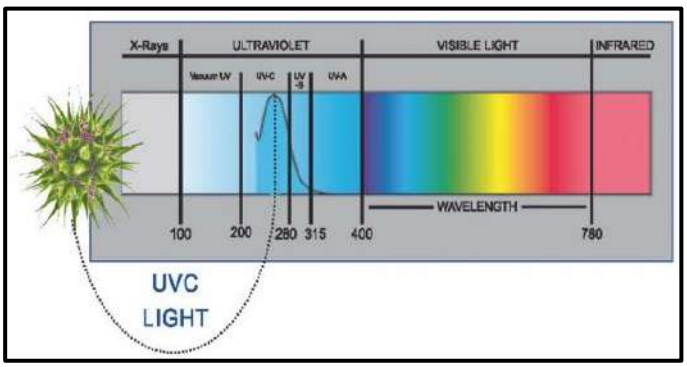

Fig 1 : UV-C light range

The UV-C range is from 100-280nm which is available for disinfection, it not only kills virus but also is used for disinfection of water and air. The researches have proved that corona virus on mask is killed with UV-C light. Masks will be disinfected hence it can be reused or disposed. It will ensure that there is no risk of virus to the persons collecting it or even if it is not disposed properly in the dumping yards.

Technological communication

Mainly the technologies used for communicating the level of waste in the bin are:

- Internet
- Bluetooth
- Zigbee
- Gsm

Internet has got its advantage over other technologies as it has no limitation of range and it can be accessed from any corner of the world. WIFI modules are required for accessing the internet and connecting it to the controller. GSM technology, Zigbee increases the cost and has a major problem of range. Bluetooth cannot be used in this application owing to its limited functional capacities.

III. PROPOSED WORK

The proposed work presents a novel approach to properly disinfect the masks and inform the status of bin to the concerned authority. Initially the user first opens the chamber and keeps the mask into it, then the user control is to turn ON the mechanism and UV-C lights are turned on. It will continue till the specified duration and then automatically turn off. The LCD installed will show the status of operation of the unit. This disinfected mask can be reused or disposed in to the bin. The bin is attached just below the chamber. The bin is installed with ultrasonic sensor and level of waste will be monitored through the dustbin. This data is then sent over the internet through WIFI module. Blynk app is installed and then an id will be created which will be dedicatedly allotted to the user only. The interface is designed according to the requirements of user, one major advantage of using this is that it will create notifications on the mobile once the bin is full and user can allot some person to collect it in a particular duration.

BLOCK DIAGRAM

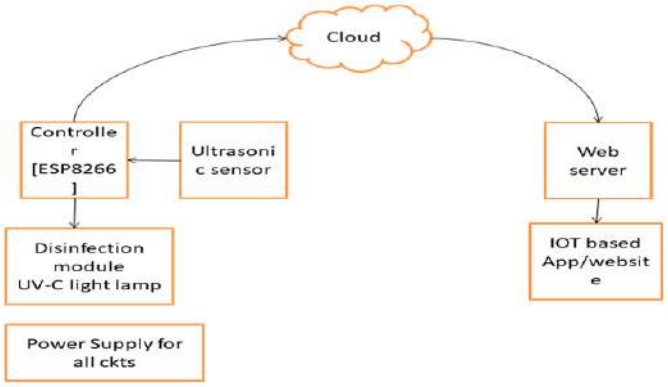

Fig 2 : Block diagram

NodeMcu is a controller that has built-in WIFI module which helps to keep the status of bin monitored continuously. The cloud will be helpful in storing and accessing the data.

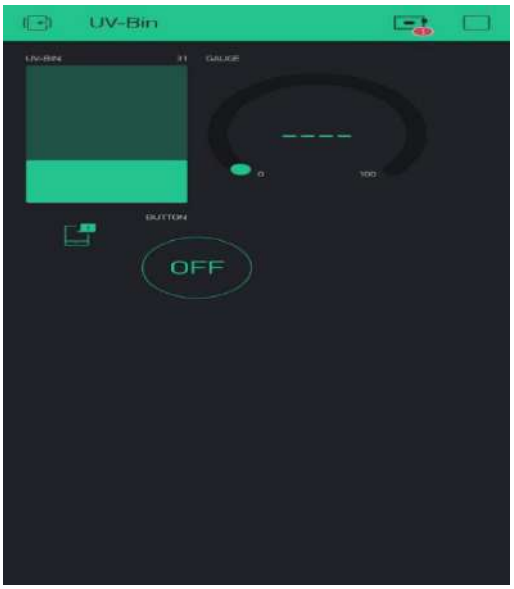

Fig 3 : Blynk app Interface

The general interface of the app is easy to use and access. Its graphical view helps to interpret the data easily. The UV-C light commercially available comes in various shapes the best suited out of these would be of a tube-light to cover maximum area of the chamber. The inside surface of the chamber has to be lined with reflective surface such as that of aluminium foil. This reflective coating ensures that the light is focused on the object to be disinfected and would help to efficiently disinfect the surface of the object. Human exposure to the UV-C light is very dangerous and has many side effects. To avoid this problem of exposure to this light a reed switch is installed which will send a signal to the controller and the light will be turned off directly when chamber is accidentally opened during the working of disinfection. Programming of the controller is done on arduino IDE which uses a structured programming language. SSID and password has to be set through programming. The system has to be kept connected to internet continuously, the internet device name and password has to be same as that of the programming.

IV. CONCLUSION

The work is designed to be an efficient smart electronic bin which will be capable of disinfecting

the masks with UV-C lights and also provide the status of waste in the bin. The level of waste will be updated on Blynk app and interface can be seen on the mobile app. This work will be beneficial for hospitals, clinics, quarantine facilities, shops etc.

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Traffic Assist E-Bike

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ABSTRACT

We have watched as the generation is going fast. there are many of the technologies are coming. People having there public vehicles more than 2 or 3 this occupying more space and making cities or areas much more crowded. Due to this traffic is becoming most of the serious problem in many of the cities and across the world and it directly effecting the environment. this project which is bring in observation is a Arduino traffic light system. The project presents an Arduino traffic light system, based on RF transmitter and receiver, which is made in low-cost high compatibility easy to upgrade is used for management system of traffic light and can be used as a road traffic system. The system is placed in such a way that it will automatically be monitored and process will proceed.

Keywords : Image recognition, convolutional neural network, Pattern Recognition

I. INTRODUCTION

In this phase as the world is growing rapidly there are innumerous vehicles are on the roads. which are responsible for the changes in environment pollution is one of the major crises the world is facing nowdays. there is rapid increase in the price of petrol. Also, it is not possible for all the classes of the society to purchase vehicles such as mopeds, bikes, scooters etc. Bicycle is an eco-friendly vehicle and can be an option but the efforts required is more. Also, it is not possible for all the classes of the society to purchase vehicles such as mopeds, bikes, scooters etc. Bicycle is an eco-friendly vehicle and can be an option but the efforts required is more.

II. METHODOLOGY

The traffic E-Bike has major and minor components. The major components are the ones we have to concentrate at first to start building the bike like choosing: a stable frame, a motor that produce enough voltage, a reliable battery that gives the user the maximum time ridding. The minor components are also important in this bike however we can work around them. Meaning we can leave them until the end of the assembly like: setting up the bicycle sensors and the data communication system.The scenario is that a bike can automatically stop when the signal is red. We had proposed an IOT based automatic traffic signal monitoring, and a automatic

traffic signal monitoring. The system used the Arduino based circuit which helps to monitor traffic signal and transmits the data online to the controllers.it is based on RF transmitter and receiver i.eArduino traffic system.it has various specifications it is easy to handle, available at a low cost, easy upgradation it is having easy management and that can be used as a traffic signal. The radio frequencyis based on wireless network technologies traffic monitoring etc. Which is very useful to control pollution and thus a helping hand to environment.

III. CONCLUSION

The traffic E-Bike has major and minor components. The major components are the ones we have to concentrate at first to start building the bike like choosing: a stable frame, a motor that produce enough voltage, a reliable battery that gives the user the maximum time ridding. The minor components are also important in this bike however we can work around them. Meaning we can leave them until the end of the assembly like: setting up the bicycle sensors and the data communication system.The scenario is that a bike can automatically stop when the signal is red. We had proposed an IOT based automatic traffic signal monitoring, and a automatic traffic signal monitoring. The system used the Arduino based circuit which helps to monitor traffic signal and transmits the data online to the controllers.it is based on RF transmitter and receiver i.eArduino traffic system.it has various specifications it is easy to handle, available at a low cost, easy upgradation it is having easy management and that can be used as a traffic signal. The radio frequencyis based on wireless network technologies traffic monitoring etc. Which is very useful to control pollution and thus a helping hand to environment.

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IoT Based Temperature Monitoring and Mask Scan Entry System: A Review

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ABSTRACT

The novel coronavirus (covid19) is declared by World Health Organisation (WHO) and the global pandemic has impacted every aspect of life. It affected the industries and economy of major sectors of the whole world and the Internet of Things (IoT) devices make no exception in it. The COVID-19 outbreak has lead to a revised growth forecast for the global economy. Hence to control the spreading virus and to inhibit resurgence of infections, social and technological measures have been implemented towards virus tracing, tracking, etc. The role of IoT in existing digital healthcare infrastructure management has been discussed on how IOT can impact COVID-19 and future pandemics. It is evolving from a conventional healthcare system through which infective can be treated and monitored more easily. Since the pandemic started, there has been a rapid effort in different research communities to exploit a wide variety of technologies to fight this worldwide threat, and IoT technology is one of the explorers in this area.

Keywords-- BDN, E-Health, BloXroute, IoT, Pandemic, WHO

INTRODUCTION

IoT has been adopted in smart cities as an infrastructure key since the introduction concept of a smart city. The IoT is the interconnection between the physical object or things that are attached with sensors and software to gather and deliver information among them and primary servers with the least human meditations. IoT services can provide the remote data collection and monitoring of patients in quarantine has made it a critical aspect in fighting the spread of virus pandemics. Adaptation leading to the evolution of IoT may include modification to the way IoT devices such as mobile phones and drones collect data, changes to IoT management platforms to meet policy requirements, and innovations by researchers to IOT technology to effectively manage a virus pandemic [1].

The first step to detect covid is by scanning for fever. Also, we need to monitor every person for the mask. We have temperature checking for every entrance for scanning but manual temperature scanning has a lot of disadvantages. Any person will not be provided entry without a temperature and mask scan. The only person having both conditions is instantly allowed inside.

LITERATURE SURVEY

1. Gerhard P. Hancke, October 12, 2020, 2020, "IOT in the wake of COVID 19: A survey on contribution, challenges & evolution". Due to different IoT technological challenges, this paper proposed the development of new forms of arrangement of sensors and different IoT techniques. Hence for advanced analysis, this article has presented healthcare IOT management before and now during the survival of COVID-19 [1].
2. Rajani Singh, Ashutosh D. Dwivedi and Gautam Shrivastava, 16 July 2020, "IOT based blockchain for temperature monitoring & counterfeit pharmaceutical prevention". This paper proposed a novel blockchain-IoT-based supply chain management system to alleviate the problem of fake drugs and to monitor the cold chain for temperature-specific drugs properly. For improvement of the system, he suggested using Raft Algorithm [2].

3. M. N. Mohammed, Halim Syamsudin, Prof. Dr. Mohammed N. Abdulrazaq on 08 April 2020. **"**Novel COVID 19 detection & Diagnosis system using IOT based smart helmet". An innovative real-time early detection of coronavirus and monitoring system using a smart helmet which integrated with thermal imaging system has been developed. The smart helmet can also detect high body temperature in the crowds and send the measured data to be displayed on a phone application [3].
4. Gurlove Singh, Amit Kumar, "Face detection and recognition system using digital image processing", published in 2020. In this paper, while recognizing any individual, the most important attribute is faced. It serves as an individual identity of everyone and therefore faces recognition helps in authenticating any person's identity using his characteristics. The whole procedure for authenticating any face data is subdivided into two phases, in the first phases, the face detection is done quickly except for those cases in which the object is placed quite far, followed by this second phase is initiated in which the face is recognized as an individual [4].

BLOCK DIAGRAM

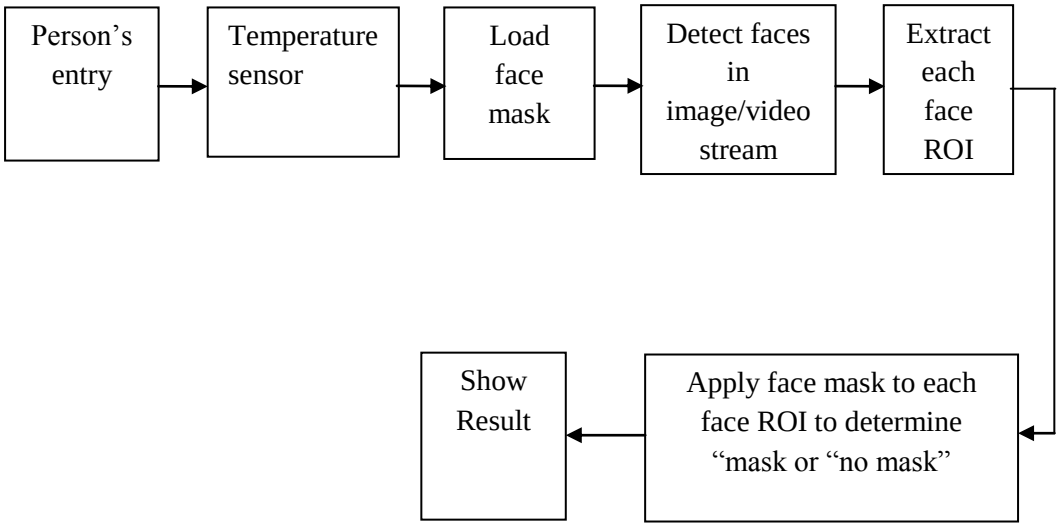

Figure 1: *IOT based temperature monitoring and mask scan entry system.*

The above Figure 1 block diagram is of "Iot Based Temperature Monitoring Mask Scan Entry System". In this block diagram, it consists of two sections first is of temperature monitoring and second is of face mask detection in this system phases and individual step for building a covid-19 face mask detector with computer vision and deep learning using python and tensor flow. If the person temperature is low then it will proceed to the next step and if the person temperature is high then the person will not goes into the next phase once the face mask detector is trained we can then move on to loading the mask detector performing the face detection and then classify each phase as with mask and without a mask. A face mask detection data set consists of with mask and without a mask, our goal is to train a custom deep learning model to detect whether the person is or is not varying a mask and person's temperature [5].

RESULT

The presented design should be checked at the beginning by the simulation to look at its achievability and confirm the steady quality of a control technique that was said over. For approving the system tentatively, the testing stage was focused on logical interims of the software to guarantee that all statements are tried and a functional interim is carried out within the tests to identify the errors [6-7]. It also keeps up that the defined input will create real outcomes that are coordinated with the required ones. Each program and models level testing has been integrated and performed. The current

innovation concerns with applicable kind of thermal imaging frameworks for detection an increase of body temperature as well as surveillance process.

CONCLUSION

In this IOT based Temperature monitoring and mask scan entry system; we detected fever and mask and displayed them on the LCD. For pandemic management, we adopted IOT along with different hardware, software, data analysis, and ethical conditions. The spreading of the coronavirus gives so much attention and awareness among people nowadays which becomes a big latest issue all over the world. One of the very common symptoms of the coronavirus is the high temperature of a person/people [1].

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De-Noising Coloured Images Using Modified Ridgelet Transform

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Abstract

The work aims at designing Ridgelet transform based denoising algorithms using Radon projections. The Ridgelet coefficients are averaged to achieve denoising. The denoising is performed using one dimensional Discrete Wavelet transform (DWT1D) algorithm for varying levels of White Gaussian Noise (WGN) and Speckle noise for variety of images. The work also deals with denoising using cycle spinning techniques with wavelet shrinkage. The study is carried out using the original image's Mean square error and Peak signal to noise ratio, noisy image and replicated image with and without loop spinning algorithm. The experiments show that the cycle spinning with wavelet shrinkage yields consistently better results for gray and color images and further points to possibility of scope of research in this area.
Keywords: *Ridgelet, DWT, Cycle Spinning, Wavelet Shrinkage.*

1. Introduction

Images can be created by a variety of input devices and techniques, such as digital cameras, scanners, seismographic profiling, airborne radar and many more. Most of the images are captured through CCD (charge coupled device), CMOS Sensors and CIS (contact image sensors). Noise is automatically added when taking the images. Any electronic network or computer that transmits or receives a signal often has a degree of noise. Using denoising algorithms, filtering, thresholding etc., one can regulate image noise. However, this processing does not necessarily get rid of all the noise in the image, but rather effectively regulates it. It is worth noting that high noise reduction levels will cause the picture to lose fine details or edge information. Wavelet denoising measures provide a simple understanding of the threshold value of a noisy signal being measured. Compare the threshold with each other pixel of the image. Normally, all wavelet coefficients of a lower magnitude than the threshold are replaced by zero while the other pixel intensities remain as they are.There are two types of 'hard' and 'soft' thresholds. These two criteria are commonly used to criticize visual images but they tackle certain drawbacks. Strong thresholding leads to oscillation, since at the predetermined threshold, the predicted wavelet coefficients are not constant. Weak threshold gives strong stability but it can induce constant variations between the approximate wavelet coefficients and the initial wavelet coefficients. Selection of thresholds is a big issue ahead of researchers [1, 22]. Translation invariant approaches were used to address these limitations and to make major enhancements to increase the visual consistency of the images. Instead of limits, we consider waves like ripples, oscillations and discontinuity near the top, which is called Pseudo-Gibbs [1, 2, 3, 9, 10, 16, 18]. The phenomenon is based on the exact alignments between the signal characteristics and the wavelet base characteristics. The thumb rule here is to move the picture to adjust the location of discontinuity, then apply the desired algorithm and move back to the original location at last. The change is based on picture discontinuity [12, 22]. This work deals with denoising using cycle spinning techniques with wavelet shrinkage. The resultant image is then passed to inverse wavelet transform. Here experiments are firstly performed for denoising using direct Ridgelet transform using 1-d DWT and in the later part we proposed Ridgelet with cycle spinned 1-d DWT with and without wavelet shrinkage. Initial analysis results are presented, where the proposed method of cycle spinning is compared with the images without cycle spinning and mainly to establish the direction of research.Initial experiments on test images show that although there is slight variations in the PSNR after applying cycle spinning with wavelet shrinkage to the before applied cycle spinned or direct Ridgelet transform without cycle spinning, the images are visually more clear when cycle spinning with wavelet shrinkage is applied .

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2.Radon and Ridgelet Transform

Radon transform presented by J. Radon is a pioneering work in the area of tomographic reconstruction [20, 22]. Many researchers have been working in this area. S. Chandra and etal presented a new fast Mojette transform that reconstructs a two dimensional object from a set of one dimensional projections [1]. The algorithm is computationally accurate, practicable, robust and also does not introduce artifacts during reconstruction**.** Digital reconstruction of multidimensional signals using projections has been presented in [3, 4, 5, 15, 16, 17, 18, 20, 21]. S. M. E. Sahraeian and F. Marvasti presented a comprehensive review and a few new algorithms for reconstruction of multidimensional objects using minimum number of projections [17, 18]. Preservation of the edges and the restoration of image objects with smooth surfaces has long been a problem [2]. The frequency domain representation in Fourier transform (FT) does not preserve the time domain information at all, though it's a much explored tool for different applications. FT only provides overall spectral contents of a signal. This problem was solved to some extent, using the Short Term Fourier transform, wherein the complete signal was divided into time indexed short time windows and the conventional Fourier transform was applied on each window individually. However, selection of window size and the introduction of high frequency components during the process of windowing (sampling) cause problems in practical implementation of this technique. Adaptive selection of window size and appropriate filtering may solve the problem satisfactorily but at the cost of increased computational load. For reconstruction of two dimensional signals or objects from its parallel projections, G. Y. Chen and etal. [15] proposed rotation invariant Fourier slice theorem. Thus, given a set of one dimensional Fourier coefficients of different parallel projections of slices of an object, reconstruction of the original 2D object and multi-scale capabilities of Wavelet transform [7, 18]. The Wavelet transform retains all knowledge about the time domain and the frequency domain, and the interaction between it. To date, the wavelet principle has been commonly used for edge detection [2], denoising [18], and ect has been feasible. Analysis problems are also choosing the diameter of a slice and addressing the angle at which estimates are made. Multi-resolut signal processing with hidden Markov models[6], image enhancement[7, 12], classification[21], pattern recognition[11, 14] has satisfactorily solved the resolution issues. Wavelet transform's popularity was mostly attributed to its excellent results at different resolutions in both dimensions, albeit one at a time[6].

Since a tensor product of one-dimensional wavelets obtains Wavelet transformation in two dimensions, it is possible to separate discontinuities around horizontal or vertical edges but it does not achieve smoothness along the curved edges[2].
To address this drawback of transforming Wavelet, its derivatives, namely Ridgelet and Curvelet transformations, were introduced [5, 8, 11, 13, 19, 21]. The basis for Ridgelet and Curvelet transform is Radon projections [3, 6, 16]. R. Coifman and D. L. Donoho presented invariant translation denouncing the use of statistical techniques and transforming Wavelet[11]. T. Hsung and et al. [4] presented periodic discrete Radon transform and the warping to compute it for digital images. Possibilities of accelerating the speed of execution of Ridgelet algorithm were presented in D. L. Donoho [8, 9]. E.J. Candes, D. L. Donoho invented the Ridgelets, which cope effectively concurrently with the two-dimensional line singularities[9]. A point in Wavelet transform (smallest square dot) is mapped using a small curved line or a 'Ridge' in the Ridgelet transform [9] for better processing of curves. E.Candes and D.Donoho presented a conditional application of Ridgelets on small tiles of images if the tile contains edge and named it Curvelet transform[10]. M. N.Do, M. Vetterli used Ridgelet to convert image compression[11, 13], since it transforms images effectively with linear singularities. C. Donoho, M. Duncan introduced digital curvelet transform and applied it to digital gray images scanned that contain smooth curves[10, 11]. It had been found that the Curvelet performs better specially in case of the images containing smooth curves even at less computational load. G. Y. Chen and B. Kegl derived properties of Ridgelet transform applied them on the synthetic images [14]. A. G. Flesia and et al. computed Ridgelet packets using tiling in

frequency and projection domain. They also presented that there can be a vast range of Ridgelet packet frames (basis) for a particular application and presented a family of best-basis algorithms using anisotropic cosine packet bases which in turn use sparsity criterion. M. N. Do and M. Vetterli [13] presented an orthonormal form of Ridgelet transform and a novel way of computing it using finite Radon projections.

3. Denoising of digital images using 1-d DWT

Find calculating x[n], n [0, N-1] from a distorted signal[2, 6, 8, 9, 15, 17, 19, 21, 22] an undefined discrete time signal.
Where d[n] is noise addition

$$y[n] = x[n] + d[n] \quad (1)$$

Denoising of the image is used to eliminate the additive noise while preserving the essential image function as much as possible. Wavelet denoising helps to suppress the noise present in signal while maintaining the characteristic of the signal, regardless of the frequency. The picture denoising goal is to eliminate noise by separating it from the signal. The wavelet transforms compactness of energy significantly assists in denoising. Energy compactness refers to the fact that much of the signal energy is stored in a few large wavelet coefficients, while a small amount of the energy is spread over a large number of small wavelet coefficients. These coefficients reflect both information and high frequencies in the image. The traditional methods of denoising are filtering and thresholding. Forward DWT algorithm in essence performs filtering and downsampling on the noisy image. Downsampling means removing every other pixel from the image. Filtering means low pass filter and high pass filter, the components of which are:
•low pass decomposition coefficient-- [1,1]
•high pass decomposition coefficient -- [1,-1].
In the inverse DWT algorithm we perform up sampling and filtering.
Up sampling means adding zeros between every other sample.
Filtering means low pass filter and high pass time inverted filter whose coefficients are:
•low pass decomposition coefficient-- [1,1]
•high pass decomposition coefficient-- [-1,1].
To yield an approximation for the true signal, as below, an inverse wavelet transform is applied to the threshold signal.

$$\hat{x}[n] = D(y[n]) = W^{-1}(w(y[n])) \quad (2)$$

Where W^{-1} and W are the representation of the inverse and forward wavelet algorithm.

4. Applying Cycle Spinning and Wavelet Shrinkage on DWT Coefficients

Denoising by wavelet processing is a well-established technique which Donoho and Johnstone first developed [8, 9, 10, 11]. After computation of two sub-bands of DWT coefficients(LP and HP), the detailed coefficients i.e. excluding the LP sub-band need to be thresholded to achieve denoising The simple wavelet denoising theory is to define and zero out wavelet signal coefficients which are likely to produce noise. Wavelet thresholding retains high pass properties of the signal such as discontinuities by defining and retaining large coefficients. This property is useful in image denoising, for example, to preserve edge sharpness in images. Thus the detailed coefficient sub-band is subjected to the following the thresholding scheme. The main challenge in denoising algorithms is that the noise should be removed without blurring the image edges considerably.

4.1 Denoising using thresholding

Wavelet shrinkage - The thresholding scheme called wavelet shrinkage proposed by Coiffman and et al was found to yield better results. It is presented in two steps. Computation of the standard deviation (σ) and computation of the shrinkage coefficient. It is to be noted that the standard deviation is computed of a row of the HP sub bandand and its theshold(Th) is calculated . Then each pixel of that row is replaced by the a new pixel given by Eq(2) If 'l' is the length of a sequence in a row here. Sign of the dwt coefficient is represented by 'sgn'. The original dwt detailed coefficient is represented by d and the new denoised coefficient is represented by dn. The scheme is represented by Eq.(1) and (2). Eq.(1) presents a threshold for each row sequence Eq.(2) presents the modification in the detail coefficient using the threshold.

$$Th = l * \sigma * \sqrt{(2 * \log(l)} \quad (1)$$

$$dn = \text{sgn}(d) * abs(abs(d) - Th) \quad (2)$$

We have used the wavelet shrinkage scheme with the cycle spinning algorithm for denoising the digital images[3, 13, 21].

4.2 Proposed : Cycle Spinning with wavelet shrinkage

Donoho's fundamental thresholding functions present optical anomalies and oscillations in the vicinity of signal discontinuities called Gibbs phenomena. Coifman and Donoho then suggested an adjustment to the simple wavelet level, called loop spinning. This method makes use of the wavelet transform shift variant property [2, 10, 11, 15, 21]

Consider the signal x[n] without noise to which one stage Haar filter is applied. Approximate and detail coefficents are obtained as below

$$X_1^{(0)}(k) = \frac{1}{\sqrt{2}}(x[2k] - x[2k-1]). \quad (3)$$

Similarly, the transformation leads to accurate coefficients for the transferred signal

$$X_1^{(1)}(k) = \frac{1}{\sqrt{2}}(x[2k+1] - x[2k]). \quad (4)$$

For x[n] constant on some interval, say[0,M], the detail coefficients are $X_1^{(0)}(k)$ and $X_1^{(1)}(k)$ for $k \in [0, M/2]$.

Now consider a noise corrupted signal y[n] and use wavelet transform with one vainishing moment. In this case the 1-stage Haar filter bank with filters are

$$\hat{x}^{(0)}[2k] = \hat{x}^{(0)}[2k-1] \quad and \quad , \quad (5)$$

$$\hat{x}^{(0)}[2k] = \hat{x}^{(0)}[2k-1] \quad and \quad \hat{x}^{(1)}[2k+1] = \hat{x}^{(0)}[2k] \quad (6)$$

0

Where $\hat{x}^{(i)}$ indicates the estimates from the ith shift for $i \in \{0,1\}$. The decomposition level used for DWT and the size of the image decides the total number of shifts . If the noise is low enough, it zeroes out the information coefficients for the noisy signal by thresholding. From the above equations (3), (4), (5), and (6) the approximation should be constant over the samples at each shift. If we conclude that the noise is very small then denoising without shift shows that the signal is constant over odd pairs, and denoising with shift exposes constancy over even pairs, so using both sets reveals that the approximation is constant over the entire interval [0, M]. And the sum of the two figures

would yield an estimation where the coefficients are usually constant in consecutive pairs [2, 6, 15, 18, 21].

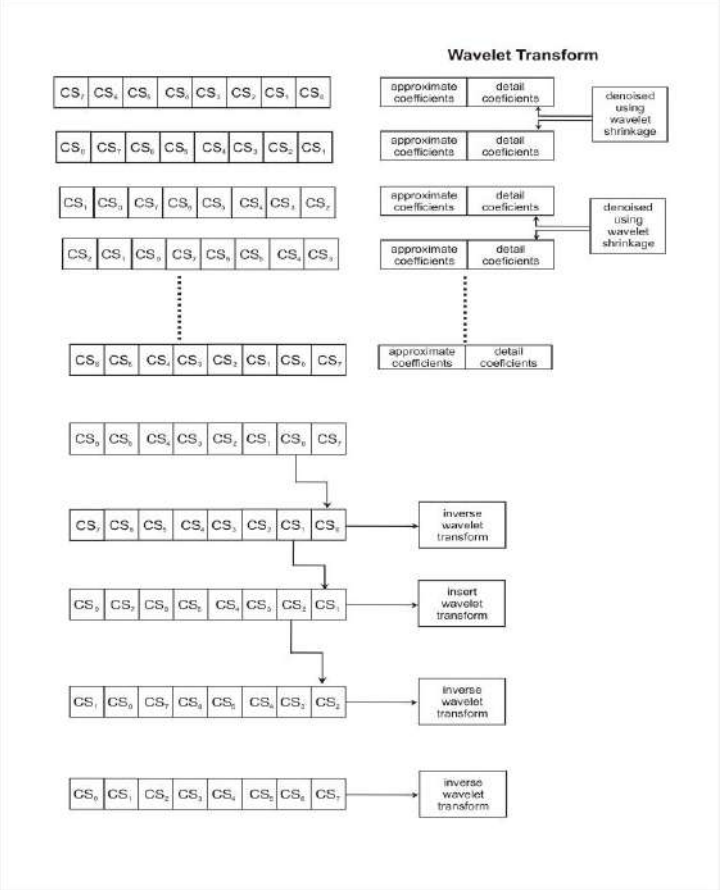

Fig. 1. Cycle Spinning Procedure

In this algorithm we can measure various estimates of the uncertain signal by using various noisy image changes, and then linearly average those estimates. This method would result in various representations of the initial picture of statistically related noise, which will be decreased by an average of [3, 4, 6, 10, 15, 16, 21, 22]. If we denote 'Ci' circular shift, 'W' and 'W-1' represent forward and reverse wavelet transformation and 'Th' threshold, i.e. wavelet shrinakage, cycle spinning can be written as

$$\hat{CS} = \frac{1}{M}\sum_{i=1}^{M}(C_{-i}\,(W^{-1}(Th(W(C_i(y))))) \qquad (7)$$

Where M = the horizontal shifts i.e maximum number of shifts which could cause improvement in denoising, that is equal to number of decompostion levels used for wavelet transform. Artifacts due to wavelet shrinkage are connected to the alignment of feature in images, different alignment may cause the artifacts to move or supress the image. Hence the use of averaging cycle spinning shifts will increase the quality of the image. Cycle spinning flow with diminishing wavelet is seen in Fig. 1.

Algorithm of Cycle spinning with wavelet shrinkage.

1. A sequence(row) is successively shifted by one position
2. Detailed coefficients are computed for each shift.
3. All of them are denoised using a wavelet shrinkage as discused above.

4. Denoised coefficients are shifted back by the same positions.
5. All the denoised and shifted coefficients are averaged to obtain the averaged denoised detail coefficients for that row.
6. This repeated for each row of the image.

5. Initial Experimental Results

It is observed from Fig. 2 that, the denoising after cycle spinning is better than that of the performance before cycle spinning. The proposed method has a significant improvement due to the averaging and shifting with wavelet shrinkage (thresholding) for color images. This is because as previously mentioned; the proposed algorithm uses translation invariant method due to which noise is averaged out hence improve denoising performance and it more visual image, demonstrating the effectiveness of the proposed method. Here in color images the transforms were applied separately on R, G, and B planes and accordingly MSE and PSNR of each color plane were computed. It has been observed that the achieved reconstruction of the color images using cycle spinning with wavelet shrinkage is better as compared to without cycle spinning.Table 1 shows relative comparison of signal to noise ratio (PSNR) of various images reconstructed using Ridgelet transform with & without cycle spinning and wavelet shrinkage.

Table 1. Denoising Performance of Ridgelet Transform using DWT1d with Cycle Spinning and Wavelet Shrinkage on Colour Images.

Image	Without Cycle Spinni PSNR(db)			With Cycle Spinning Wavelet Shrinkage PSNR(db)			With Cycle Spinned D DWT PSNR(db)			With Cycle Spinned D DWT & Wave Shrinkage PSNR(db)		
	Using Gauss n No Mode σ=0.1	Using Gaussia Noise Model σ=0.01	Using Speck Noise Mode σ=0.0	Using Gauss n No Mode σ=0.1	Using Gaussia Noise Model σ=0.01	Using Speck Noise Mode σ=0.0	Using Gauss n No Mode σ=0.1	Using Gaussia Noise Model σ=0.01	Using Speck Noise Mode σ=0.0	Using Gauss n No Mode σ=0.1	Using Gaussi n No Model σ=0.0	Using Speck Noise Mode σ=0.0
Footb	27.97	34.173	36.41	27.89	34.429	36.32	27.97	34.597	36.64	28.00	34.348	36.30
Peppe	27.86	34.381	37.94	27.92	34.532	37.38	27.98	34.679	37.78	27.88	34.235	37.24
Autun	28.95	34.887	36.37	28.89	34.370	35.66	28.89	34.621	35.89	28.87	34.114	35.60
Fabric	27.92	30.793	31.42	27.84	30.304	30.70	27.86	30.346	30.76	27.88	30.249	30.59
Saturn	25.50	30.408	38.25	25.44	30.384	38.09	25.40	30.521	38.17	25.48	30.179	37.31

Noisy Image Reconstructed Image without cyclespinning Reconstructed Image with cyclespinning

Reconstructed Image with cyclespinned DWT Reconstructed Image with cyclespinned DWT +Shrinkage

Fig. 2 Comparison of Noisy and Reconstructed Denoised 'Football' image using Wavelet shrinkage with Cycle spinning.

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Research Article: Computing

EVALUATING PERFORMANCE OF FUZZY SET & CONVOLUTION NEURAL NETWORK USING SPN & AWGN NOISE IN GRAY LEVEL IMAGE

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ABSTRACT

The images take part anvital role in handing over the vital information, but the image expected after transmission are often tainted and differ from the original value. When creating an image, different features such as spectra of light, source, intensity, and camera properties (sensor response, lenses) affect the image. The major feature thatlower image quality is noise. Hides important details from images and changes the pixel value of the image in the main locations causing blur and other distortions. We need to prevent image noise without quality of image. Noise removal is the pre-treatment step for image processing. There are many types of noise that spoil pictures. This noise appears in images in different ways: at the time of acquisition due to loud sensors, due to a wrong scanner or due to a wrong digital camera, due to errors in the transmission channel, due to corrupt storage media. Image must be removed before use in applications to get accurate results. Various types of noise that cause image defects are discussed. There are many methodology to eliminate image noise, none of them are complete and their implementationmostly depends on the nature of image and the different type of noise. In this article, we will discuss some algorithms for deleting the image and comparing them to each other. The signal-to-noise ratio and computation time for various noisy image algorithms provide aamount to measure of image noise removal methodology. It is added to the original images, which the methods receive as input for improvement. The method is MF, Fuzzy Set & Convolution NeuralNetwork to improve in some cases, but not at all, depending on the image and how it was modified before it was applied to the method. Using MATLAB, three objective measurements, mean square root error (MSE), peak signal-to-noise ratio (PSNR), were used to assess the quality of the filtered image. Finally, our results are compared to the Image Refinement Factor (IEF), mean square root error (MSE), and peak signal-to-noise ratio (PSNR)

KEYWORDS: Fuzzy Set, CNN, IEF, PSNR, MSE,SPN

1.INTRODUCTION

Deep Convolutional Neural Networks are basically artificial neural networks, the main use of which is the classification of images. Currently, ConvNets are responsible for the last generation of reverse image reconstruction problems, that is, they are convincing. It can be defined that the performance of these networks depends on the fact that they can learn data from previous real life pictures. Previous images are technically preliminary information related to an image that can later help in filtering, processing, etc..But ConvNets' capabilities go beyond the public data-driven image classification. In other words, ConvNets has the ability to ring with the data structure and demonstrate strong capabilities in data modeling. Moreover, deep neural networks can be trained without a clear decomposition model (the added noise process that uniquely changes the image) as long as noisy pairs of images are inserted into the grid.

Conversational grids mark pictures as folders, as 3D objects, instead of 2D canvases that are only measured based on height and width. The added value that makes images a 3D entity is the fact that digital color photos are encoded in red, blue, and green (RGB). Once these three colors are mixed together, they produce a human-perceived color spectrum. The Deep Convolutional Neural Networks color images with three separate layers of colors stacked on top of each other. In other words, the convolutional grid basically reads a color image as a rectangular square with a specified width and

height in number of pixels along those dimensions. Depth will be three layers deep, with each layer associated with RGB color. These are specific depth layers. They are referred to as channels.

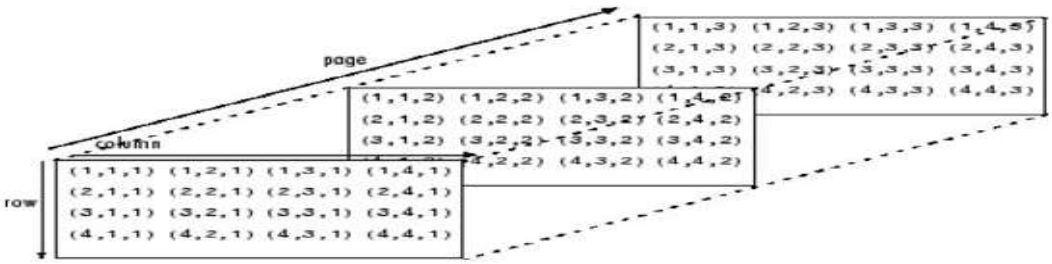

Figure 1.Depth Layers of a ConvNet

DNNs can now classify objects in images with near-human accuracy and accuracy. Therefore, it is natural to question the calculated difference between computer vision and human vision. However, research has revealed that by changing an image, for example, a cat, in a way that the human eye cannot comprehend or perceive, this can lead to the DNN naming the image as something else. Neural networks describe these unrecognizable images as a particularly recognizable image, with confidence greater than 99%. Noise reduces image quality and can lead to failure to interpret useful information. It is difficult to analyze troublesome pictures programmatically and through the human eye. Therefore, in order to eliminate a problem where neural networks place the wrong markings on images due to noise, it is necessary to extract noise from the image. Image filtering algorithms are often used to reduce the effect of noise on sent images. DnCNN (Shrink Neural Network) is designed to predict the difference between a noisy image and a clean image. DnCNN removes the clean underlying image with hidden layer operations. DnCNN not only generates the filtered image, but also provides prediction of the filtered image. To test accuracy, the prediction of a diluted image must essentially be the same as the original, untouched image.

2. LITERATURE REVIEW

The adaptive median filter (AMF) [5] uses changing window size for the removal of noise. Size of window increases until correct value of median is calculated and noise pixel is replaced with its calculated median value. In this filter, two conditions are used, one for detecting damaged pixels, and the other is validating the mean value. If test pixel is less than minimum value and greater than maximum value of the pixel present within the window then center pixel is treated as noisy pixel. If calculated median value is less than minimum value and greater than maximum value present in the window then median value is treated as corrupted value. If the calculated mean is corrupted, increase the window size and recalculate the average value until we get the correct average value or until the window size reaches the maximum.EEPA, similar to EDPA is introduced by P.Y.Chen and C.Y.Lien[6] for the removal ofimpulse noise without degradation of fine details of image (Chen and Lien, 2008). NAFSM [8] developed by Kenny et al is a recursive double stage filter. It employs fuzzy reasoning for the removal of noise present in the image. Initially, for the detection of impulse noise the histogram of the noisy image is utilized. Only noisy pixels take part in the next filtering stage and the noise free pixels are left unchanged to avoid any alteration of fine details. However a major drawback of this filter is large computation time as well as inaccurate median term for restoration. FSM [7] is also proposed by Kenny et al. It utilizes the separate noise detection and noise cancelation module. NAFSM is essentially adaptive FSM. Its working is same as FSM. In the literature[9], Ren Jing gave a deep network based on convolutional neural network in the research of image denoising algorithm of basic Convolutional Neural Networks. This network is different from traditional neural network, which consists of four sub-networks. The input image of the network is subjected to multiple convolution operations, and the input image is filtered multiple times to obtain a feature map. Finally, resource maps are fully connected to get the output image. In[10], Wang Jing

et al. proposed a new improved method for noise images. Different from tradition traditional convolutional network, the structure she gave only contains the convolutional layer and does not contain the sampling layer. The noise cancellation process is: three image block extractions, nonlinear mapping and image reconstructions, which directly assign noise images to clean up the images.In[11], Wang Chun et al. proposed a deconvolution algorithm based on real scene image Convolutional Neural Networks. This method is constructed by constructing a new noise-free image data set and inputting it into the convolutional neural network. Simulated annealing algorithm improves training rate and establishes denoising model to realize real scene image denoising. In [12]LeiJunfeng point out an image mixing noise removal algorithm based on convolutional neural network. The grid uses a 9-layer wrap grid by resource extraction, dimensional contraction, non-linear mapping, dimensional magnification, and image. Reconstruction trains the noise image to get the final model. In the literature Zhang Yungang [13]Point out an image denoising method use convolutional neural network for the poor visual effect of low-dose computed tomography images. The network introduced batch normalization and then learned images. The mapping function between the two uses the cavity convolution to increase the receptive field Apart from classical techniques, recent progress in the fuzzy logic results in the development of new noise reduction methods. **Fuzzy** filters are easy to make with simple, obscure rules that characterize certain noise. Already several fuzzy filters for noise reduction have been developed, such as the well-known Fuzzy Inference Rules by Else action (FIRE) filters by Russo[14]. Sheremetet. al.[15] propose a system to denoise an image by utilizing a denoising convolutional neural network to produce a correction signal in the infocommunication system—which transmits a noisy image.

3. FRAMEWORK

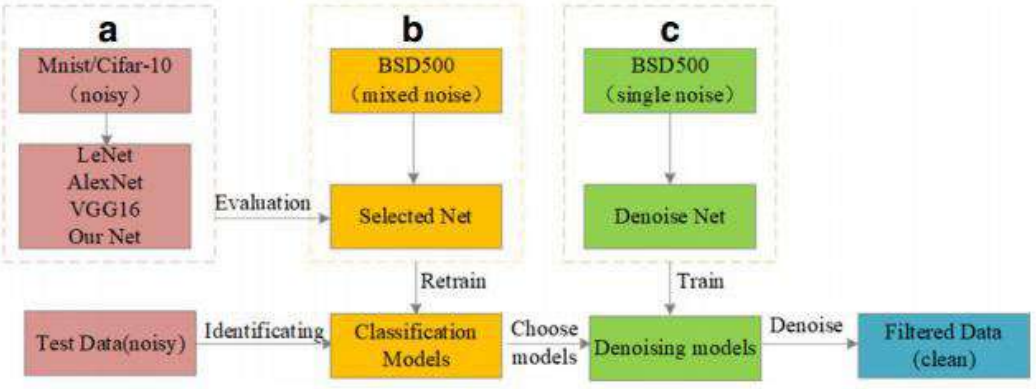

Figure 2.The Process of Framework

Framework mainly consists of four processes: datapreprocessing, noise classification, denoising, and testing.In the data preprocessing, our framework generates 4 groupsof noisy images that are added single, two, multiple typesof noises and mixture of these 3 groups. In the mixedtypes of noises case, each image may contain single, twoor multiple types of noises. Then these grouped datasets areutilized to train corresponding classification models. Thedenoising models derive from a same denoising network andeach of them is trained on corresponding single type noisy
images. Based on the classification result, our framework selects related denoising models and use them one-by-one to denoise the images. The overall framework is shown in Fig. 2 including the processes of classification and denoising. To select the best network for the classification, our framework evaluates the existing networks and our modified one on the noisy datasets that derived from MNIST, Cifar-10 and BSD500. As it is shown in Fig. 2a, it selects the classification network that achieves the highest accuracy on the datasets. Based on the evaluation, it trains the selected network to classify the noise type as Fig2 b shows. Our framework selects the noisy images that are

derived from BSD500 large-scale dataset for thevisualization of the denoising results. Finally, as Fig2c shows, we use pre-trained models to denoise theimage based on the classification result.

In the traditional denoising method, a neural network that was trained on a set of images is not required. Instead, all that is done is that the image is inputted, the noise is added, the individual color channels(red, blue, green) are extracted, and then median filtering is applied to each color channel. 2-D Median filtering performs median filtering of the image in question in two dimensions. Each output pixel contains the median value in a 3-by-3 neighborhood around the corresponding pixel in the input image.

4. RESULTS OF CNN &FUZZY SET FILTER

The original image has been corrupted by the addition of Salt and Pepper noise& Gaussian noise of different variance. The IEF because of the three Filtering (median ,CNN and Fuzzy Set Filter) techniques are compared. The IEF for the proposed Fuzzy Set &CNNfilter is found to be greater than median filters, which shows the significant removal of noise.

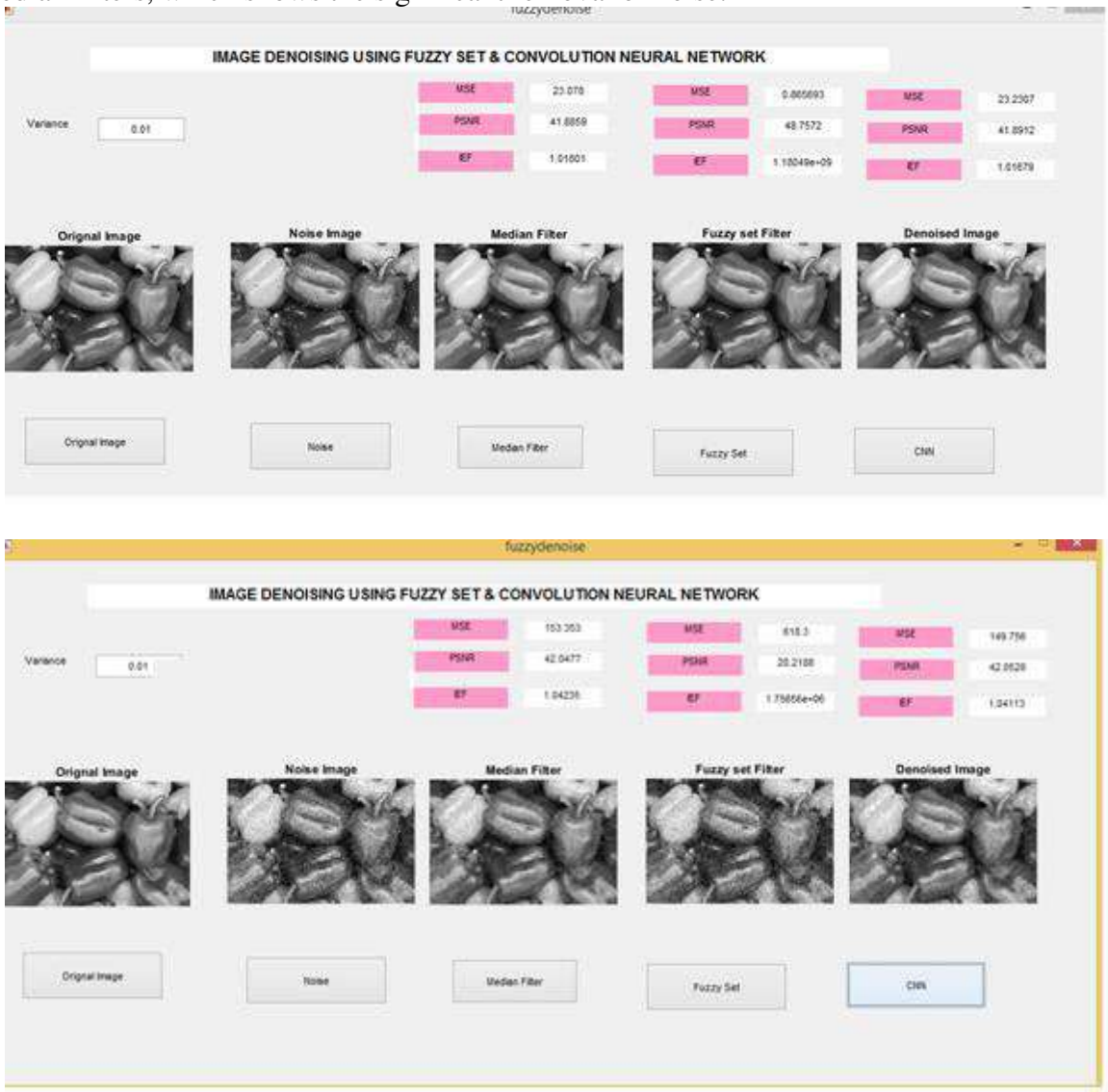

Figure 3. Comparison of Salt and Pepper noise & Gaussian noise with variance (0.01)

The comparison of the result obtained by denoising using median filter,Fuzzy filter and CNN It is found that IEF for the proposed filter increases as the amount of impulse noise increases and is greater than the IEF of other filters. The IEF decreases as the corrupted amount of Salt and pepper noise increases. Table 1 shows comparative result for varying amount of Salt &Pepper

Noise&similarly Table 2 shows comparative result of varying amount of Gaussian Noise.The comparison results are made for various amount of different noise.

Table 1. MSE, PSNR, IEFof Salt& Pepper Noise

Salt &Pepper Noise		Median Filter	Fuzzy Set	CNN
MSE	0.01	23.078	0.8656	23.2307
PSNR		41.8859	48.7572	41.8912
IEF		1.01801	1.18e9	1.016
MSE	0.02	24.2814	2.898	23.2307
PSNR		41.886	43.509	41.8912
IEF		1.029	3.56e8	1.01679
MSE	0.03	24.586	3.567	24.6884
PSNR		41.8647	42.6067	41.889
IEF		1.037	2.9177e8	1.03608

Table 2. MSE, PSNR, IEF of Gaussian Noise

Gaussian Noise		Median Filter	Fuzzy Set	CNN
MSE	0.01	153.353	618.3	149.756
PSNR		42.0477	20.2188	42.0528
IEF		1.04235	1.75e8	1.04113
MSE	0.02	172.862	641.346	169.74
PSNR		42.2137	20.0599	42.2187
IEF		1.04048	1.75e6	1.03927
MSE	0.03	200.52	669.545	197.796
PSNR		42.3593	19.873	42.3645
IEF		1.0374	1.7345e6	1.03619

5.CONCLUSION

A simple and novel Fuzzy Set & CNN filter has been proposed. The subjective and objective analysis of the filter has been made. The image enhancement factor is found to be greater than the, median and fuzzy filters. The filter preserves the edges, which provides information. Since the value of alpha adapts itself, this filter is optimized for any type of noise and any type of image. The Pepper image is considered as the test image. Better noise elimination has been obtained while preserving the edges The proposed filter has been implemented in three stages using a threshold value to detect impulses and its removal, threshold value for the detection of edges and to reduce the blurring in images. The operation of this filter involves less complexity as it is compared with other filters. The performance of the proposed adaptive fuzzy filters are found to be better in salt and pepper but degrade using Gaussian noise same as CNN done better in Gaussian noise but degrade in Salt & Pepper Noise.

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Mems & IOT Based Automatic Fall Monitoring: A Review

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ABSTRACT

Falls and fall-related injuries are major incidents, especially for elderly people, which often mark the onset of major deterioration of health. More than one-third of home-dwelling people aged 65 or above and two-thirds of those in residential care fall once or more each year. Reliable fall detection, as well as prevention, is an important research topic for monitoring elderly living alone in residential or hospital units. The aim of this study is to review the existing fall detection systems and some of the key research challenges faced by the research community in this field. We categorize the existing platforms into two groups: wearable and ambient devices; the classification methods are divided into rule-based and machine learning techniques. The relative merit and potential drawbacks are discussed, and we also outline some of the outstanding research challenges that emerging new platforms need to address.

Keywords: short-time fall monitoring, fall detection, fall prevention, wireless sensors, wearable sensors

I. INTRODUCTION

Adults 65 years of age or older experience higher rates of falling and are generally at a higher risk for falls. 1–4 One in every 3 persons over the age of 65 years are estimated to fall 1 or more times each year. 5–7 Falls and fall related injuries represent a significant threat to the health and independence of adults 65 years of age and older. Falls can have severe consequences such as injury or death; in 2010 in the United States, 21,649 older adults died from fall related injuries. 8 Even if a fall does not result in a physical injury, it can often produce fear of falling resulting in a decrease in mobility, participation in activities, and independence. 9, 10 Fear of falling can be amplified in the presence of the "long lie", which is identified as involuntarily remaining on the ground for an hour or more following a fall. 1 Such an event can results in substantial damage to the individual's body and morale. Lying on the floor for an extended period of time often results in several medical complications such as dehydration, internal bleeding, pressure sores, rhabdomyolosis or even death. Half of those who experience the "long lie" die within 6 months of the fall. 11 A recent cohort study reported a "long lie" was seen in 30% of fallers; 12 therefore it represents a great threat to the long term health of older adults.

Evidence-based methods to prevent falls include regular exercise, vitamin D supplementation and having regular fall risk assessments. 2, 13–15 However, despite prevention efforts falls are still likely to occur as one ages, and they need to be quickly identified to prevent further injury to the fallen individual. Personal emergency response systems or PERS represent one commercial solution to addressing this issue. These clinical alarm systems provide a way for individuals who fall to contact an emergency center by pressing a button. 16 While appropriate in many situations, the PERS system is rendered useless in the event that the person is unconscious or unable to reach the button. Even when the system is available, a recent cohort study found that around 80% of older adults wearing a PERS did not use their alarm system to call for help after experiencing a fall.

In this project, a surveillance system based on Arduino, fall detection is proposed. Raw data of three-dimensional accelerometer are provided by Arduino with ADXL345., analyzing, storing and acquiring any

time from any place as long as they have access to the Internet. The system architecture is shown is Fig. 1 as follows.

Figure 1. System Architecture

II. LITERATURE REVIEW

Falls represent one of the leading causes of deaths and injuries in the elderly population. According to Lord et al. [1], more than one-third of home-dwelling people aged 65 or above and two-thirds of those in residential care fall one or more times each year. More than two-thirds of people who have experienced a fall are prone to falling again [2]. Vellas et al. [3] reported that 219 out of 487 elderly subjects had experienced a fall during a two-year study period and one-third of which developed a fear of falling after the incident. The psychological consequences often lead to decreased mobility and independence among elderly population [4]. Falls can occur on level surfaces, mostly in living rooms, bedrooms, kitchens, bathrooms, or hallways [5]. The rate of fall-related injuries is generally higher among women [6] and the medical costs increase rapidly with age [7]. Damages caused by falls include tissue injuries, lacerations, joint dislocations, bone fractures and head trauma. Carroll et al. [8] reported that the total direct medical costs of fall injuries among elderly people in the U.S. in 1997 were $6.2 billion. The costs increased to $19 billion in 2000 [7] and $30 billion in 2010 [9]. Fall-related injury is considered one of the 20 most expensive medical conditions among community-dwelling elderly population [7]. Most elderly people are unable to get up by themselves after a fall and it was reported that, even without direct injures, half of those who experienced an extended period of lying on the floor (>1 h) died within six months after the incident [10].

Fall is defined as “an event which results in a person coming to rest inadvertently on the ground or other lower level”. This definition has been used as a baseline in many fall prevention and fall-risk assessment studies [11–14], and covers most types of falls targeted by fall detection research. Variations of fall definitions from different perspectives of seniors, health care providers and research communities can be found in [15]. Thus far, there are several review papers on fall detection and prevention. Noury et al. [16,17] reported a short review on fall detection methods and proposed a set of protocols to evaluate fall detection algorithms. In the study, a fall is divided into four phases, i.e., prefall, critical (impact), postfall and recovery phases, and fall detection algorithms are categorized based on whether they focus on “direct” detection of the critical phase or postfall phase. The critical phase, which consists of a sudden body movement towards the ground, lasts for approximately 300–500 ms.

III. DESIGN COMPONENTS

Fall detection sensor system uses a sensor device, a hardware that detects the body position and motion, which then communicates with the system (thesoftware part) to send out an emergency to the contact person if falling is detected. The system would only send the signal after the alarm is triggered by the sensor for 15 seconds. The hardware needed is presented in Sections 4.1 and 4.2 while the software languages used in provided in Section 4.3.

3.1 Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (Figure 3). It has 14 digitalinput/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a

USB cable or power it with AC-to-DC adapter or battery to get started [8, 9, 10, 11, 12].

Figure2: Arduino UNO board

In most fall situations, the body leans to the side and touches the ground with high acceleration. So, an algorithm must detect a fall in these situations when there is a rapid change of position in a very short amount of time.

Commonly, fall detection systems use a gyroscope and an accelerometer. A gyroscope is used to determine an orientation and an accelerometer provides the information about the angular parameter as three-axis data. But we also need to decide a threshold so that the system can differentiate between a fall and normal activity.

The circuit we discuss in this tutorial is built around an Arduino UNO and an MPU6050 accelerometer and gyroscope breakout module. We will also try to send the SOS message via a Wi-Fi module. First of all, we need to decide on an algorithm

3.2 Arduino Programming Language

Arduino programs can be divided in three main parts: structure, values (variables and constants), and functions. The Arduino language is based on C/C++ and supports all standard C constructs and some C++ features. In Arduino, the standard program entry point (main) is defined in the core and calls into two functions in a sketch. The function setup() is called once, then loop() is called repeatedly until the board is reset. Besides, Arduino development environment, SPI Arduino Library and SoftwareSerial Arduino Library are also needed [13].peaker in a voice signal by analyzing it. Our long term goal is to implement a gender classifier that can automatically predict the gender of the speaker based on the above investigation.

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Automated Muscle Fatigue Diagnosis using EMG Signal

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ABSTRACT

One of the major causes of injuries in athletes is related to muscle fatigue and is normally detected after the muscle is already injured. To prevent future injuries it is important to detect muscular fatigue before it is visible, so that the athletes performance is improved. The main objective of this thesis is to detect and characterize muscular fatigue. The signals under study are electrical impulses produced by the muscle (electromyography). Analysing these signals allows us to evaluate if fatigue is present. The amplitude of EMG signals increases progressively as a function of time when the fatigue increases. EMG signal will be acquired from clinical database. Signal generated the main muscles during particular task will be analysed for fatigue assessment. In recent research paper many EMG indices have been suggested and compared in muscle fatigue assessment, including root mean square (RMS), the median (MF), and mean power frequencies (MPF) based on Fourier Transform. Feature obtained from the signal is given to Classifier which is identified category or class Label of EMG signal, two different class labels used is Fatigue and non-fatigue.

Keywords: Muscle Fatigue Analysis, Electromyography, Support Vector Machine (SVM), K-nearest Neighborhood (KNN)

I. INTRODUCTION

Muscle fatigue is a condition in which muscle' ability to perform decreases over time. It is a common non-specified health symptom experienced by many people and is associated with many health conditions. It is associated with a state of exhaustion, often following strenuous activity or exercise. When fatigue is experienced, the force behind the muscles movements decreases resulting a neuromuscular symptom in which the muscle fails to maintain the required or expected force. To overcome this problem Electromyography is used. To evaluate and record the electrical activity produced by the skeletal muscles, Electromyography commonly known as EMG technique is used. When muscle cells are electrically or neurologically activated, the electrical potential generated by muscle cell is detected by an EMG.

Electromyography (EMG) recordings can be divided into two types depending on the place of the recording electrodes; if the electrodes are placed on the skin, the procedure is considered surface electromyography (sEMG), and if the electrodes are inserted in the muscle, it is referred to as intramuscular electromyography. The results obtained from both techniques may differ in some aspects. For example, the evolution of the amplitude of the recording during fatigue differs because the RMS value of intramuscular EMGs decreases, whereas the RMS of the sEMG increases. Both these techniques are useful for studying muscle fatigue. The invasiveness of the Intramuscular EMG results in discomfort of the subject, therefore surface EMG is more preferred.

In this work, surface electromyography is performed for analysing muscle fatigue. Due to the non-invasiveness and real time applicability surface

EMG or sEMG is widely used for muscle fatigue diagnosis, sEMG signal is a non-stationary and weak bioelectrical signal and is ranges from 20Hz to 500Hz. EMG signals contains motor unit action potentials (MUAPs) from several Motor Units (MU). The characteristics and shape of the motor unit action potential (MUAPs) is affected with the changes in neuromuscular diseases. For the classification of fatigue muscle and non-fatigue muscle, the DWT based feature extraction scheme is used in this procedure. The DWT of the dominant motor unit action potential (MUAP) gives the statistical features. SVM is used as base classifier for designing the multi classifier. The base classifiers consist of different kinds of classifiers such as adaptive certainty-based, the adaptive fuzzy k-NN, and the adaptive matched template filter classifiers. here in this work the K-nearest neighbourhood (KNN) is employed. The comparative analysis of EMG signals presents the experimental result for muscle fatigue analysis.

2. METHODS AND MATERIAL

2.1 Signal Acquisition and Pre-processing

The EMG signals obtained from the sensor contains noise or unwanted electrical signal. It is important to filter the signal taken from EMG sensor to attenuate unwanted electrical signal. First of all, the EMG signal of 10Hz to 3KHz is filtered by a band pass filter in MATLAB. The filtered signal contains inactive and active segments with motor unit action potentials (MUAPs). For the extraction of MUAPs around this inactive segment, window function is used. The threshold parameter ($\pm\lambda$) is been set around baseline of the sample between $+\lambda$ and $-\lambda$ for removing the inactive segment. At the identified peak of MUAPs, a window of 180 sampling points is centered where the size of window depends on the sampling rate. Depending upon the temporal energy of the dominant MUAP, MUAPs is been extracted from the EMG signal. When the dominant MUAPs for different datasets are acquired then they are used for the feature extraction.

2.2 Feature Extraction

Feature extraction converts the input data to a set of features for extracting the information relevant from the data. The changes in EMG parameters shown by the sEMG signal analysis helps to detect muscle fatigue. The morphological features of the MUAPs for the Time Domain extraction used for visual assessment.

2.2.1 Time and frequency domain analysis

The obtained signal is analyzed in time domain where the amplitude/voltage of signal is represented as a function of time. The frequency of signal having greater value should be analyzed using frequency domain. The morphological features for representing each MUAP are as follows:

1. Within the main spike, rise time between the positive peak to the negative peak.
2. Ratio of Peak to Peak magnitude to RMS value
3. From first to the last positive peak, the spike duration.
4. ascending to descending slope positive spike of MUAP.
5. Positive to negative area of spike MUAP.
6. Phases: The number of baseline crossings where amplitude exceeds ±25 μV, plus one.
7. Thickness: The ratio of the area to the peak-to-peak amplitude.
8. Total samples between the minimum positive and the maximum negative peak called as peak-to-peak samples number.

2.2.2 DWT Based Feature Extraction

The wavelet transform decomposes signal into number of multi resolution components using wavelet function. The detection and classification of short time component within a non-stationary signal is performed using this function. For extracting the features from EMG signal, DWT is used because this technique offers localisation in both time and frequency.

Number of ‘Mother Wavelets’ are used for the purpose of signal decomposition. The properties of wavelet function and characteristics should be matched so that the most appropriate mother wavelet is selected for the particular application. Db4 is suitable for the signals using feature extraction with more than 4 samples.

2.3 feature selection

It is important to ensure the selected features should contain class relevant information as most features does not include such information. Therefore, feature selection is used for selecting the features of the required information. To enhance the comprehension of the produced classifier model, feature selection creates a model of generalised unseen dimensions. Feature selection is categorized into two types such as the wrapper approach and filter approach.

The evaluation of most optimal feature or sub-set is carried by the wrapper approach. This model is widely used in machine learning for improving the performance of the classifier. When classifier cannot be directly linked with the data set then the filtering approach is employed. It is linked with the data mining where data reduction is required.

2.4 Classification

In solving the statistics and computational problem where the individuals are grouped according to their characteristics, classification methods are used. In this method individuals having same characteristics are labelled in the same sets. There are many ways for classifying the sEMG signals. One of the popular methods is to measure the Euclidean distance among the waveform and MUAP.

Multi-Classifiers Majority Voting (MCMV) classification strategy is used in the presented work.

It contains two groups parallel to each other. The two non-parametric methods, k-nearest neighbour (kNN) and support vector machine (SVM) are used for classifying the signals of fatigue and Non-fatigue conditions. Using the predefined MATLAB functions, the classification is performed. The built in MATLAB function with radial basis function kernel is used for performing the classification with SVM. For better accuracy, all other parameters must be set to default.

FLOWCHART

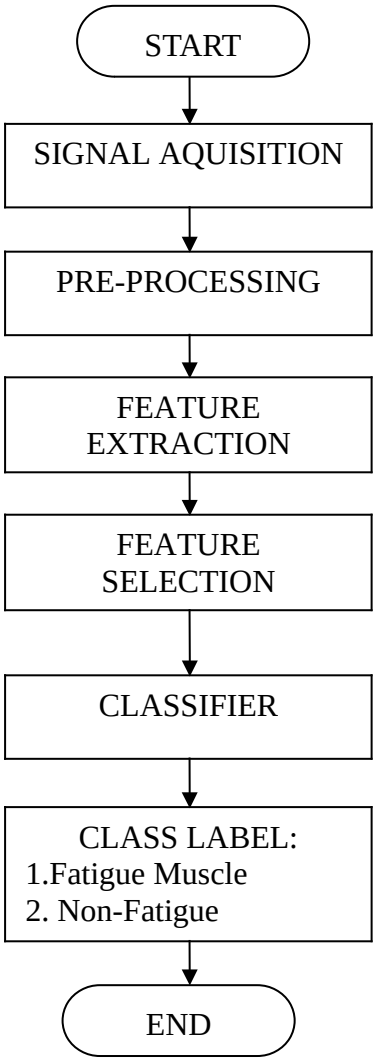

Fig 1: flowchart

3. RESULT AND DISCUSSION

It is seen that in the same class, the classification accuracy is high. In all the groups, the second highest accuracy for base classifier is taken from classification strategy one against all class label. For time-frequency feature, the multi-classifier provides an average accuracy of 97% whereas WKNN classifier achieves the accuracy of 95%. The data of 100 EMG signal, with 50 samples each has been tested for both the classes. The use of window function gives simple approach for MUAPs extraction. By removing the inactive region segmentation of EMG is carried out. The time and time-frequency domain selects the dominant MUAPs for feature extraction. The time domain feature fails to map spectrum behaviour therefore the time-frequency domain feature is selected. A number of changes occurring at both central and peripheral level are represented by the muscle fatigue phenomenon.

4. CONCLUSION

This review paper focuses on classifying MUAPs into fatigue and non-fatigue class. Several base classifiers such as time domain features, time-frequency features are used for taking different MUAPs features. The limitation of single stage classifier with complexity and processing time is overcome with Multi-classifier. As it allows to segment big decision into many detailed decisions, this strategy can be used in other pattern recognition applications. This review paper shows that the approach to muscular fatigue diagnosis using sEMG is successful for getting the information about the skeletal muscles. Both types of time-frequency and time domain features gives promising results (97%) for the two classes. This research can be further extended if the influence of recording conditions on the classification accuracy is investigated.

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A Review of Prediction of Different Syndrome also COVID-19 using Machine Learning Techniques

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Abstract—This Disease Prediction Using Machine Learning is completely done with the help of Machine Learning and Python Programming language with Tkinter Interface for it and also using the dataset that is available previously by the hospitals using that we will predict the disease One of the solution to control the current havoc can be the diagnosis of disease with the help of various AI tools Disease Prediction using Machine Learning is a system which predicts the disease based on the information or the symptoms he/she enter into the system and provides the accurate results based on that information. If the patient is not much serious and the user just wants to know the type of disease, he/she has been through. It is a system which provides the user the tips and tricks to maintain the health system of the user and it provides a way to find out the disease using this prediction. Now a day's health industry plays major role in curing the diseases of the patients so this is also some kind of help for the health industry to tell the user and also it is useful for the user in case he/she doesn't want to go to the hospital or any other clinics, so just by entering the symptoms and all other useful information the user can get to know the disease he/she is suffering from and the health industry can also get benefit from this system by just asking the symptoms from the user and entering in the system and in just few seconds they can tell the exact and up to some extent the accurate diseases..

Key words COVID-19, Machine Learning, Prediction, Supervised Learning, Classification Techniques

1. INTRODUCTION

Disease Prediction using Machine Learning is a system which predicts the disease based on the information provided by the user. It also predicts the disease of the patient or the user based on the information or the symptoms he/she enter into the system and provides the accurate results based on that information. If the patient is not much serious and the user just wants to know the type of disease, he/she has been through. It is a system which provides the user the tips and tricks to maintain the health system of the user and it provides a way to find out the disease using this prediction. Now a day's health industry plays major role in curing the diseases of the patients so this is also some kind of help for the health industry to tell the user and also it is useful for the user in case he/she doesn't want to go to the hospital or any other clinics, so just by entering the symptoms and all other useful information the user can get to know the disease he/she is suffering from and the health industry can also get benefit from this system by just asking the symptoms from the user and entering in the system and in just few seconds they can tell the exact and up to some extent the accurate diseases. This DPUML is previously done by many other organizations but our intention is to make it different and beneficial for the users who are using this system. This Disease Prediction Using Machine Learning is completely done with the help of Machine Learning and Python Programming language with Tkinter Interface for it and also using the dataset that is available previously by the hospitals using that we will predict the disease. Now a day's doctors are

adopting many scientific technologies and methodology for both identification and diagnosing not only common disease, but also many fatal diseases. The successful treatment is always attributed by right and accurate diagnosis. Doctors may sometimes fail to take accurate decisions while diagnosing the disease of a patient, therefore disease prediction systems which use machine learning algorithms assist in such cases to get accurate results. The project disease prediction using machine learning is developed to overcome general disease in earlier stages as we all know in competitive environment of economic development the mankind has involved so much that he/she is not concerned about health according to research there are 40% peoples how ignores about general disease which leads to harmful disease later. The main reason of ignorance is laziness to consult a doctor and time concern the peoples have involved themselves so much that they have no time to take an appointment and consult the doctor which later results into fatal disease. According to research there are 70% peoples in India suffers from general disease and 25%of peoples face death due to early ignorance the main motive to develop[p this project is that a user can sit at their convenient place and have a check-up of their health the UI is designed in such a simple way that everyone can easily operate on it and can have a check-up.

Machine Learning Definitions

Algorithm: A Machine Learning algorithm is a set of rules and statistical techniques used to learn patterns from data and draw significant information from it. It is the logic behind a Machine Learning model. An example of a Machine Learning algorithm is the Linear Regression algorithm.
Model: A model is the main component of Machine Learning. A model is trained by using a Machine Learning Algorithm. An algorithm maps all the decisions that a model is supposed to take based on the given input, in order to get the correct output.
Predictor Variable: It is a feature(s) of the data that can be used to predict the output.
Response Variable: It is the feature or the output variable that needs to be predicted by using the predictor variable(s).
Training Data: The Machine Learning model is built using the training data. The training data helps the model to identify key trends and patterns essential to predict the output.
Testing Data: After the model is trained, it must be tested to evaluate how accurately it can predict an outcome. This is done by the testing data set.

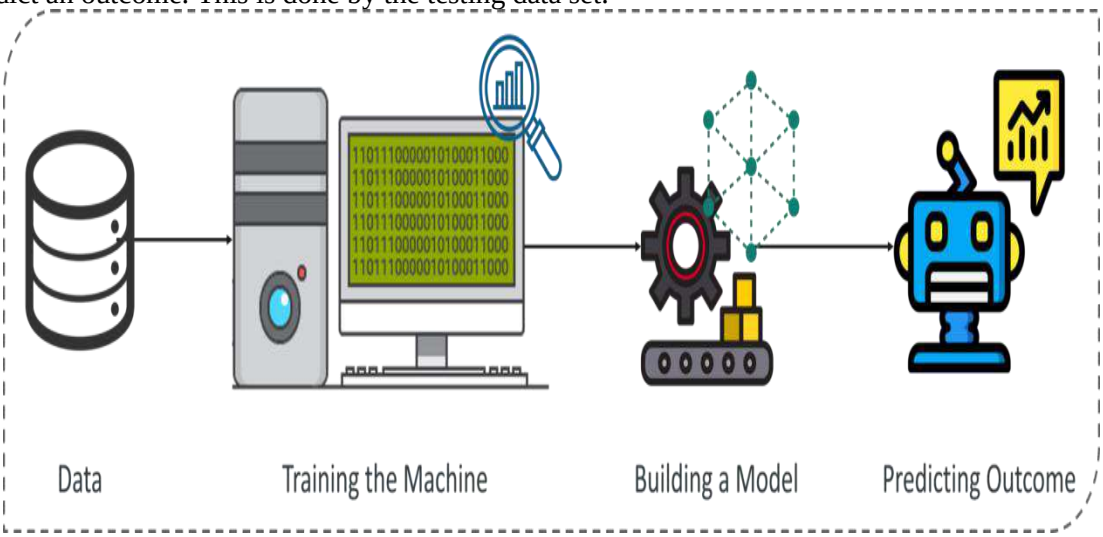

Fig..1 Tree Diagram of Machine Learning algorithm

2. LITERATURE REVIEW

In this paper [1] author has presented the concept namely, "Disease prediction using Machine Learning over Big Data". The big data is fastest concept in current trend, so this concept is applied in more fields. The big data is most widely used in each every field because it is very large. The big data is applied in medical field both side developing the better growth in both fields, that is big data is applied in medical fields develops the medical fields at the same time increase the growth in big data field. The big data helps to achieve the better growth in medical and health care sectors. It additionally, provides the more merits gives, (i) medical data analysis with accuracy, (ii) early prediction for disease, (iii) patient oriented data with accuracy, (iv) The medical data, is securely stored and used in many places, (v) incomplete regional data are reduced and give the accuracy result. Goal of the concept is choose the region and collects the hospital data or medical data of particular selected region, this process is using the machine learning algorithm. This term based on the data mining technique is used for disease prediction with accuracy. Then, finding the missing data based on latent factor get the incomplete data and it is reduced. The previous system use the CNN-UDRP (Unimodal Disease Risk Prediction), then continuously implements the next level use the CNN-MDRP (Mulimodal Disease Risk Prediction). The CNN-MDRP is overcome the drawback of CNN-UDRP.

The CNN-MDRP is uses the hospital data, that is structured and unstructured data. The CNN-MDRP algorithm based prediction is produce more accurate, this accuracy is compared with previous system. The advantages of the concept is, better feature description and better accuracy, and the disadvantages of this system is, this feature is only applicable for the structured data so it is not good in disease description.

Authors, in this paper [2] has proposed in to the concept is machine learning based disease prediction using the big data for overcome the machine learning drawbacks. The smooth progress of big data is moves in the biomedical and healthcare communities in hospital for accurate results in any experiment result. This concept is (a) reduces the incomplete data and (b) effective disease prediction.

The proposed concept is tested or experimented the real-life hospital data collections such as hospital oriented information like daily updated data- doctor data prefer doctor details, patient data prefer patient details, disease data prefer disease oriented data, etc,. This technique overcomes main two difficulties in the existing system are, (i) incomplete data, (ii) missing data. So rebuild the latent factor model. The concept is get the information from hospital that collected information forum called "structured and unstructured data", and by using the Machine Learning Decision Tree algorithm and Map Reduce (MR) algorithm. The MR algorithm is used for data partitioning. It reaches the 94.8% with the normal speed but it is quicker than CNN-UDRP and then, it report give the information is disease occurrences possibilities.

The paper [3] author has presented the data mining concept "Disease Prediction by using Machine Learning". The data mining best growth of the stage is develops that technique into the healthcare basis, the data analysis is an important part of every field. The data mining is predicts the information for healthcare is called rapid growth of medical care field. The existing one is designed the purpose of (i) analyze, (ii) manage, (iii) predict of healthcare data, it is described the overall healthcare systems. The concept of machine learning is applied into the disease-related information retrievals and the treatment processes in these types of process are achieved by using the data analysis. The predictions of outbreaks in diseases are using the decision tree, because it is very effective. This concept based experimental shows that result is related to the disease symptoms, so that data is described medical data using modified prediction model. If the concept choose the raining set like medical patient symptoms, than,

use the decision tree, then, predicted, finally give the symptoms of patient and get the accurate result for disease prediction. This concept is only performs, that is predicts only the patient related information with low time and low cost.

Authors, presents the survey paper [4] for "prediction of disease using machine learning over big data". Can develop the medical specialty basis this concept is applied to produce the medical data in to mass medical data, which means the data which is enlarged. The goal of this concept is targeted the simplest data is stored into the space of medical massive data analysis, called "medical data analysis in massive collection". It produces the accuracy and it reaches the 4.8% speed faster the CNN-UDRP. It only focuses this three data, (a) structured data, (b) text data, (c) structured and text data. In this proposed system is improves the medical data oriented term.

Concept presented by author, this paper [5] delivered theme is, "personalized disease prediction care from harm using big data", for healthcare analysis. This concept describes the medical field is a rich data industry because it holds the healthcare records, also. The daily treatment records are increased in every day that is it includes number of transactions, and the patient information is stored and retrieved from the database. The medical treatment records are every day updated one, because every day improves the patient health improvements based on treatment. It gives the correct solutions for different types of diseases. This system is change medical record, which means manually noted every medical oriented record into the electronic record that is, digitalize the medical care. This technology is simply called, "e-healthcare". The medical data is stored in the database. The big data methods and the logics are used to analyze the statistical analytics. The proposed system is known as, "disease recommendation system", and this system holds the specialized tool, this tool is creating the profile. The profile making needs some information from the personalized persons, that is doctors, patients, etc, If entering the required field of the system finally get the personalized model health profile, but this personalization includes huge number of profiling information and other data.

This personalized profile is based on current treatment and any other treatment is takes, if can use the same profile, cannot require again make the profiling. It increased the computational time, so frame the time for clinical purposes. This concept is extracted and applies the application like, Collaborative Assessment and Recommendation Engine (CARE). The CARE is analyzes the performance limitation, and it improves the personalized disease prediction. The concept improved application CARE is classified into two types namely,

.

Enthusiastically presents the author, give the information are collected by the paper [6] namely, "Use the Weighted Ensemble to Neural Network based Multimodal Disease Risk Prediction (WENN-MDRP) and feature selection of Ant colony improved classifier for disease prediction over the big data concepts". This concept feature selection performance is gives the dataset, this data set making is one the significant task. The feature selection task is splits into level by level, (i) first, structured the normal and more explainable models,

(ii) apply the concept knowledge and learning its performance, (iii) finally, ready to preparing the clean, that is clear the data. Then, the proposed concept is analyzes the feature selection difficulties for big data based data analytics, so resolving this complexity by using the Improved Ant Colony Optimization (IACO) technique. This technique is early solves the missing data problem in incomplete data, which means it before set the latent factor mode, also. But is not easily selects the best feature from the medical data.

The second technique WENN-MDRP is called the unheard technique, in this technique is helps to select the best features from medical data. These two methods are combined and give the special merit is improved prediction with accuracy, if this accuracy is evaluates to compare the experimental techniques. This concept is works only the time full fill the needed instances

like, (i) accuracy, (ii) precision, (iii) recall. It selects the best feasible, but not previously checks the possibility.

Paper [7] gives the survey for Disease prediction in big data healthcare using extended CNN. This concept is applied in the medical field to implements the hospital. It provides the (i) high accuracy, (ii) high performance, (iii) high convergence speed. To select the particular region and then, analyzed the chronic diseases, that holds the structured data (extracted useful features), the unstructured data is use the CNN technique, so automatically selects the features. The novel CNN is proposed the medical data, and disease risk model is combined this data. The characteristic behavior of this system is selects the data via previous term. This term is previously applied is possible but not satisfied the disease changes, because disease level is not standard, it is changed in every seconds. To take the selected data from large number of data and improves the accuracy by using risk classification term. The proposed system aim is to predict the risk in liver oriented disease. So, the hospital dataset is related to the liver oriented disease and it collects only the structured data from liver disease information. In the proposed system is use the disease risk modeling and get the accuracy. But the risk prediction is depends on the different feature of medical data with higher accuracy.

This paper [8] author has presented the big data techniques in public health like, "Terminology, Machine Learning, Privacy". The digitalize world is day by day increases the huge amount of data and increasing the data rate, so meet the staggering, but this problem is solved by incoming the new and fantastic forum and clever concept called the "Big Data". The big data cannot lock the novel approach chances it understands the public health. The concept is express step by step but it is very force, firstly, it takes the classification of sources of the data like, big data, and then to clarify the terminology and then, identify its threads. The medical field oriented researches takes the big data, and it including the protection, hypothesis related generating researches takes the big data information. The interpretability is not aim this proposed system using machine learning technique.

This paper [9] author has presented the concept is, "Improving disease prediction by machine learning", that is using the machine learning and improving the disease prediction. The big data is expanding the medical data, so improving this type of information. This concept use the genetic algorithm, it is utilizing the recover data, that is the missing data, then, it dataset includes the medical data. In this system using the two calculation terms namely, (i) KNN, (ii) SVM. The chronic diseases every increasing the data CNN-MDRP technique use the medical data. The database includes the medical data, and personal data and detailed history of patient is stored. The RNN based techniques are easily find out the logical data. This system uses the online and offline methods.

In the paper [10] author has presented the concept is, "Competitor Mining and Unstructured Dataset Handling Technique", which used in healthcare communities. This paper competitive mining is describes with its related works. Finally gave competitor mining algorithms with its advantages and drawbacks. This paper experimental result shows CMiner++ yielded least computation time when comparing others.

Paper [11] gives the survey for Personalized Clinical Decision Support System Using Effective Data Mining Algorithms. This paper effectively designed a framework which is called A-CDSS (adaptive clinical decision support system).This framework manage and solved many research issues such as feature selection, classification issues like class Inequality and accuracy problems and finally the decision selection based on the diagnosed result. This paper result shows achieve the higher accuracy and effective clinical decision support system.

Author Senthil Kumar proposed [12] BioSearch engine with effective data mining machine learning algorithm with less energy for query processing. This proposed approach contains predictive data caching techniques which gives for fast and effective data retrieval. This system also integrates with auto query incremental algorithm to ease the search. Finally retrieved data's are ranked and summarized using RII result shows to the user view.

Paper [13] analyzes Clinical Decision Support Systems methods and techniques. This paper provides a review of different techniques and methods such as Genetic Algorithms, fuzzy, k-nearest neighbor, back propagation algorithm and ANN for clinical decision support system with its merits and demerits. This paper survey exposed that the Artificial Neural Networks (ANN) and fuzzy classification rules using data mining techniques can incorporate data from many clinical and laboratory variables to provide better diagnostic accuracy in various clinical dataset.

The paper [14] author has presented the data mining concept for Clinical Datasets Using Weighted Genetic PCA Methods. Diagnosis and detection of diseases from patient electronic health records are very dynamic in nature and achieving that is a very promising area of research. So this paper implements a new weighted Genetic based algorithm with the use of effective weighted features from the PCA. The system finds the type2 Diabetes and Heart disease Classification using WGA technique. The system developed with the intension of high accuracy and less training overhead.

The paper [15] author has presented Identification of Diabetes Risk Using Machine Learning Approaches. With the numerous sizes in digital Healthcare data processes, the classification and prediction based on the statistical data is very tough .This survey discusses several machine learning approaches such as supervised learning, clustering and regression for Diabetes Risk this paper shows the advantages and disadvantages of several traditional classification algorithms based on different techniques .

In the paper [16] author has presented the concept is Feature Selection Methods Feature Selection Methods. The problem of feature selection, or choosing the most relevant features out of what can be an incredibly large set of data, is particularly important for accurate text categorization. So that this paper extract a feature vector for each new document by using feature weighting and feature selection algorithms for enhancing the text classification accuracy. After that we train our classifier by Naïve Bayesian (NB) and support vector machine (KNN) algorithms. In Experiments, although both algorithms are show acceptable good results for text classification.

3. CONCLUSION

In the survey discuss Disease predicts the hospital data by using the different data mining technique. This analyze the medical data in multiple ways, like that, multidimensional ways and view based collects that data and it escapes the hard risks then, prediction is easily completed. The hospital data is classified in to two types namely, (i) structured data, (ii) Unstructured data. The concept fulfill the existing system focused both types of data prediction in medical area, that is big data analytics. There are numerous researches from various domains are continuously working towards developing Achieving Disease Prediction. The aim of this survey was to Summarize the recent researches and its demerits towards achieve Disease Prediction. This paper gives the merits and demerits of the recent techniques and its capabilities are studied. This paper concludes that there is no effective method discovers for Achieving Disease Prediction. So, further approaches should overcome all the above issues. Further implementation has to be done in order to Achieving High Disease Prediction using machine learning algorithm

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Various Disorder and COVID-19 identify using Machine learning Methodology

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Abstract—Technology advancements have a rapid effect on every field of life, be it medical field or any other field. Artificial intelligence has shown the promising results in health care through its decision making by analysing the data. COVID-19 has affected more than 100 countries in a matter of no time. People all over the world are vulnerable to its consequences in future. It is imperative to develop a control system that will detect the coronavirus. One of the solution to control the current havoc can be the diagnosis of disease with the help of various AI tools Disease Prediction using Machine Learning is a system which predicts the disease based on the information or the symptoms he/she enter into the system and provides the accurate results based on that information. If the patient is not much serious and the user just wants to know the type of disease, he/she has been through. It is a system which provides the user the tips and tricks to maintain the health system of the user and it provides a way to find out the disease using this prediction. Now a day's health industry plays major role in curing the diseases of the patients so this is also some kind of help for the health industry to tell the user and also it is useful for the user in case he/she doesn't want to go to the hospital or any other clinics, so just by entering the symptoms and all other useful information the user can get to know the disease he/she is suffering from and the health industry can also get benefit from this system by just asking the symptoms from the user and entering in the system and in just few seconds they can tell the exact and up to some extent the accurate diseases. This Disease Prediction Using Machine Learning is completely done with the help of Machine Learning and Python Programming language with Tkinter Interface for it and also using the dataset that is available previously by the hospitals using that we will predict the disease..

Key words COVID-19, Machine Learning, Prediction, Supervised Learning, Classification Techniques

1. INTRODUCTION

Corona viruses are a large family of viruses that are known to cause illness rang- ing from the common cold to more severe diseases such as Middle East Respiratory Syndrome(MERS) and Severe Acute Respiratory Syndrome(SARS) [6]. These two diseases are spread by the corona viruses named as MERS-CoV and SARS-CoV. SARS was first seen in 2002 in China and MERS was first seen in 2012 in Saudi Arabia [8]. The latest virus seen in Wuhan, China is called SARS-COV-2 and it causes corona virus.

A pneumonia of unknown cause detected in Wuhan, China was first reported to the World Health Organisation (WHO) Country Office in China on 31 December, 2019 [1]. Since, then the number of cases of corona virus are increasing along with high death toll. Corona virus spread from one city to whole country in just 30 days [50]. On Feb 11, it was named as COVID-19 by World Health Organisation (WHO)[5].

1.2 What is COVID-19

The Problem Corona Virus disease (COVID-19) is an infectious disease caused by a newly discovered virus, which emerged in Wuhan, China in December of 2019.

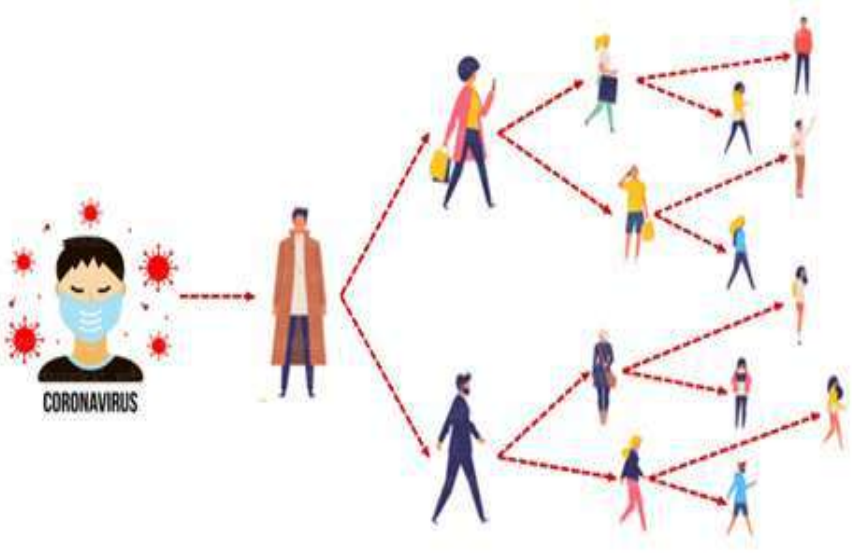

Fig. 1. Tree Diagram of Corona

Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness.

The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes, so you might have heard caution to practice respiratory etiquette (for example, by coughing into a flexed elbow). As this COVID-19 is spread from person to person, Artificial intelligence based electronic devices can play a pivotal role in preventing the spread of this virus. As the role of healthcare epidemiologists has expanded, the pervasiveness of electronic health data has expanded too [13]. The increasing availability of electronic health data presents a major opportunity in healthcare for both discoveries and practical applications to improve healthcare [48]. This data can be used for training machine learning algorithms to improve its decision-making in terms of predicting diseases Disease Prediction using Machine Learning is a system which predicts the disease based on the information provided by the user. It also predicts the disease of the patient or the user based on the information or the symptoms he/she enter into the system and provides the accurate results based on that information. If the patient is not much serious and the user just wants to know the type of disease, he/she has been through

2. LITERATURE REVIEW

Opinion mining is majorly being used for elections, advertisement, business etc. Verma et al. [8] analysed Sentiments of Indian government projects with the help of the lexicon-based dictionary. The machine learning has changed the perspective of diagnosis by giving great results to diseases like diabetes and epilepsy.

Chakraborti et al. [9] detected epilepsy using machine learning approaches, electroencephalogram (EEG) signals are used for detecting normal and epileptic conditions using artificial neural networks (ANN).

Sarwar et al. [10] diagnosis diabetes using machine learning and ensemble learning techniques result indicated that ensemble technique assured accuracy of 98.60%. These purposes can be beneficial to diagnose and predict COVID-19. Firm and exact diagnosis of COVID-19 can save millions of lives and can produce a massive amount of data on which a machine learning (ML) models can be trained. ML may provide useful input in this regard, in particular in making diagnoses based on clinical text, radiography Images etc.

According to Bullock et al. [11], Machine learning and deep learning can replace humans by giving an accurate diagnosis. The perfect diagnosis can save radiologists' time and can be cost-effective than standard tests for COVID-19. X-rays and computed tomography (CT) scans can be used for training the machine learning model. Several initiatives are underway in this regard.

Wang and Wong [12] developed COVID-Net, which is a deep convolutional neural network, which can diagnose COVID-19 from chest radiography images. Once the COVID-19 is detected in a person, the question is whether and how intensively that person will be affected. Not all COVID-19 positive patients will need rigorous attention. Being able to prognosis who will be affected more severely can help in directing assistance and planning medical resource allocation and utilization.

Yan et al. [13] used machine learning to develop a prognostic prediction algorithm to predict the mortality risk of a person that has been infected, using data from (only) 29 patients at Tongji Hospital in Wuhan,

China. Jiang et al. [14] proposed a machine learning model that can predict a person affected with COVID-19 and has the possibility to develop acute respiratory distress syndrome (ARDS). The proposed model resulted in 80% of accuracy. The samples of 53 patients were used for training their model and are restricted to two Chinese hospitals. ML can be used to diagnose COVID-19 which needs a lot of research effort but is not yet widely operational. Since less work is being done on diagnosis and predicting using text, we used machine learning and ensemble learning models to classify the clinical reports into four categories of viruses

Tom Mitchell states machine learning as "A computer program is said to learn from experience and from some tasks and some performance on, as measured by, improves with experience". Machine Learning is combination of correlations and relationships, most machine learning algorithms in existence are concerned with finding and/or exploiting relationship between datasets. Once Machine Learning Algorithms can pinpoint on certain correlations, the model can either use these relationships to predict future observations or generalize the data to reveal interesting patterns. In Machine Learning there are various types of algorithms such as Regression, Linear Regression, Logistic Regression, Naive Bayes Classifier, Bayes theorem, KNN (K-Nearest Neighbor Classifier), Decision Tress, Entropy, ID3, SVM (Support Vector Machines), K-means Algorithm, Random Forest and etc.,

Nanshan Chen et al. performed a retrospective, single-centre study of various patients data from Jinyintan Hospital in Wuhan, China. In this research they described the epidemiological data(short term) or long term exposure to virus epicenters, signs and symptoms, laboratory results, CT Findings and clinical outcomes[16]. Though this research does not directly focus on the prediction of COVID-19, it gives us a better understanding of the clinical outcomes.

Shuai Wang et al. has identified the radio-graphical changes in CT images of patients suffering from COVID-19 in China. In this research, he has used deep learning methods to extract COVID-19's graphic features through the CT scan images to develop it as a alternative diagnostic method. They have collected CT images of confirmed COVID-19 Patients along with those who were diagnosed with pneumonia. The results from their work provide the proof-of-principle for the use of AI for accurate COVID-19 prediction[47]. This research uses CT Scan images, which is different from our research as we use clinical features and laboratory results for the prediction

Dawei Wang et al. in this research has described the epidemiological, demographic, clinical, laboratory, radio-logical and treatment data from Zhongnan Hospital, Wuhan China. The data was analysed and documented to be used to track the infections[46]. The author gives better insights about the radio-logical and treatment data that could be used for our prediction of COVID-19 in our model.

3. .METHODOLOGY

Disease prediction using machine learning predicts the presence of the disease for the user based on various symptoms and the information the user gives such as sugar level, hemoglobin level and many more such general information through the symptoms. The architecture of the system disease prediction using machine learning consist of various datasets through which we will compare the symptoms of the user and predicts it, then the datasets are transformed into the smaller sets and from there it gets classified based on the classification algorithms later on the classified data is then processed into the machine learning technologies through which the data gets processed and goes in to the disease prediction model using all the inputs from the user that is mentioned above. Then after user entering the above information and overall processed data combines and compares in the prediction model of the system and finally predicts the disease. An architecture diagram is a graphical representation of a set of concepts, that are part of an architecture, including their principles, elements and components. The diagram explains about the system software in perception of overview of the system. proposed system of disease prediction using machine learning is that we have used many techniques and algorithms and

all other various tools to build a system which predicts the disease of the patient using the symptoms and by taking those symptoms we are comparing with the system's dataset that is previously available. By taking those datasets and comparing with the patient's disease we will predict the accurate percentage disease of the patient. The dataset and symptoms go to the prediction model of the system where the data is pre-processed for the future references and then the feature selection is done by the user where he will enter the various symptoms. Then the classification of those data is done with the help of various algorithms and techniques such as Decision Tree, , Naïve Bayes, Random Forest and etc

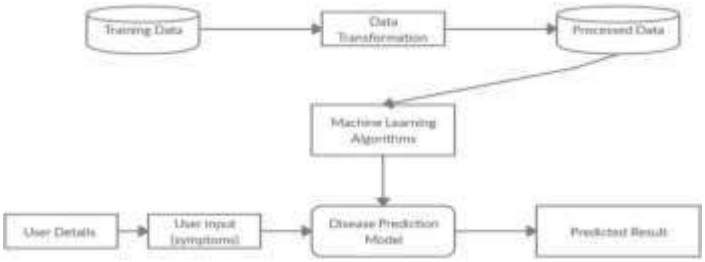

Fig 3 System Architecture

4. RESULT & DISCUSSION

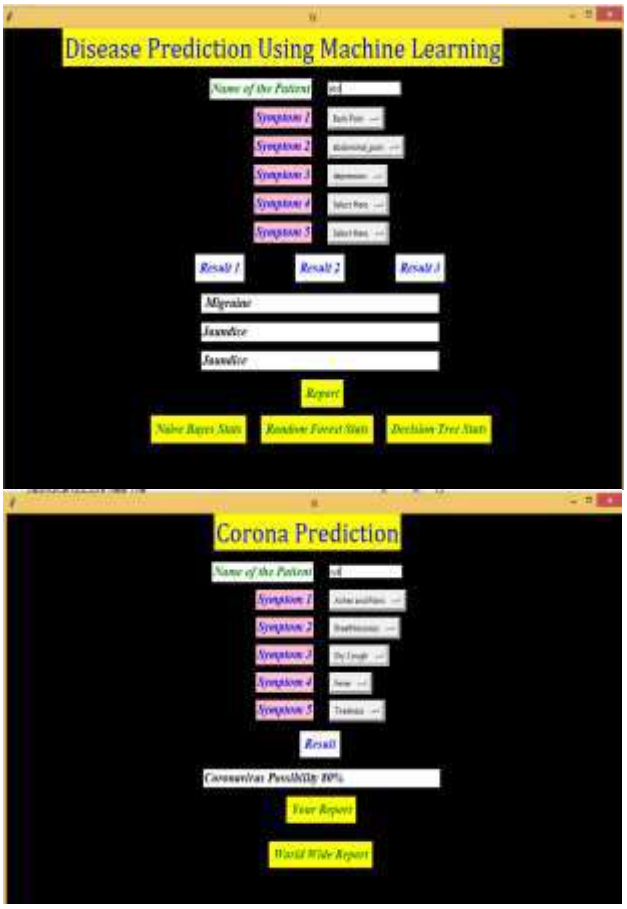

Figure3. Predicted result of All algorithm and Corona

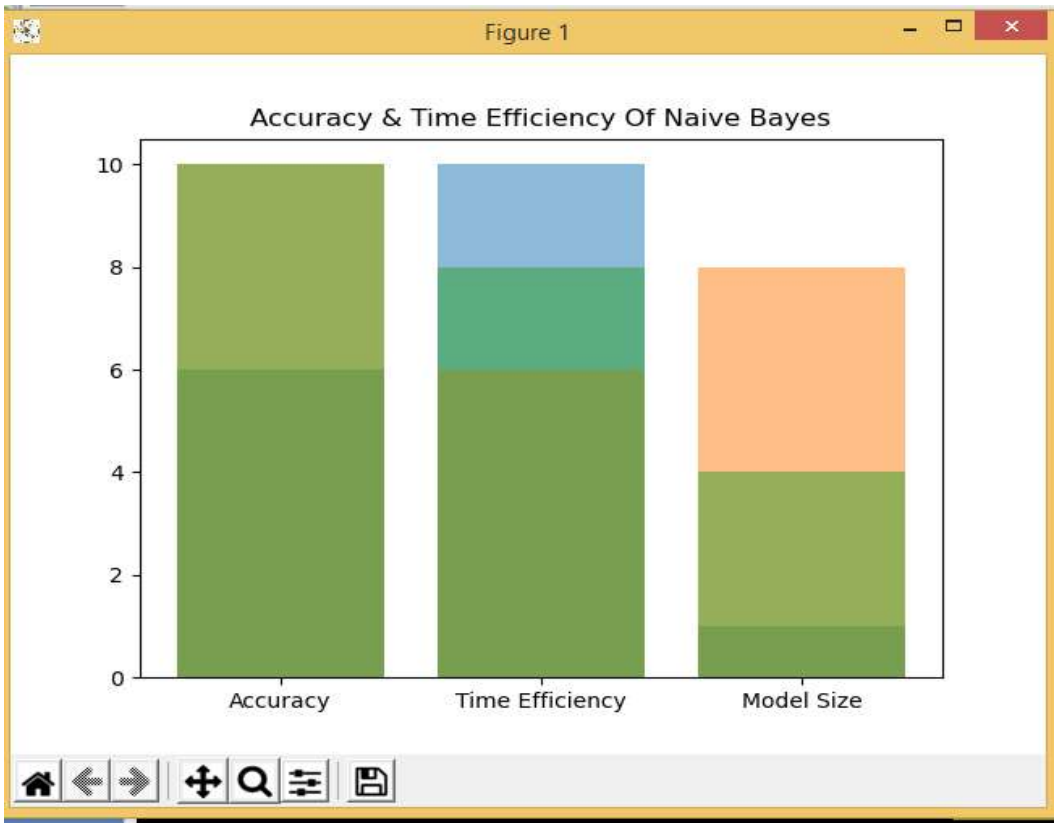

Figure 4. Barchart of Navie Bayes, Decision tree and random forest

Worldwide diagram of corona affected area

conclude by saying that, this project Disease prediction using machine learning is very much useful in everyone's day to day life and it is mainly more important for the healthcare sector, because they are the one that daily uses these systems to predict the diseases of the patients based on their general information and there symptoms that they are been through. Now a day's health industry plays major role in curing the diseases of the patients so this is also some kind of help for the health industry to tell the user and also it is useful for the user in case he/she doesn't want to go to the hospital or any other clinics, so just by entering the symptoms and all other useful information the user can get to know the disease he/she is suffering from and the health industry can also get benefit from this system by just asking the symptoms from the user and entering in the system and in just few seconds they can tell the exact and up to some extent the accurate diseases. If health industry adopts this project then the work of the doctors can be reduced and they can easily predict the disease of the patient. The Disease prediction is to provide prediction for the

various and generally occurring diseases that when unchecked and sometimes ignored can turns into fatal disease and cause lot of problem to the patient and as well as their family members.

The main motive of our report was to comparing the accuracy and analyzing the reasons behind the variation of different algorithms. By the end of the implementation part, we have found Gaussian Naive Bayes and Random Forest are giving the maximum accuracy level in our dataset which is 91.21 percent and Decision Tree is performing the lowest level of accuracy which is 84.62 percent. Probably for other instances and other datasets other algorithm may work in better way but in our case we have found this result. Moreover, if we increase the attributes, maybe we can found more accurate result but it will take more time to process and the system will be slower than now as it will be little

more complex and will be handling more data's. So considering these possible things we took a decision which is better for us to work with.

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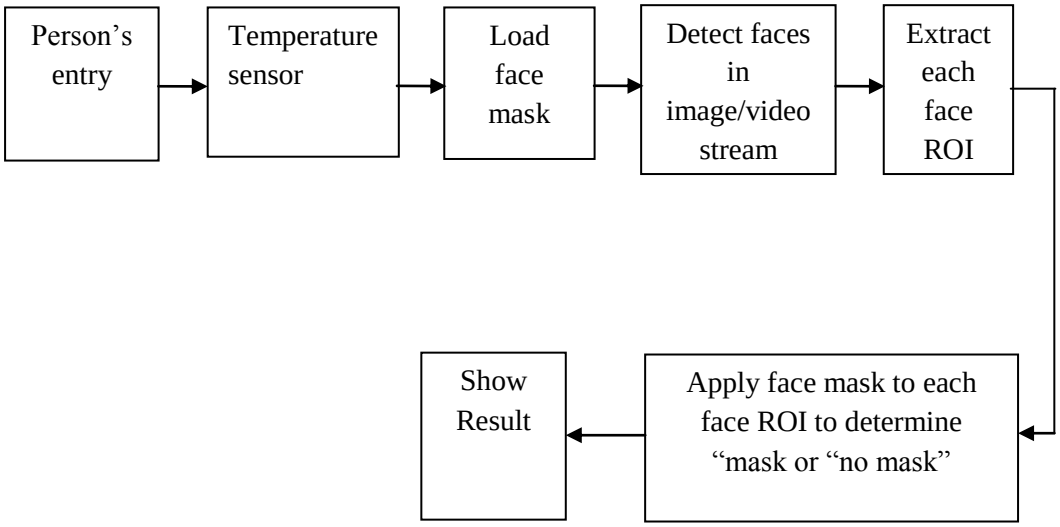

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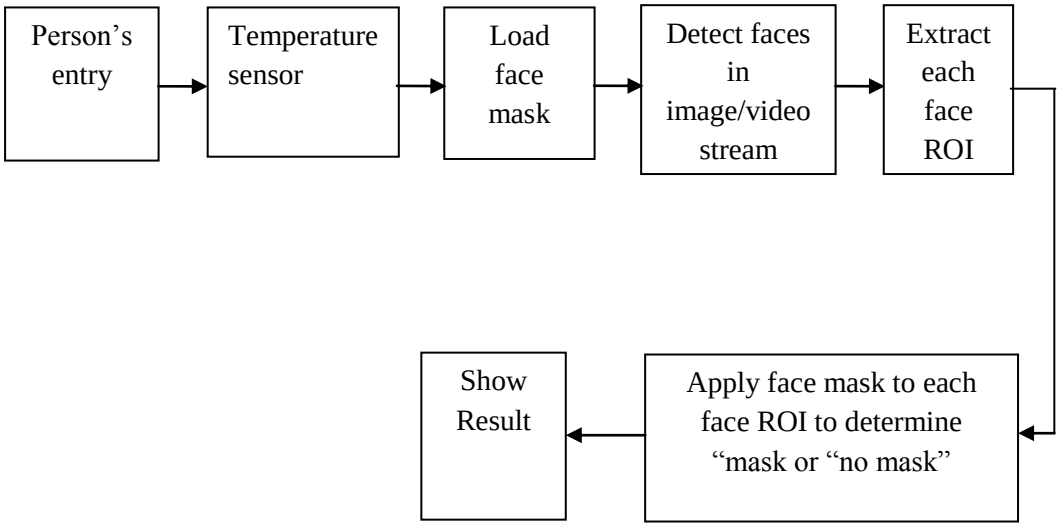

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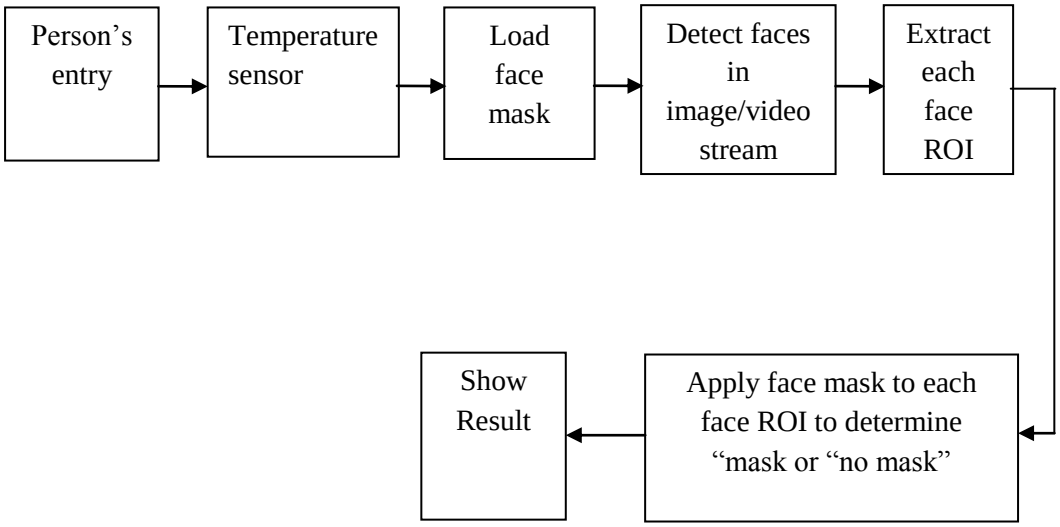

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[1]Student, [2]Associate Professor, Department of Electronics and Telecommunication Engineering, Anjuman College of Engineering & Technology, Nagpur, Maharashtra, India

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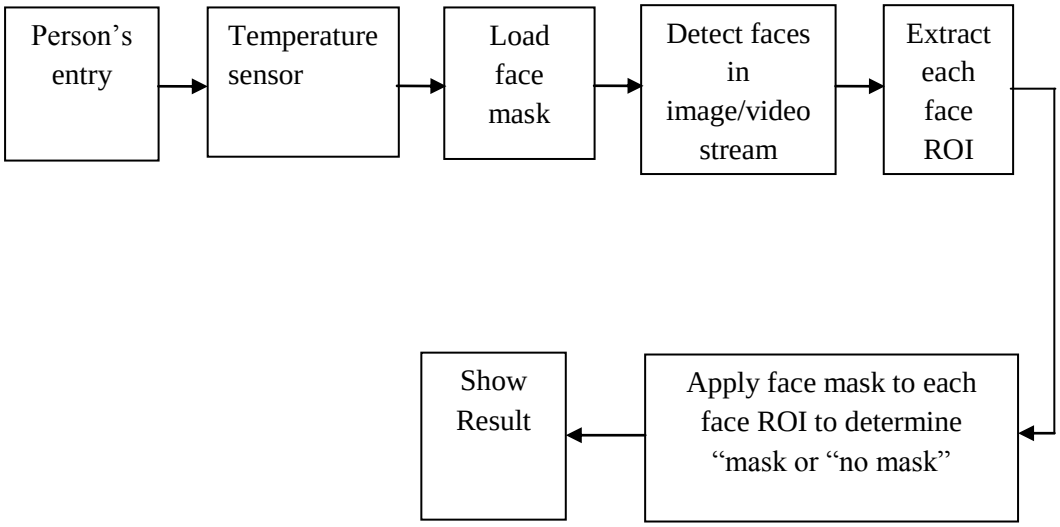

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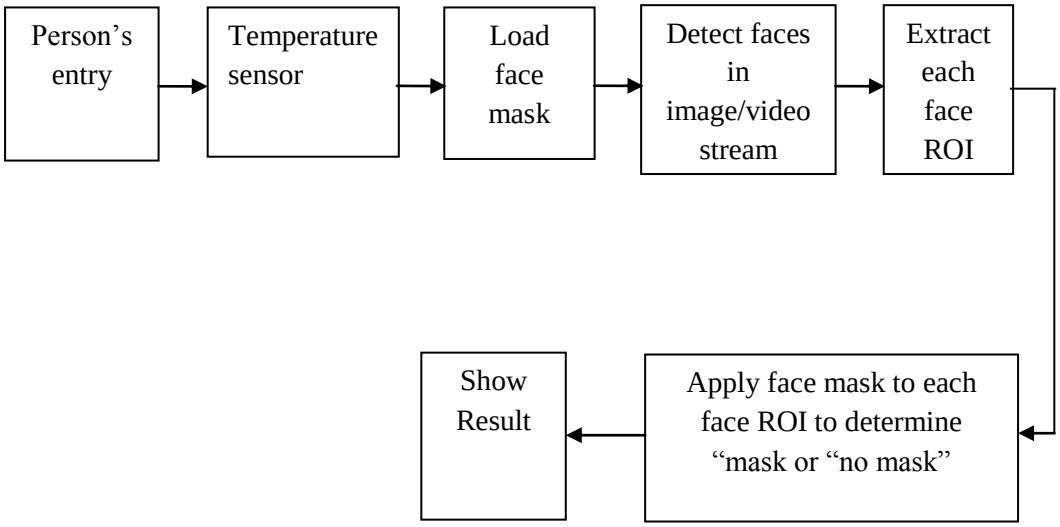

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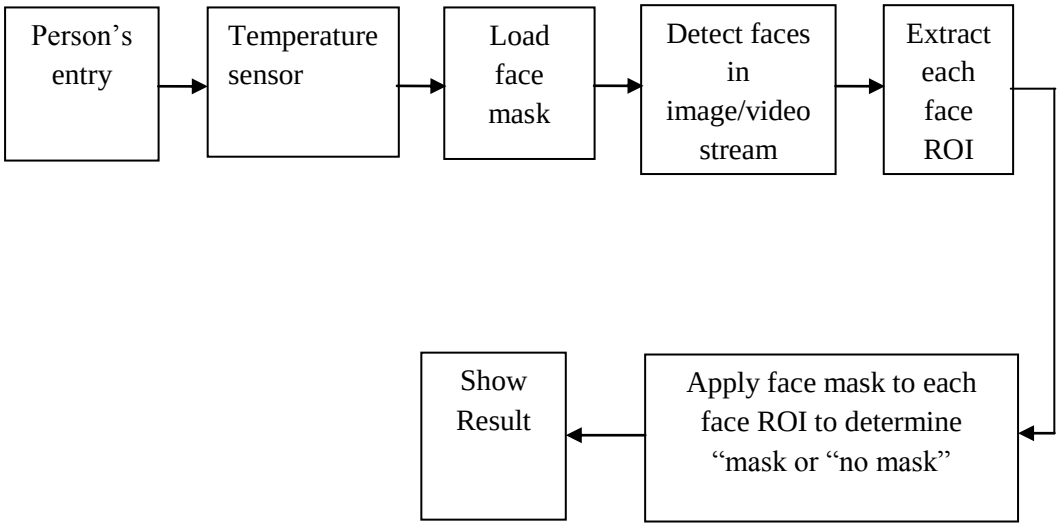

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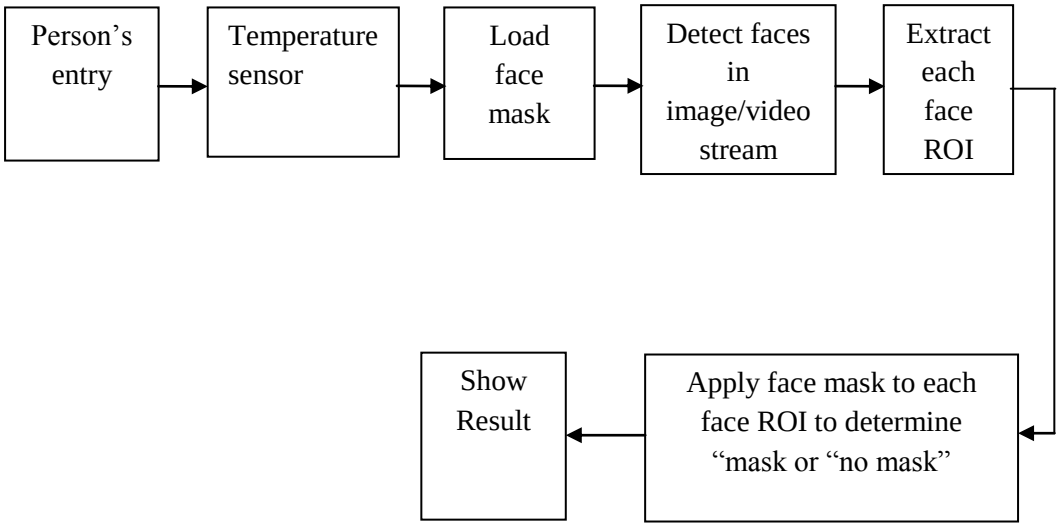

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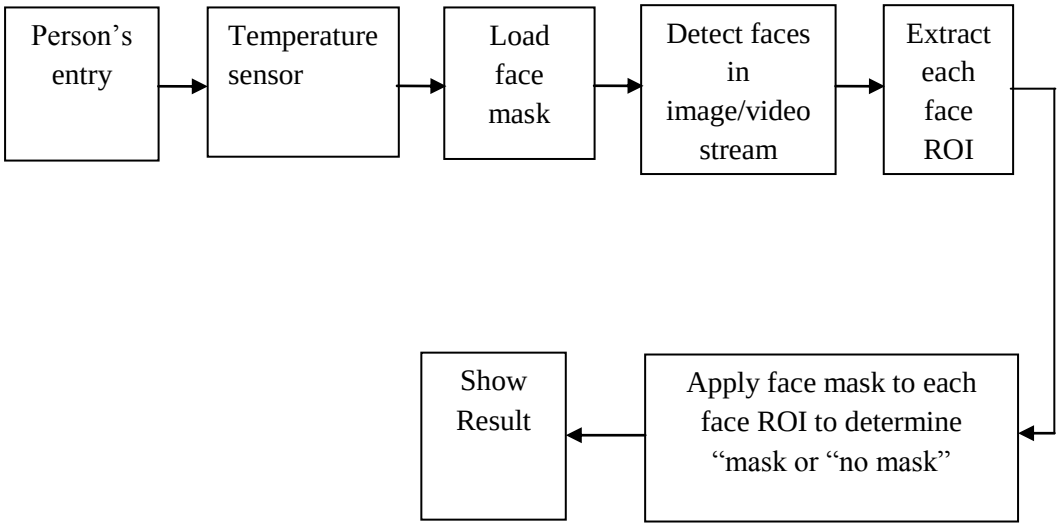

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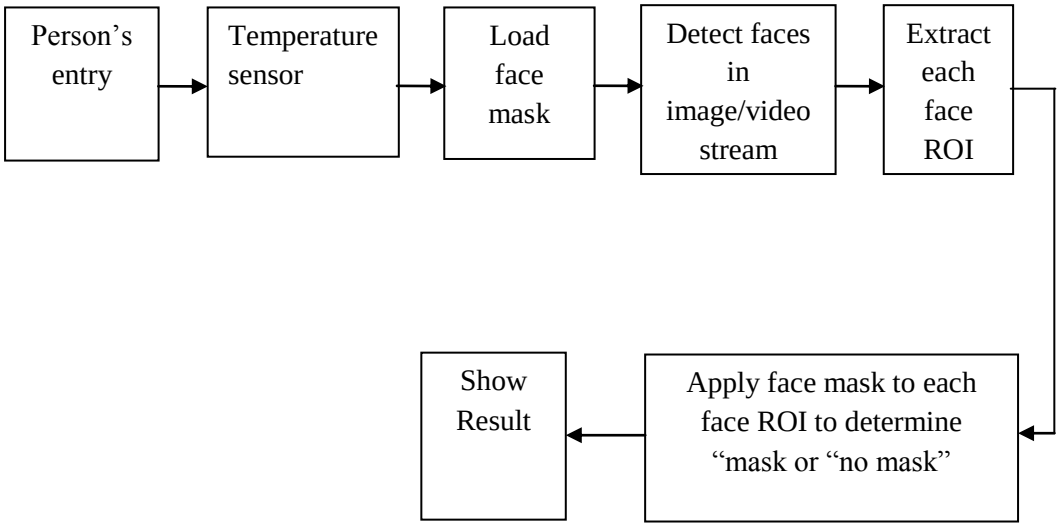

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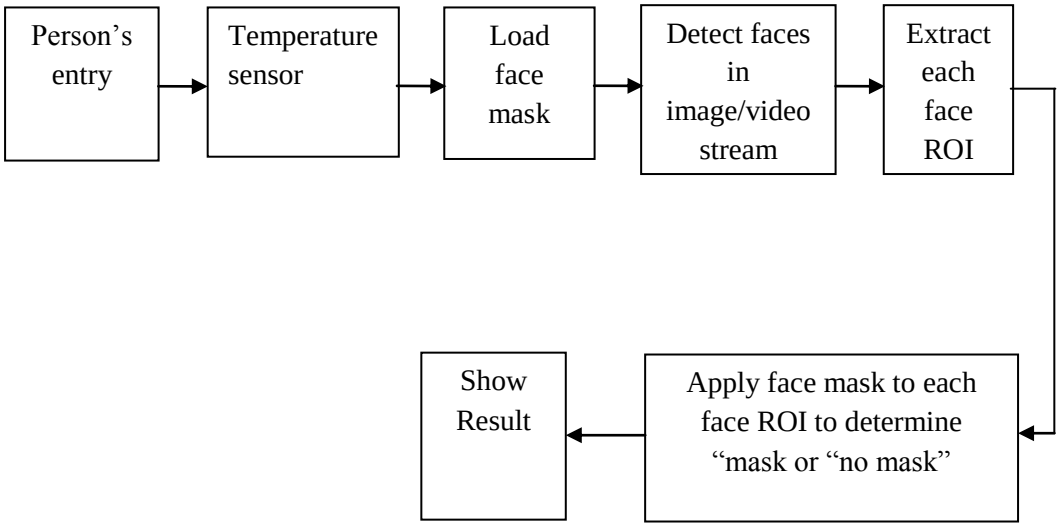

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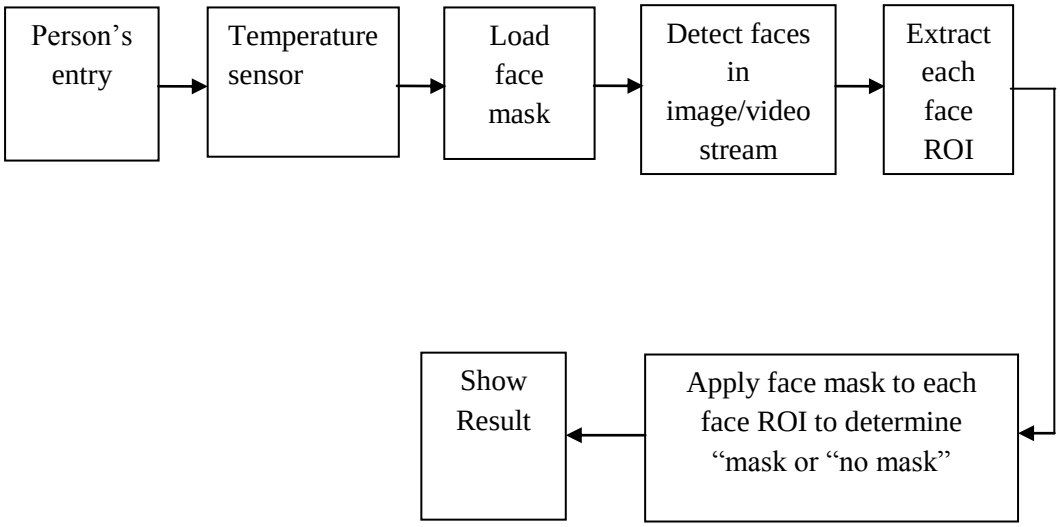

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IoT Based Temperature Monitoring and Mask Scan Entry System: A Review

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ABSTRACT

The novel coronavirus (covid19) is declared by World Health Organisation (WHO) and the global pandemic has impacted every aspect of life. It affected the industries and economy of major sectors of the whole world and the Internet of Things (IoT) devices make no exception in it. The COVID-19 outbreak has lead to a revised growth forecast for the global economy. Hence to control the spreading virus and to inhibit resurgence of infections, social and technological measures have been implemented towards virus tracing, tracking, etc. The role of IoT in existing digital healthcare infrastructure management has been discussed on how IOT can impact COVID-19 and future pandemics. It is evolving from a conventional healthcare system through which infective can be treated and monitored more easily. Since the pandemic started, there has been a rapid effort in different research communities to exploit a wide variety of technologies to fight this worldwide threat, and IoT technology is one of the explorers in this area.

Keywords-- BDN, E-Health, BloXroute, IoT, Pandemic, WHO

INTRODUCTION

IoT has been adopted in smart cities as an infrastructure key since the introduction concept of a smart city. The IoT is the interconnection between the physical object or things that are attached with sensors and software to gather and deliver information among them and primary servers with the least human meditations. IoT services can provide the remote data collection and monitoring of patients in quarantine has made it a critical aspect in fighting the spread of virus pandemics. Adaptation leading to the evolution of IoT may include modification to the way IoT devices such as mobile phones and drones collect data, changes to IoT management platforms to meet policy requirements, and innovations by researchers to IOT technology to effectively manage a virus pandemic [1].

The first step to detect covid is by scanning for fever. Also, we need to monitor every person for the mask. We have temperature checking for every entrance for scanning but manual temperature scanning has a lot of disadvantages. Any person will not be provided entry without a temperature and mask scan. The only person having both conditions is instantly allowed inside.

LITERATURE SURVEY

1. Gerhard P. Hancke, October 12, 2020, 2020, "IOT in the wake of COVID 19: A survey on contribution, challenges & evolution". Due to different IoT technological challenges, this paper proposed the development of new forms of arrangement of sensors and different IoT techniques. Hence for advanced analysis, this article has presented healthcare IOT management before and now during the survival of COVID-19 [1].
2. Rajani Singh, Ashutosh D. Dwivedi and Gautam Shrivastava, 16 July 2020, "IOT based blockchain for temperature monitoring & counterfeit pharmaceutical prevention". This paper proposed a novel blockchain-IoT-based supply chain management system to alleviate the problem of fake drugs and to monitor the cold chain for temperature-specific drugs properly. For improvement of the system, he suggested using Raft Algorithm [2].

3. M. N. Mohammed, Halim Syamsudin, Prof. Dr. Mohammed N. Abdulrazaq on 08 April 2020. **"**Novel COVID 19 detection & Diagnosis system using IOT based smart helmet". An innovative real-time early detection of coronavirus and monitoring system using a smart helmet which integrated with thermal imaging system has been developed. The smart helmet can also detect high body temperature in the crowds and send the measured data to be displayed on a phone application [3].
4. Gurlove Singh, Amit Kumar, "Face detection and recognition system using digital image processing", published in 2020. In this paper, while recognizing any individual, the most important attribute is faced. It serves as an individual identity of everyone and therefore faces recognition helps in authenticating any person's identity using his characteristics. The whole procedure for authenticating any face data is subdivided into two phases, in the first phases, the face detection is done quickly except for those cases in which the object is placed quite far, followed by this second phase is initiated in which the face is recognized as an individual [4].

BLOCK DIAGRAM

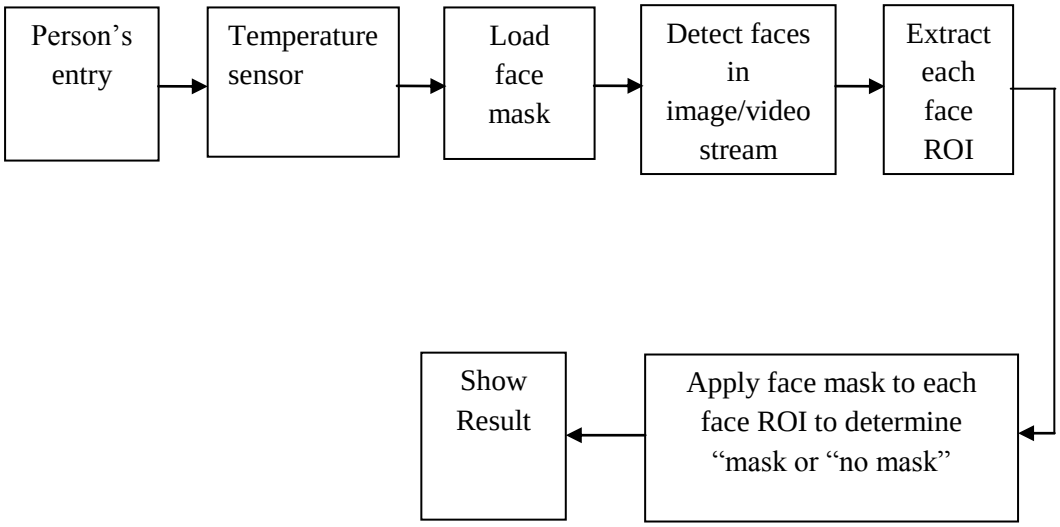

Figure 1: *IOT based temperature monitoring and mask scan entry system.*

The above Figure 1 block diagram is of "Iot Based Temperature Monitoring Mask Scan Entry System". In this block diagram, it consists of two sections first is of temperature monitoring and second is of face mask detection in this system phases and individual step for building a covid-19 face mask detector with computer vision and deep learning using python and tensor flow. If the person temperature is low then it will proceed to the next step and if the person temperature is high then the person will not goes into the next phase once the face mask detector is trained we can then move on to loading the mask detector performing the face detection and then classify each phase as with mask and without a mask. A face mask detection data set consists of with mask and without a mask, our goal is to train a custom deep learning model to detect whether the person is or is not varying a mask and person's temperature [5].

RESULT

The presented design should be checked at the beginning by the simulation to look at its achievability and confirm the steady quality of a control technique that was said over. For approving the system tentatively, the testing stage was focused on logical interims of the software to guarantee that all statements are tried and a functional interim is carried out within the tests to identify the errors [6-7]. It also keeps up that the defined input will create real outcomes that are coordinated with the required ones. Each program and models level testing has been integrated and performed. The current

innovation concerns with applicable kind of thermal imaging frameworks for detection an increase of body temperature as well as surveillance process.

CONCLUSION

In this IOT based Temperature monitoring and mask scan entry system; we detected fever and mask and displayed them on the LCD. For pandemic management, we adopted IOT along with different hardware, software, data analysis, and ethical conditions. The spreading of the coronavirus gives so much attention and awareness among people nowadays which becomes a big latest issue all over the world. One of the very common symptoms of the coronavirus is the high temperature of a person/people [1].

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Cupola Furnace: Detailed Review of Advances in the Design and Control over Melting Process

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Abstract

This paper is focused on the study of cupola furnace and the melting process of metal in it. The design and construction of the cupola furnace are one of the primary factors. The necessary design procedure, changes and various sample calculations are presented to improve the efficiency of the conventional type of cupola furnace. Many foundries are dependent on the operator's skill and knowledge to control the melting process. The melting process of metal inside the cupola is a nonlinear dynamic problem and complicated. Various input parameters of melting process affect the process output parameters. The percentage change in output parameters with percentage change in input parameters is also provided. Therefore, an automatic control over the complete process of cupola by using fuzzy algorithm and Artificial Neural Network is presented in detail.

Keywords*: - Cupola design, coke to metal ratio, cupola melting process, fuzzy algorithm, Artificial Neural Network*

INTRODUCTION

Cupola furnace is one of the significant among metal foundries as a major source for recycling and reusing the metal scrap. It is the cheapest medium to melt the metal with less fuel having the suitability for intermittent type of work. According to the requirement of foundry, cupolas are constructed in various sizes. Cupola is a hollow vertical cylindrical shell lined with refractory material. Cupola installs on the bottom cast iron plate with hole at center and sand bed used to provide on this iron plate. Cupola has many openings above

this sand bed for withdrawing the molten metal and slag. Opening requires for introducing air inside the furnace through the tuyers. The tuyers may vary in numbers from one to hundred. Another opening requires for charging the metal, coke and flux. This cupola is enclosed at the top by stack located at sufficient height for removing the flumes. Melting of one ton of metal in the cupola requires around 78 to 89 kg of coke. The whole history of the cupola furnace, its comparison with other furnace and all the improvements over the period of time in construction, design of tuyers, fuel, melting and mixing process, design and arrangement of blast pipes, blowers are presented by Kirk (1903). The basic design, various factors affecting the process, various controls, equipments, materials used in cupola melting, improvement and control of process are the factors responsible for economical and efficient cupola operation. All these factors are studied and presented by Barmingham (1979).

In this paper, the design concept of cupola furnace is provided in detail with the aim to improve the efficiency of the cupola and to provide the ease in handling melting process. This design includes concepts for deciding the height of cupola, diameter and height of tuyers, sizes of various openings provided for slag removal, molten metal tapping and metal charging, volume of combustion chamber, height and mass of metal charge, area of air blast, air flow rate, volume of air, height of cupola legs, heat losses through cupola walls, required amount of heat, and finally efficiency.

Control of melting process inside the cupola is a big challenge even today. It is difficult to maintain the desired output parameters of the molten metal like temperature, carbon percentage, melt rate as they are dependent on number of input parameters. Melting process is dynamic process which makes control of process difficult. In many Indian foundries, the melting process is manually controlled by the operator. So, the efficiency of cupola is totally dependent on the operator's knowledge and skill.

In this paper, different studies are provided to control the melting process automatically. Various input parameters which affect output parameters are studied. The most affecting parameters on particular output parameter are identified using the relative gain matrix. From these input parameters delayed and un-delayed parameters are separated to control them separately. Fuzzy logic algorithm and

Artificial Neural Network methods are used to develop the controller. Fuzzy logic algorithm used to provide the set of desired input parameters. ANN is used to continuously monitor the melting process and interpret the desired output. It will then compare the interpreted and actual output to send it to the controller.

A GENERALIZED LINE OF CUPOLA DESIGN

Cupola furnace is a tubular formed vessel lined with refractory material where the metal in the form of scrap is melted by adding the layers of coke, metal and limestone. Coke is used for the combustion process whereas the limestone used as flux to enhance the combustion. Most of the Indian foundries still use the oldest model of Cupola for producing the cast Iron due to simplicity and low fuel cost. The process of melting the cast iron inside the Cupola is quite complicated and involves many chemical and heat processes.

A Cupola is charged with the metal scrap, coal coke and limestone from the door positioned near the top of the cupola. An air is introduced through the tuyers located near the bottom generally heated and enhanced with oxygen. Once the combustion is set up, charge starts to melt and hot gases rise up. These flue gases flows upward preheating and increasing the combustion efficiency. A melted metal starts to emerge at the bottom of cupola continuously at the rate of 100 tons per hour (Larsen et al 1997).

It is difficult to control the processes inside the cupola due to complexity in relating the input variables to the output variables. The primary input parameters like blast rate, blast temperature, oxygen addition and secondary input variables like coke ratio affects the output parameter that is metal temperature. Metal charge ratio, coke ratio, blast temperature, oxygen addition input parameters affect the output parameter that is Iron constituent. One of the major output parameter that is melting rate depends on the input parameters like blast rate, coke ratio, oxygen addition. Other parameters like size of scrap metal and size of coke also affect the output parameters.

The parameters like air blast rate, blast temperature, oxygen addition are kept constant for short period of time. The coke ratio and metal charge ratio are changed according to the last charged into the top of cupola. All these changes take around one hour to disseminate the slow melting to active melting zone inside the cupola. So, over a period of time many researchers

come with the new designs of the cupola to reduce the cost and time to run the foundries more efficiently.

In Nigeria, Erythrophleum suaveolens charcoal-fired cupola constructed by including the more durable and suitable refractory brick lining, drop bottom, spark arrester, charging door and air enriched oxygen to increase the efficiency of cupola and therefore to get the cheaper and better foundries (Olorunnishola and Anjorin 2015).

A cylindrical shape vessel made up of steel lined with refractory from top to bottom of cupola divided into five zones includes stack, preheating, melting, combustion and well zone. Furnace lined with heat resistant refractory bricks of 80mm thickness. Air blast by centrifugal blower into the furnace carried out through tuyere located in the combustion zone. A centrifugal blower used for air blast and fitted 740mm away from the cupola. Molten metal and slag located in the well zone could be tapped through the tap and slag hole. A cupola with a capacity of 400 kg/hour designed to charge the material hourly. The parameters specially considered are

1. Erythrophleum Suaveolens Charcoal

Charcoal is superior source of energy compare to the coke as it burns to the maximum temperature of 2700o C. Charcoal is a porous material and susceptible to air flow. So the heat generation can be controlled by adjusting the air blast. Charcoal not only reduces the fuel but also supply the carbon in iron. Erythrophleum Suaveolens is a tree whose charcoal is free from sulfur and holds 86.16 percent fixed carbon.

2. ***Refractory lining***

The refractory elements combine the refractory bricks, binder, limestone, silicon carbide. The refractory bricks of length 0.08m, thermal conductivity 0.138 W/m K and melting temperature 1870o C are used. Binder with length 0.005m and thermal conductivity 0.48 W/m K is used. Silicon carbide and limestone with thermal conductivity 0.138 W/m K 0.138 W/m K are used. Metal shell with thermal conductivity 45 W/m K constructed for length of 0.03m. Insulation material constituted of refractory clay and brown clay. Fire clay is used instead the china clay because even if the china clay is an excellent refractory material it has very little plasticity compare to the fire clay.

3. ***Melting and tapping temperatures***

The measurement of melting temperature and tapping temperatures can be recorded by K-type thermometer and digital multimeter. The recorded melting and tapping temperatures are ranged as 1600-1670 and 769-1074 depending on the oxygen addition.

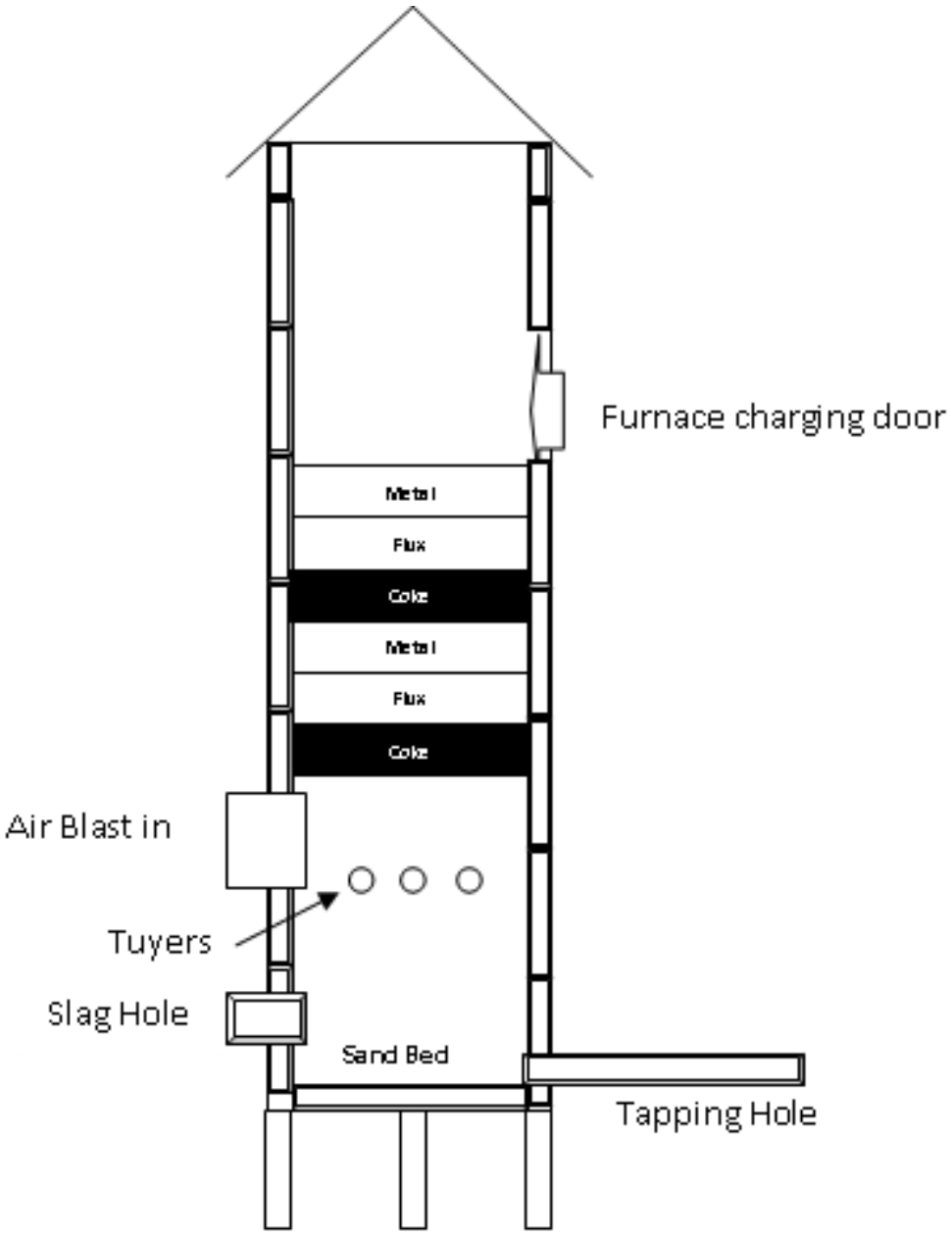

Fig. 1 View of cupola

The design of cupola carried in following steps,

1. Initially the diameter of cupola (d) and ratio of metal to coke are assumed.

2. Then the effective height of cupola (h) that is the vertical distance measured between the bottom layers of tuyers to the charging door decided. The effective height of cupola is recommended as 4d to 6d while it is 5d for small cupola.

$$h = 4d \text{ to } 6d \quad (1)$$

So, tuyer diameter (d_t) decided on the basis of cupola diameter. Four tuyers in each row are recommended for 250- 700 mm diameter of cupola. The total cross sectional area occupied by the tuyers has range of 1/6 to 1/4 of the cupola diameter.

$$a_t = (\frac{1}{6} to \frac{1}{4}) \times a_c \quad (2)$$

$$a_t - Total\ area\ of\ tuyeres$$
$$a_c = Area\ of\ cupola$$

$$\text{Area of Individual tuyer} = \frac{a_t}{4} \quad (3)$$

$$Diameter\ of\ tuyer\ d_t = \sqrt{\frac{4}{\pi} \times \frac{a_t}{4}} \quad (4)$$

$$\text{And diameter of pipe } d_p = \sqrt{\frac{4}{\pi} \times \frac{a_t}{No.\ of\ tuyer}} \quad (5)$$

3. Slag notch height

$$(h_s) = 0.7 \text{ to } 1.1\ d \quad (6)$$

4. Volume of furnace available

$$Volume\ furnace\ available = h \times a_c \quad (7)$$

5. As per recommended, Size of Iron notch should be 15 mm in diameter for loading up to 5tons/hour.

6. Size of slag notch is recommended as 30-50 mm in diameter for loading up to 5tons/hour. So for small cupola having loading of 360kg/hour, slag notch should have diameter 30mm.

7. Tuyer Height

$$Tuyer\ Height\ = \quad (8)$$
$$Height\ of\ sand\ bottom\ (50.8mm)\ +\ height\ of\ slag\ hole\ +127\ mm$$

8. Height of cupola leg (Minimum)

$$L_{cu\_Leg} = Door\ length + height\ of\ sand\ bottom + constant \quad (9)$$

Constant=152.4mm

This height of cupola leg can be increased as per the requirement.

9. Height of bed (h_b)

To calculate the maximum height

$$h_b = minimum\ height + constant \quad (10)$$

$$Minimum\ height = 52.917\sqrt{\frac{p_{blast}}{1.73}} \quad (11)$$

p_{blast}=*blast pressure*

10. Weight of metal charge

Ratio of metal to coke initially assumed usually it is 6:1

$$\text{Weight of coke (fuel) } W_{fuel} \text{in Kg} = 55.29\ a_c \quad (12)$$

a_c=Area of cupola

And therefore the metal charge could be calculated proportional to the weight of coke.

11. Mass of metal charge

$$m_{metal\ charge}(Kg/hour) = \rho_{iron} \times available\ volume\ of\ furnace \quad (13)$$

$Iron\ density = \rho_{iron} = 7600 \frac{Kg}{m^3}$ and

Effective height of charged well,

$$h_w = V_{charged\_well}\, a_c \tag{14}$$

Volume of charged well,

$$V_{charged\_well} = (h_s \times a_c) \tag{15}$$

Area of air blast circulation

It is recommended that the area of air blast circulation range is 1.3 to 1.6 of area of tuyer.

$$a_{blast\_circulation} = 1.3\ to\ 1.6\ a_t \tag{16}$$

12. Air flow rate

If the stack gases contains 13% CO, 13.2% CO2 and 73.8% Nitrogen with incomplete combustion then it represents the best cupola process.

$$\text{Approximately, } charcoal \xrightarrow{holds} 90\%\ carbon \tag{17}$$

$$C\ (0.454\ kg) + air\ (3.1998\ \text{m}^3) \rightarrow \text{ratio of } 13\%\ \text{CO2} - 13.2\%\ \text{CO} \tag{18}$$

$$Q_c = 0.454\ kg, \qquad Q_a = 3.1998\ \text{m}^3$$

The CO burn to CO2 with large flame as it discharges from the stack. The amount of air to burn the 1Kg of metal per hour can be found as

$$Q_{charcoal} = \frac{Q_{charcoal}}{Q_{metal}} \times \frac{Q_{carbon}}{Q_{charcoal}} \times m_{metal\ charge} \times 1\ hour \tag{19}$$

$$\frac{Q_c}{Q_a} \times Q_{charcoal} = Air\ flow\ rate\ in\ \frac{m^3}{min} \tag{20}$$

Whereas, $Ratio\ of\ charcoal\ to\ metal\ charge = \frac{Q_{charcoal}}{Q_{metal}}$

$$Ratio\ of\ carbon\ to\ charcoal = \frac{Q_{carbon}}{Q_{charcoal}}$$

13. Volume of air supplied

The manometer recording of the air pressure measurement helps to determine the velocity and volume of air flow.

$$The\ velocity\ of\ airflow\ in\ m/min \quad \vartheta_{airflow} = 7658\sqrt{H_{mano}} \tag{21}$$

$$H_{mano} = Manometric\ head\ in\ meters\ of\ water.$$

$$V_{airflow} = a_{airflow} \times \vartheta_{airflow} \tag{22}$$

$$a_{airflow}(m^3/s) = 3.325\left(\frac{d_p^2}{2}\right) \tag{23}$$

14. Blower selection

The centrifugal blowers are preferred over the axial blower for cupola. The recommended blower size can be found as

$$S = 111 \times a_c\ in\ m^3/min \tag{24}$$

15. Oxygen Enrichment

Addition of oxygen increases the melting rate with reduction in coke utilization and also reduces the sulfur content. The maximum output of cupola can be increased more up to 25% with the addition of oxygen.

Oxygen volume flow rate $V_{oxygen}(m^3/\text{min}) = S \times \%\ of\ oxygen\ addition$ (25)

16 For reduction in oxygen,

New reduced air blast rate $(\text{m}^3/\text{min}) = \text{S} - (\text{S} - \%\ \text{of reduction in oxygen})$ (26)

17. Heat transfer through cupola furnace wall

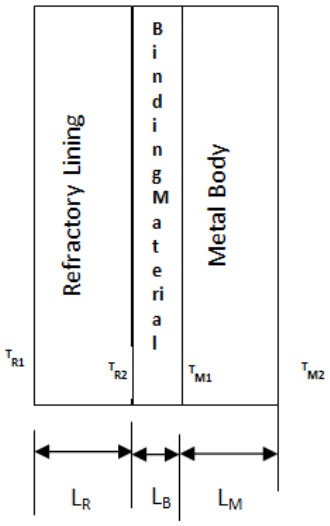

Fig. 2 Heat conduction through cupola wall

(27)

$$\text{Heat transfer } Q(W/m^2) = \frac{T_{R1} - T_{M2}}{\frac{L_R}{k_R} - \frac{L_B}{k_B} - \frac{L_M}{k_M}}$$

Whereas, k = thermal conductivity

17. Required melting heat

$$Q_{melting} = h_{specific\ heat\ of\ iron} \times (T_{R1} - T_{M2}) \times m_{metal\_charge} \quad (28)$$

18. Cupola efficiency

$$\eta = \frac{Q_{melting} - Calorific\ value\ of\ coke}{Q_{melting}} \quad (29)$$

In addition to all these design parameters, the fuel analysis is equally important to predict the actual efficiency of the cupola. This design of cupola proved to be more economical, reliable, and having simplicity in operations with maximum efficiency.

Lipnitsky [1] and Chastain [2] adopted the theory for design and construction of cupola laid down the basis for further designs. Offor et al [3] formalized theory for finding the efficiency of cupola. Anjorin et al. (2016) tested the cupola for the performance by charging the cast metal, scrap with limestone and blended Okaba coal and Erythrophleum suaveolens charcoal. Cupola operated at 1.02 bar pressure and recorded fuel to metal ratio as 1:5.58 and rate of melting as 283.04 Kg/hr. For 1.03 bar pressure, the fuel to metal ratio is 1:5.56 anticipated with melting rate as 280.63 Kg/hr. The efficiency of the cupola achieved up to 83.3% with the use of blended coal and Erythrophleum suaveolens charcoal. Ugwu and Ogbonnaya (2013) focused on the design of cupola to modify and reconstruct it for efficient and easy operation of cupola.

CONTROL OVER THE MELTING

Melting process inside the cupola is not dependent on one or two variable but depends on many variables. Also each output parameter is related to multiple input parameters. An operator utilizes his experience to control the input parameters to attain the desired output like melting rate, melt temperature, metal composition etc. There is a need to control melting process automatically to eliminate the dependency on an operator and increase the efficiency up to the maximum level. Specially, during the shutdown of casting unit, the material consumption and time can be reduced by evading the formation of transition iron which is not exploitable.

A finite difference numerical model generated by American Foundry men's society for the cupola melting process considering all the combustion reaction, material, charge parameters, and heat transfer rate including the various input parameters. This model is one dimensional nonlinear dynamic system and proved to be very helpful in assessing the change in various parameters as verified with experimental data (Larsen et al.1997).

Neurons and processing elements constitute the Artificial Neural Network which sum up the inputs and apply the interpolation function to generate the single output. ANN developed to interpret the output of the numerical model of cupola process by analyzing the

continuous data of melting process in terms of input and output parameters. An algorithm is developed to set the ANN which can take much iteration.

The developed set for ANN is made by changing the various inputs over the entire range of operating set of parameters. So the ANN is basically an interpolation of data which can work pretty correctly only within the specified range of operating input parameters specified in the developed sets.

An Algorithm to control the Cupola melting process consists of two levels of controller. At first level, a system is controlled. While at second level, process is controlled. So system control level takes the input from the operator of whole process and these inputs are iron temperature and its composition. Then system controller decides all the inputs (set parameters) required for the optimized and economic melting process such as iron composition, iron temperature, melt rate, metal to coke ratio and blast rate . All these set parameters are decided by using Fuzzy logic algorithm which depends on the information of availability of raw material and proficiency of process operator. Once these set parameters in optimized way decided are given to the process controller.

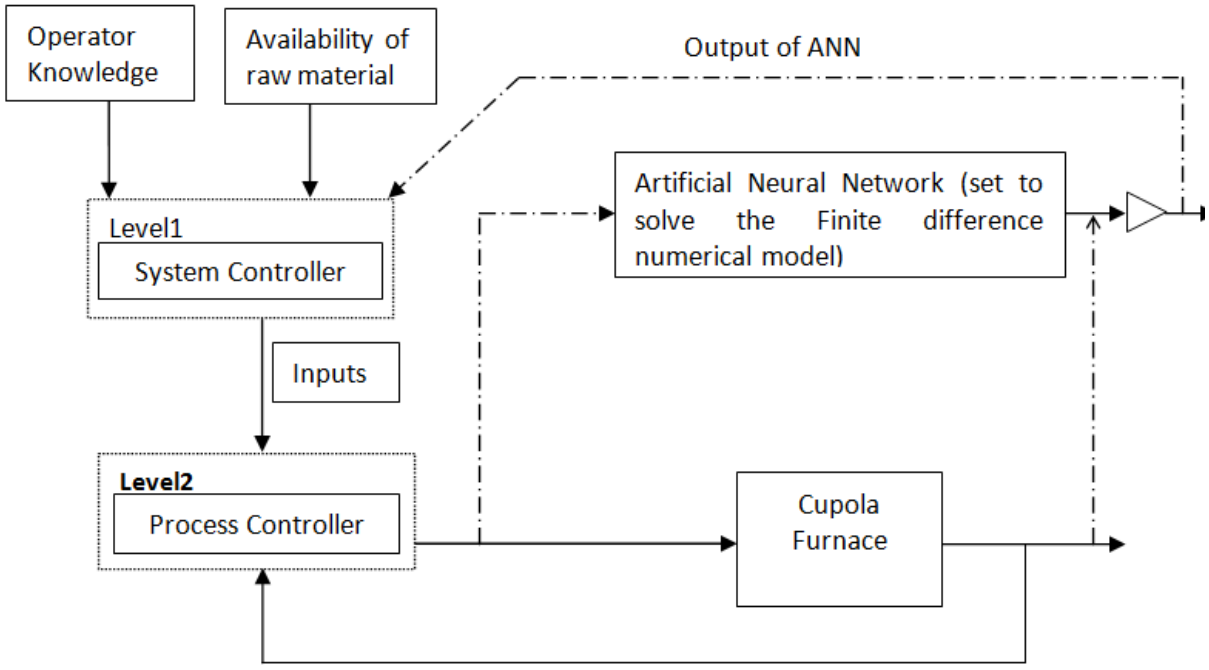

Fig. 1 line diagram of Automatic control over the cupola

The process controller basically uses the feedback of melting process outputs to adjust the input set parameters so that the desired output can be achieved. Process controller uses feedback of multiple parameters of process output including time delays, attainment of set parameters and also improving the process efficiency. Artificial Neural Networks continuously throughout the process learn changing conditions of melting process, output parameters and input parameters. So the ANN provides the feedback to system controller and process controller to respond according to changes in all parameters of melting process.

Abdelrahman and Moore (1997) designed the robust controller to handle the delayed changes in the melting process separately. H infinity control and smith predicator are combined to design the robust controller. Though there are number of process input and output parameters but for simplification of the model only four input and three output process parameters are decided to design the controller. A percentage change in values of coke to metal ratio, oxygen addition, blast rate and blast temperature changes the values of percentage of carbon content, iron temperature and melt rate by some percentage. Controller design involves the establishment of relation between these changes of output process parameters with respect to the input parameters. So these relations between input and output process parameters are written in the form of matrix (30).

A relative gain matrix is a tool helps to establish the relation between multi input and output parameters. It identifies best pairs of input and output parameters by clarifying the more affecting input parameter on the specific output parameter. The relative gain matrix found as

$$\begin{bmatrix} \delta BR \\ \delta CMR \\ \delta BT \\ \delta O_2 \end{bmatrix} \begin{bmatrix} 0 & 0.515 & 0.044 & 0 \\ 0.026 & 0.289 & 0.05 & 0.804 \\ 1.5 & -1.303 & 0.071 & 4.78 \end{bmatrix} = \begin{bmatrix} \delta\%C \\ \delta IT \\ \delta MR \end{bmatrix} \quad (30)$$

δ – Percentage change

So the above matrix is

$$[Input][P] = [Output] \quad (31)$$

$$[G] = [P] \times [P^{-1}]^T \tag{32}$$

$$\begin{bmatrix} \delta BR \\ \delta CMR \\ \delta O_2 \end{bmatrix} \begin{bmatrix} 0 & 0.515 & 0 \\ 0.026 & 0.289 & 0.804 \\ 1.5 & -1.303 & 4.78 \end{bmatrix} = \begin{bmatrix} \delta \%C \\ \delta IT \\ \delta MR \end{bmatrix} \tag{33}$$

For the different input output set, the gain matrix calculated for first set of output parameters are carbon percentage, melt rate, iron temperature and input parameters are coke to metal ratio, oxygen addition and blast rate.

On finding the relative gain matrix, it is found that the coke to metal ratio (CMR) with %C, iron temperature with oxygen addition (02), and Blast rate (BR) with Melt rate (MR) should be paired. Similarly other pairs of input and output pairs also evaluated. Based on this blast temperature (BT) forms best pair with %C. the melting process inside the cupola is a dynamic process and all the parameters changes with time. So to accompany time to time changes in the process, dynamic model is designed by considering the time delay and other time constants. These time constants and time delay are decided with the help of foundry operator by conducting experiments in step response. The dynamic model helps to decide the delayed and un-delayed inputs. Coke to metal ratio is the only delayed process parameter and others are un-delayed. The carbon percentage gets affected only with the change in Coke to metal ratio. Therefore, a controller designed to separate the delayed and un-delayed parameters. The controller contains mainly feed forward controller, metal coke ratio with oxygen and blast temperature controller.

Feed forward controller designed to separate the delayed and un-delayed parameters. Coke metal ratio contains the unsure long time delay while oxygen and blast temperature parameters have no time delays. So, feed forward controller applied to the dynamic model of melting process equations to remove the effect of metal coke ratio on the oxygen addition and blast rate.

Coke metal ratio controller is designed by combining the H-infinity and Smith predicator. To design the controller an equation set includes the nominal transfer function and actual transfer function.

Nominal transfer function contains the set value of nominal time delay which will be the greater than the actual time delay added in actual transfer function. A set of equations are defined to include all type of transfer functions which should satisfy all the higher delimited improbability of all process parameters and delays. An expected output is designed by considering the disturbing elimination properties, tracking error, controlling power and its frequency characteristics. Then weighting transfer functions are used to contain the robustness and performance attributes. A generalized form of process is elaborated by using these weighting functions. If the designed H-infinity controller does not match the interpreted performance then set parameters relaxed to some lower limit and again the all steps are repeated. Metal coke ratio controller overcomes the 10% of improbability in process parameters and time delay. To match the interpreted performance, weighting function to track the error for enduring constant reference is developed. This controller is developed in MATLAB by using the robust control tool which is capable of solving nonlinear dynamic problems. An optimization procedure using linear quadratic regulator (LQR) is adopted to develop the controller for handling the un-delayed parameters like oxygen addition and blast rate.

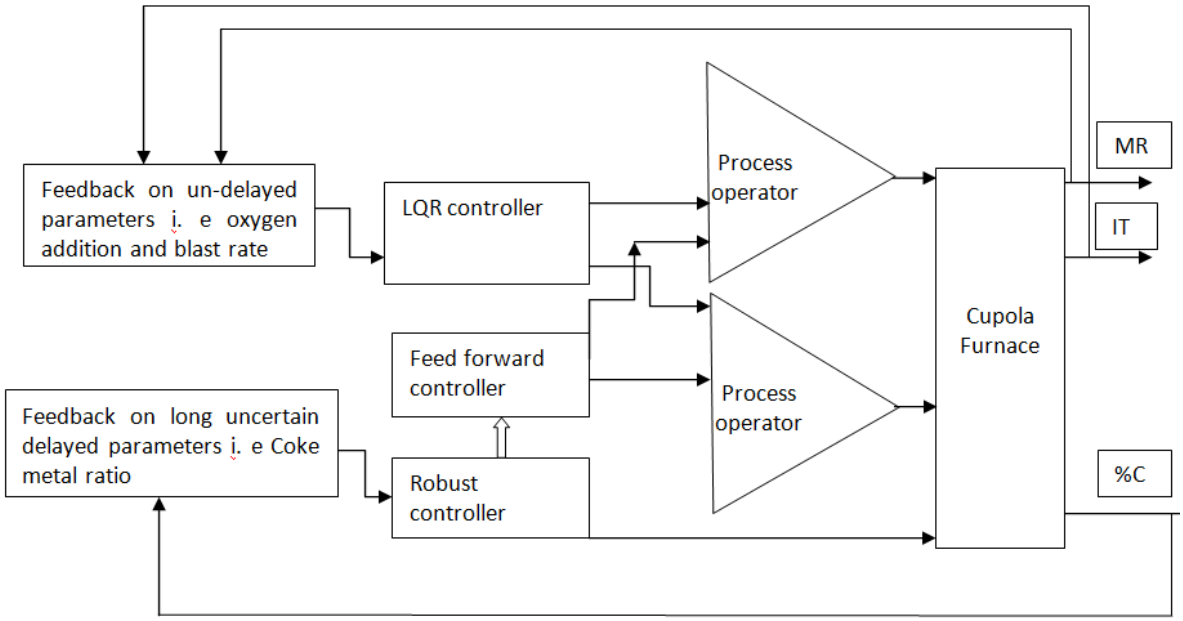

Fig. 4 line diagram of controller of cupola

A fuzzy controller designed to change oxygen addition for making change in iron temperature. The input to the controller is a change in the values of melt temperature and rate of change. So according to the input, a controller output is change in value of addition of oxygen. This value is passed to integrator which stores this value to check the feasibility before giving the output by controller. Integrator contains maximum to minimum value of oxygen addition which is applicable to cupola. If the change in value suggested is not in range then integrator assigns the zero. The output of controller that is change in temperature should be congregated within the 5 minutes. Similarly fuzzy controllers are developed to control melt rate by suggesting the changes in blast rate and coke to metal ratio.

Ristiana et al. used the fuzzy controller to maintain the desired iron melt parameters by keeping the change in pressure values. In this controller, there is no need of mathematical model of the melt process. The design is simple and based on the knowledge of operator with iron melt pressure measurement. Controller output used to control the melt and solenoid valve used to control the air flow. Three inputs given to the fuzzy controller are variation in desired melt temperature, the difference between current temperature difference and previous temperature difference and third input is pressure measured. This designed controller fulfilled the optimum melting properties with air control valve.

CONCLUSION

This paper presented a detailed review of advancement in basic design of cupola to enhance its efficiency and aid in simplicity of handling the melting process. Many researchers suggested and tested the cupola for various changes in the basic design of the cupola. The key issues were refractory material used for lining the cupola, height of cupola, ratio of metal to coke, type of fuel, type of flux, air blast, type of blower for air flow, form and size of metal to melt, heat losses, effect on air pollution.

One of the peculiar problem in case of cupola is to control the melting process, so that to get the economical and efficient melting of metal. Melting process can be controlled automatically by using Fuzzy logic and ANN. These two techniques can be effectively applied to develop the controller to monitor the process continuously and according change the input parameters to get the desired output. A detailed overview is presented for both the techniques so that the process can be

controlled by automatically and at the same time help to remove the complete dependence over the operator.

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A critical review in the design and optimization of thermo acoustic refrigeration system

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ABSTRACT

Thermo acoustic refrigeration is the process which involves the attainment of low temperature with the help of sound waves. The technology does not utilize any moving parts or use any refrigerant which has always been a cause of concern for the environment. The system does not use refrigerants like Hydrochlorofluorocarbons (HCFCs), Chlorofluorocarbons (CFCs), which are toxic chemicals and result in the depletion of the ozone layer but uses inert gases like Helium, Argon, etc. or air at 1 atm instead. The paper discusses the review of the investigation in thermo acoustic refrigeration. The thermo acoustic refrigerator is a device that converts sound acoustic power into heat energy using the thermo acoustic effect. The basic concepts of the thermo acoustic refrigeration system are explained and the analysis of thermo acoustic refrigeration, with reference to various investigations into thermo acoustic refrigeration system, and associated parameters, has been reviewed.

Selection and peer-review under responsibility of the scientific committee of the Emerging Trends in Materials Science, Technology and Engineering.

1. Introduction

Over the years refrigeration technology has been evolving very fast. Refrigeration and air conditioning systems have almost now been an integral part of every scientific domain. Even though conventional refrigeration systems make use of refrigerant vapor compression systems which are able to attain any requisite temperature. To attain these properties, various refrigerants are utilized in different proportions. Depending on these refrigerants, the refrigerant not only shows a particular set of characteristics but is also responsible for global warming and ozone depletion. From the time when the undesirable effects of these refrigerants came into being, the area of refrigeration and air conditioning has been shifting away from conventional refrigerants and is continuously in search for an alternative refrigeration technology. Thermo acoustic refrigeration is an alternative refrigeration technology that can provide cooling and low temperature attainment without using any other environmentally hazard substance.

Thermo acoustic refrigeration is becoming popular refrigeration technology. Loudspeakers convert electrical power into acoustic power. Fig. 1 shows schematic arrangement of thermo acoustic refrigerator (TAR). This technology uses sound wave to pump heat across a temperature gradient. It is relatively easy, as compared to conventional vapor compression refrigeration system (VCRS) to implement as well as inexpensive, as there are no moving parts, the system can be much more extensive and may have robust operational lifetime. Sound is a pressure wave that converts kinetic energy from one air parcel into the next using compression and expansion of the medium through which it is travelling.

A thermo acoustic device uses a medium (gas/air) to achieve the work within the stack. A stack is a section which is inserted inside the resonator tube, at the ends of which; heat exchangers are incorporated one for cold temperature and the other used for hot temperature. The ends of the stacks are separated through plates whose spatial gap decides region of heat flux caused through the fluid. The working fluid goes through expansion and compression since it propagates along these channels due to the passing of acoustic waves. At a particular wavelength and frequency of acoustic wave, cold temperature zone is created at one end of the stack and hot temperature zone is created at the other end of the stack which is utilized for the refrigeration process. Advantages of TAR include ease of construction, steady-operation, and less harmful to environment, which has led to interest in the field of research in thermo acoustic refrigeration.

At present, thermo acoustic refrigeration is not commercially available and highly developed as compared to VCRS. Various stack combinations, stack position with different gas mixtures, and var-

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Nomenclature

Cp	Isobaric specific heat [J/KgK]
Dk	Thermal Penetration depth [m]
Gu	Normalize velocity function
Kx	Wavefactor
Q_c	Cooling Power [W]
K	Thermal conductivity of the material [W/mK]
ρ	Density, [kgm^{-3}]
Φ	Leading phase
Cs	Specific heat of stack material [J/KgK]
Gz	Normalize impedance function
Gp	Normalize pressure function
Kg	Thermal conductivity of gas [W/mK]

Acronyms

TAR	Thermo acoustic refrigerator
TARS	Thermo acoustic refrigeration system
COP	Coefficient of Performance
VCRS	Vapor Compression Refrigeration System
TAHE	Thermo acoustic heat engine
CFC	Chlorofluorocarbon
HCFC	Hydrochlorofluorocarbon

ious application areas are still being researched for development of thermo acoustic refrigeration systems such as refrigeration appliances, development of very low temperatures, automobile cooling units, biomedical, etc. Hence thermo acoustic refrigeration still has a large scope for research. The idea of using acoustic waves for cooling gained interest in the late 1960s. Even though the principle of this refrigeration technique is simple, analysis of the phenomenon and equations that describe it are complex. More than a century before thermo acoustic phenomenon was revealed by Swift [1] however, only some decades ago important development in the field were started at the Los Alamos National Laboratory (Los Alamos National Laboratory is the only laboratory in Los Alamos, N. Mex., USA where specific work towards the design of nuclear weapons has been undertaken besides the Lawrence Livermore National Laboratory), where various types of thermo acoustic heat engine, refrigerator was developed. Thermo acoustic refrigeration can find application in various specific areas where the magnitude of sound generation is high, this sound generated can be suitably used or modified for refrigeration purposes.

2. Improvement in stack and resonator tube for TAR

A long hollow tube which is opened at one end and closed at the other end is called as resonance tube or resonator, while a solid porous material is called stack. Tijani *et al* [2] Analyzed the outcome of geometry of plate, and the plate spacing in the stack on the performance of the device, also attempted to optimize the stack spacing and advised maximum pressure of 12 bars. Earlier, it was assumed that a refrigerator could sustain about 1.5 bars only. In order to attain and maintain higher pressure and to obtain higher COP, many parameters associated with TARS like materials used, different array for the stack, etc. would have to be altered.

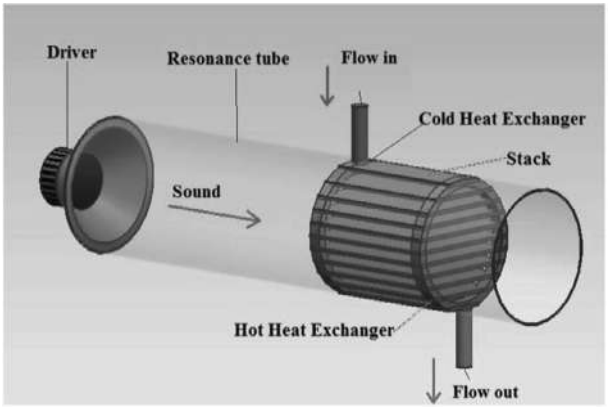

Fig. 1. Schematic arrangement of TAR.

The COP of the TARS calculated by means of temperature gradient along the stack, by two different spacing i.e. 0.4 mm and 0.8 mm by Hariharan *et al* [3]. Fig. 2 shows the variation of hot end temperature with time for different stack material sheet of different stack spacing.

Fig. 3 shows the temperature difference between the hot end and cold end versus time for different stack with different spacing.

The outcome of stack factor, for example spacing of plate, resonator length, and thickness of plate, on the performance of thermo acoustic engine was calculated by means of onset temperature, frequency of resonance pressure amplitude, and variation by means of air as a resonator fluid illustrated by Hariharan *et al* [4]. Haruko Ishikawa *et al* [5] quantitatively analyzed the effect of the stack plate length while gap between the plates is greater than thermal penetration depth d_k. It was stated that there was a heat pumping effect on the short and long plates analyzed with standing wave particle displacement length. Also, the energy indulgence close to the plates increased with the particle displacement and also concluded that no heat transfer takes place when the spacing of plate was equivalent to thermal penetration depth d_k.

An association between size of cold and the hot exchanger and rate of entropy generation in a thermo acoustic device along with the temperature differences along the regenerator stack and their position in the resonator was explained by Hobson *et al* [6]. It was found that the effect of heat transfer was more dominant than the viscous effect in the quick decrease of the generation of entropy. Further, the size of heat exchanger at cold section of stack should be bigger as compared to hot section.

Reid *et al* [7] developed a thermo acoustic refrigerator with a steady-flow equivalent to the thermo acoustic oscillations passing through the stack, to analyze quantitative studies along experimental result for stack temperature profile and the cooling effect. Nsofor *et al* [8] studied, heat exchanger fluctuating flow heat transfer, with respect to Prandtl number, Nusselt number, and Reynolds number and utilized to show a relationship outcome of investigation to find a novel relationship for heat transfer within heat exchanger. The association among variable heat transfer coefficient on heat exchanger, fluctuating frequency, and mean pressure was analyzed. If the thermo acoustic refrigerator runs at specific frequency then the advanced mean pressures obtained results in better heat transfer coefficients.

Basir Jafari *et al* [9] designed and developed a simple thermo acoustic refrigerator with a modifiable mechanical resonator, attached with the acoustic resonator. The experimental data revealed about 10% increment in the refrigeration efficiency in comparison with a simple thermo acoustic refrigerator with no mechanical resonator.

Nsofar *et al* [10] carried out the experimentation on the performance of the TAR with respect to various parameters like pressure,

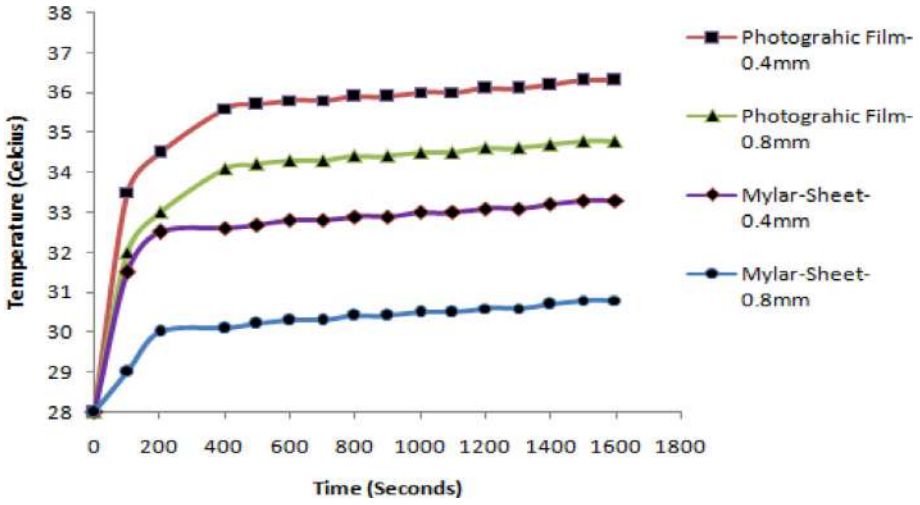

Fig. 2. Variation in hot end temperature with stack of different materials.

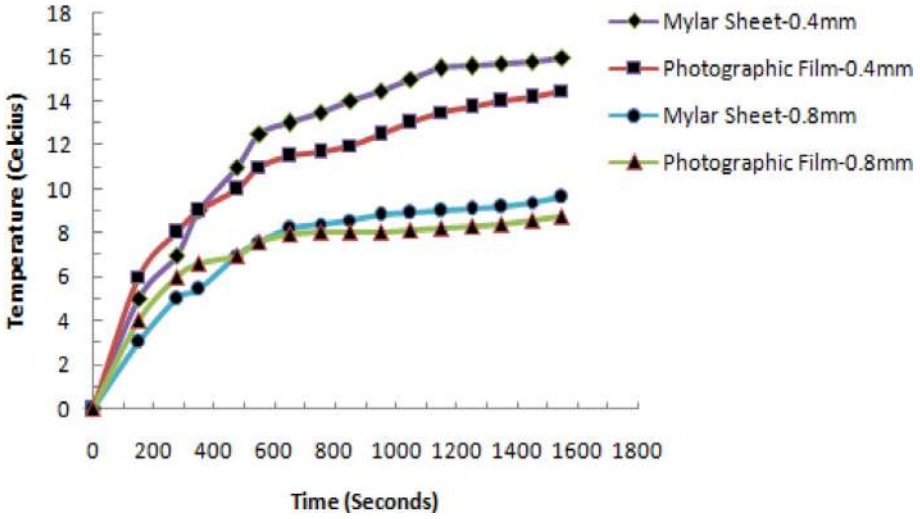

Fig. 3. Variation in temperature difference with stack of different materials.

frequency, cooling load, and its effect on the temperature difference between the stack. The variation of the temperature difference across the stack and the pressure is shown in Fig. 4. The maximum temperature difference was observed at around 4 bars.

Wetzel M *et al* [11] discussed about system optimization, and aimed at obtaining the best possible COP of a thermo acoustic refrigeration system. Fluid properties and geometric variables of refrigerator were considered along with a specific algorithm in the direction to find out the most favorable result. While, managing the working parameters of thermo acoustic, DeltaEC was utilized broadly. Besnoin *et al* [12] aimed at the heat exchanger. Pressure being one of the variable parameters, was proved that the temperature difference across stacks can be increased to a specific limit by increasing the average pressure for helium.

Hariharan *et al* [4] designed and developed a double thermo acoustic system, the aim was to design a twin thermo acoustic heat engine (TAHE) producing sound waves with high resonance frequencies which was used to drive a TAR efficiently by the variations in geometrical parameters. The performance was measured with reference to the onset temperature difference. Fig. 5 shows the consequence of resonator fluid on onset temperature difference for various resonator lengths for various plate thickness and different plate spacing's

Paek I *et al* [13] carried out analysis on a working model of thermo acoustic refrigerator based on linear thermo acoustic theory which used heat exchangers without water flow and with water flow. It was established that as soon as the stack temperature curve turns to be non-linear, the performance significantly reduces. Zink *et al* [14] optimized the stack by finite element method considering thermal losses in the surrounding environment. An easy 2D computational technique was specified by Piccolo *et al* [15] using this method, standard linear theory of thermo acoustic integrates in to energy balance based quantitative calculus method. For a particular temperature gap and refrigerating output level, the least entropy formation could be used efficiently as an appropriate design test to optimize the most favorable length of stack, stack position, and the plate spacing was explained.

Various researches on stack length its position and the resonator tube were discussed in the previous literature. The effect on the COP of the TARS by the variations on the resonator length, stack geometry, stacks plate thickness, stack plate spacing were

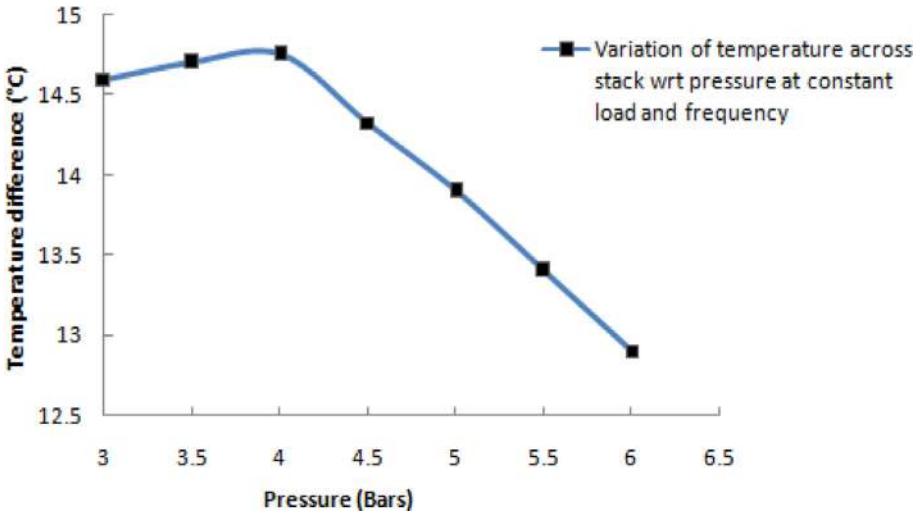

Fig. 4. Variation in temperature difference with pressure.

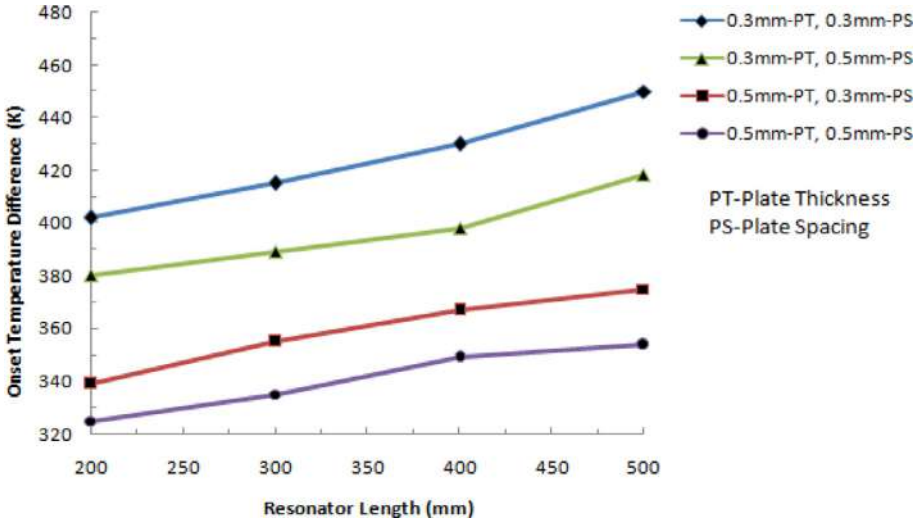

Fig. 5. Variation in onset temperature with length of resonator tube.

discussed. The effect of stack plate spacing on pressure maximums, resonant frequency, and onset temperature gradient were also discussed. From the mentioned literature review it was concluded that if the spacing between stack plates is increased, the temperature difference was low.

3. Gases used in resonator tube

The international constraint on the application of chlorofluorocarbon (CFC) and uncertainty over the replacements of CFC gave thermo acoustic devices a considerable advantage over traditional refrigerators. Air, helium and xenon, are the gases generally used in thermo acoustic devices which have no environmental effect and are also harmless to the ozone layer. It is expected that regulations will be tougher on green house gas emissions in the near future. Alertness about the harmful effects of CFC on ozone depletion and the prohibition of its production led researchers to find an alternative resolution to this problem.

Dhuley *et al* [16] explored the outcome of two characteristic parameters, the charging pressure the resonant frequency on the dynamic pressure created inside a TAR, since the dynamic pressure inside a TAR is a significant parameter which governs the cold temperature obtained and the cooling power. Tasnim *et al* [17] studied the numerical analysis for increasing the COP of TARS by changing the operating conditions as well as the result of variation in the fluid used in the resonator tube. The TARS was evaluated on the basis of COP, refrigerating effect, and generation of entropy in the system. Results due to variation in the fluid by varying Prandtl number were also obtained. During investigation it was obtained that the values of COP increased from 1.53 to 1.7, at various values of drive ratio.

Tijani *et al* [2] employed binary gas mixture obtained at low temperature 208 K with thermo acoustic refrigerator analyzed the result of various important factors, like Prandtl number, COP, etc. Garrett *et al* [18] assembled a unique spaceship cryocooler that used inert gas resonant oscillating sound wave to transfer heat. In pulse tube refrigeration system Jin *et al* [19] deliberated thermo acoustic phenomenon, with the assistance of thermo acoustic prime mover to develop a sound wave to drive the refrigerator. Thermo acoustic prime mover uniqueness and result of working fluid i.e. helium and different percentage of helium-argon mixture,

on the thermo acoustic refrigerator was considered, and during experiments achieved cryogenic temperature of 120 K. From [2] and [19] it shows that the TARS can achieve low temperature, by using working fluid as helium with other gas mixtures.

Helium gas is a colorless, non-hazardous, flavorless, monatomic, inert gas which is ahead the noble set of gas within periodic chart. It is melting and boiling points are the lowest and it behaves more like an ideal gas apart for a considerable high range of temperature. The velocity of sound within helium is almost three times the velocity of sound within air. Since the fundamental frequency of a gas packed hollow space is relative to velocity of sound within gas, as soon as helium is drawn in, there is subsequent increase in the resonant frequency. Hence, helium gas is mostly used in thermo acoustic refrigeration as a working fluid, but also has certain problem of leakages. From this literature review it is clear that the researchers have used pure helium and helium-argon mixture, to enhance the performance of TAR.

Hiller RA *et al* [42] demonstrated dehumidification of a humid air stream using a flow-through thermo acoustic cooler. Even though the efficiency was lower than commercial compressed air dehumidifiers using VCR systems, the approach helped in a greater simplicity and reliability of thermo acoustic systems.

4. Use of sound generation systems in TAR

Symko *et al* [20] utilized thermo acoustic refrigerator and prime mover to eliminate heat from an electronic circuit. They used the thermo acoustic device at frequencies ranging between 4 kHz and 24 kHz and examined the performance of the device. The COP of a TARS was depended on changeable load and evaluated numerical data with the computed data was experimentally analyzed by Jebali *et al* [21] and Bailliet *et al* [22] computed auditory influence flow within thermo acoustic resonator, with the help of laser Doppler anemometry by measurement of sound pressure using microphone. A fair agreement between hypothetical and investigational outcome was obtained. In the experiments, the stack hot heat exchanger was maintained at ambient temperature and the cold heat exchanger temperature was varied while to accomplish temperature differences of 0.5 K and 10 K. For this temperature difference the refrigerating effect was also varied by changing the driving frequency between 30 Hz and 65 Hz.

Siddiqui *et al* [23] examined the acoustic standing wave velocity fields within rectangular resonator, further the effects by changing few refrigerator factors on the amplitude of pressure was determined. Zink *et al* [14] suggested more powerful speaker to obtain more acoustic power and worked on operating frequency to run the device. Kang *et al* [24] analyzed the optimization of acoustic field and hydraulic radius of resonator that illustrated through relation of traveling wave factors to standing wave factors (Q_c, K_x, Φ, Gp, Gu, Gz, *etc.*), temperature gradient, cooling power, COP, and heat flux of TAR by various combinations of acoustic fields and hydraulic radiuses were also stated.

Pan et al [25–26] carried out experiments on imposed fluctuation driven through loudspeaker and evaluated to self-energized fluctuation. Also, variation of temperature with respect to operating frequencies and power was discussed. It was stated that enforced fluctuation had superior selectivity for operating frequencies. The fundamental frequency or resonant frequency was best possible option to employ thermo acoustic system in realistic appliance.

It is stated in the literature that the onset temperature difference and the performance of thermo acoustic refrigerator depends on the driving frequency of working medium/fluid. The forced oscillations and the pressure amplitude/maximums were by powerful speaker. Depending upon the necessity of measuring span the pressure-field microphone and decibel (sound pressure level) meter were used for acoustic measurement by the researchers.

5. Analysis of approach of optimization for thermo acoustic refrigeration system

Various researchers carried out study in the field of thermo acoustics by using linear theoretical method, numerical method, analytical method, software, *etc.* to optimize the thermo acoustic refrigerator eventually to increase the coefficient of performance (COP) of system. Tijani *et al* [27] justified in detail the designing criterion for TAR in order to attain an optimal system, the linear thermo acoustic theory was suggested to describe design criteria. To decrease the number of parameters and to simplify the equations, dimensionless independent variables were used. A technique to obtain optimum design for different parts of TAR was established.

Antonio Piccolo *et al* [28] stated a methodology to investigate the source of the divergence from the estimate of the linear theory and evaluated them with the computed performances of a thermo acoustic device. Huelsz *et al* [29] established terminology for variation in phase, among pressure waves and temperature by using linear theory for thermo acoustic refrigeration phenomenon considering ideal situation of endless heat ability and zero Prandtl number for the plate. Sun *et al* [30] based on linear thermo acoustic explained optimization on theoretical investigation. A novel Helmholtz resonator was utilized to evolve the transportation capability of thermo acoustic engine, which produced complete utilization of the interface along with conformity and effect of pressure change due to unit change in volumetric flow rate. The variation of Helmholtz resonator tube length on outlet pressure amplitude is shown in Fig. 6.

In this arrangement, the intensity of output pressure of thermo acoustic engine was amplified as maximum pressure amplitude would be evolving at the end of Helmholtz resonator tube. Fig. 6 shows the consequence of Helmholtz resonator tube span on pressure amplitude at the exit of resonator tube. Curves for various volumes of the reservoir were obtained. For every reservoir volume there was a specific highest point of pressure amplitude obtained corresponding to a particular length of resonator tube. Maximum value of pressure amplitude decreased as the reservoir volume increased.

Wetzel *et al* [31] stated a method for approximating and designing TAR components to attain an optimized device. Bheemsha *et al* [32] with the help of general linear theory of thermo acoustics described the optimization and design of a thermo acoustic refrigeration system, the basis for the design was by taking its simplified assumptions into consideration. Optimization was carried out using MATLAB. Tijani *et al* [33] presented a simple analytical model describing the interaction between a sound wave and a solid surface. The outcome of the model was that thermal relaxation losses can be minimized by using a tube material with the smallest possible combination of K_s ρ_s C_s and a gas with the largest possible combination K_g ρ_g Cp_g.

Worlikar *et al* [34] mathematically observed the unsteady flow and the temperature field in the vicinity of ideal TARS by simulating a thermo acoustic device. A Numerical model was presented to simulate energy and momentum equation, and unsteady mass within the thin-plate. Babaei *et al* [35] demonstrated optimization algorithm for the designing of thermo acoustic refrigeration devices. The characteristic feature of the algorithm was the execution of the entropy balance on the device to improve the optimization process, which included different correlations based on the energy balance for different device configurations.

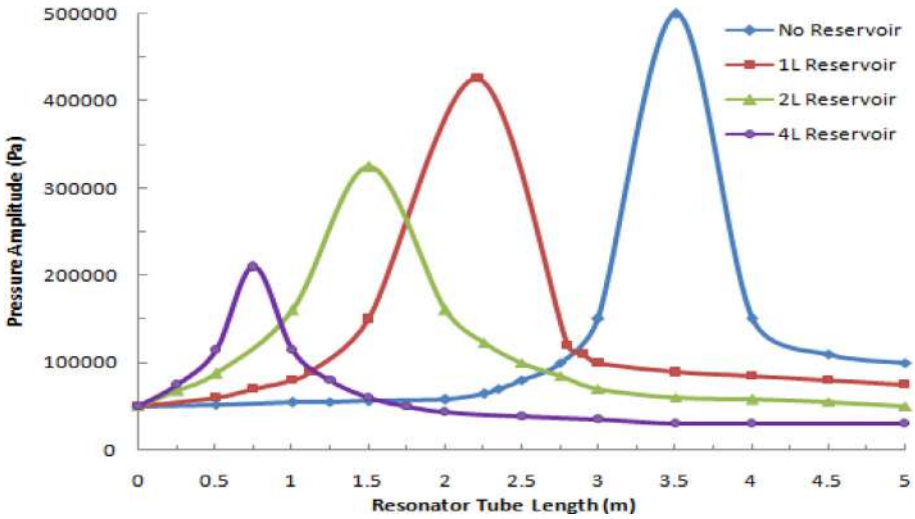

Fig. 6. Variation in pressure amplitude with length of resonator tube.

Hariharan *et al* [36] optimized variables like stack length, stack location, acoustic frequency, and stack plate spacing included in design TAR by means of the response surface methodology. Using this method, the effect of parameters like frequency, stack position, stack length and plate spacing on the performance of TAR, in terms of temperature difference between the hot end and cold end of the stack was investigated and the parameters were optimized. A mathematical model based on response surface methodology was developed from the results obtained through software DeltaEC.

Ghorbanian *et al* [37] developed a simplified model, which enabled to identify and evaluate the most important physical characteristics of a compact traveling wave thermo acoustic refrigerator driven by a traveling wave thermo acoustic engine. The hydraulic radius, position, length, and of the refrigerator was optimized for maximum COP. Along with the COP of the refrigerator, prime mover efficiency and the dissipation of heat and their outcome on the overall COP was also examined. Lycklama *et al* [38] presented a 2D CFD simulation study of traveling wave thermo acoustic engine. The main purpose of the study was to find out whether commercially available CFD code was able to model a thermo acoustic system, both oscillatory flow behavior of the fluid and the interaction between the acoustic wave and the porous structure were taken into account.

Raspet *et al* [39] developed the finite difference approximation method which was useful for initial design estimates for thermo acoustic engines and refrigerators, and to solve equations of thermo acoustic refrigerator. The traveling wave interpretation of thermo acoustic engines was presented, which explained gain in thermo acoustic resonators in terms the interactions of traveling wave contributions, and demonstrated that the reflected components are a significant contributor to thermo acoustic gain. The equations for both standing and traveling wave were evaluated and the results were compared with calculated values. Bheemsha *et al* [40] described the design of a resonator and buffer volume for a thermo acoustic refrigerator, it was confirmed that the maximum cooling effect of the thermo acoustic refrigerator was found at the position of maximum pressure amplitude (Pressure-Antinode). The optimization of the design was carried out using MATLAB and the modeling was done using CATIA.

Reid *et al* [7] focused on a standing-wave thermo acoustic refrigerator with parallel superimposed steady flow and investigated the dependence of the stack's temperature profile, and the cooling power on the steady flow rate. Zoontjens *et al* [41] investigated the performance of TAR and stated the comparison between the predicted and experimentally obtained results showed the ability of DeltaE to model the system performance to facilitate the design of thermo acoustic systems. Critical analysis revealed that the optimal use of DeltaEC can be carried out to established best probable design. Russel *et al* [43] optimized the performance of the spiral stack material used in the resonator tube and obtained the variation of temperature difference with respect to the spiral stack material

Arnott et al [44] developed a general linear formulation for gas filled thermo acoustic elements such as stacks and heat exchangers with pores of arbitrary cross section and geometry. In the approximation presented heat and work flows were found best for parallel plate stack geometry.

The literature presented is established on the various optimization methods of TAR which include methods like linear, theoretical, numerical, experimental, analytical, and software. The linear method was focused mainly on pressure amplitude, resonator tube length, and plate spacing. The numerical and analytical methods are employed for optimization of temperature difference cross the resonator tube, heat exchanger dimensions, heat exchanger position, stack length, stack position, acoustic frequency, acoustic power, stack position, plate spacing, *etc*, with the help of software models like CFD simulation, CATIA, MATLAB, and DeltaEC. These methods were used for the optimization of TAR and to improve the COP of thermo acoustic refrigeration systems.

6. Constraints in the use of thermo acoustic refrigeration

The major problems associated with the use of thermos acoustic refrigeration lies in the fact that the effect of low temperature or cooling generated is consequence of the amalgamation of three different fields of thermodynamics, acoustics and refrigeration. Hence the design consideration involves the parameter and variables associated to all the three fields. The following issues with the design of TAR are mentioned below:

- Selection of acoustic power input (loud speaker) with respect to the dimensions, power, efficiency, frequency response, position, and resonant frequency.
- Dimensions of the resonator tube with related parameters like shape, material, length, and cross-sectional area.

- The characteristics parameters of the stack i.e. its material, dimensions, porosity, geometry and position.
- The hot and cold heat exchanger design associated with its effectiveness, efficiency, blockage fraction, porosity, length, material, heat transfer resistances.

In present circumstances of development, as mentioned in the literature review the performance of the thermo acoustic refrigerator is less as compared to conventional VCRS. The TAR is not available commercially.

7. Major benefits to promote thermo acoustic refrigeration

Since thermo acoustic refrigeration is a technology that does not utilize any harmful refrigerants considering the environmental impact, its potential use and application could be of great help in the coming times. Thermo acoustic refrigeration can greatly decrease the emanation of harmful gases like HCFCs, CFCs because of the use of environmental friendly refrigerants like helium, air etc. and hence can be an alternative to conventional refrigeration. Enhancement and up gradations in the field of TAR proposes economical and cost efficient system over conventional VCRS.

8. Prospects in the field of thermo acoustic refrigeration

It is examined from the review of literature that development has been done in the field of thermo acoustic refrigeration systems; there is still a large scope of improvement. It is significant that research has been done in designing the various components of TARS like the resonator tube, stack, and medium used (fluid), the variations in the experimental analysis needs to be enhanced. Further improvement requires in the domain of increasing the COP of the system so that it is competitive with respect to the COP of conventional VCRS.

9. Developments in the design of resonator tube

The literature states that one of the factors on which the functioning of TARS depends is the resonator tube and its design. In practically most of the work carried out, a uniform diameter resonator tube is used, the effect of variation in the tube diameter for enhancing the acoustic velocity is not yet considered. By using convergent-divergent section the acoustic velocity can be increased, consequence of which would be the reduction in the sound intensity, input power and hence the COP of the system.

10. Utilization of different types of air gas mixtures

In the investigations it was found that the most of the researcher's used helium as a medium inside the resonator tube, and combination of helium with other gases and established the effect of the working fluid on temperature variations. Experimental investigations of TAR with compressed air-gas mixtures or gas–gas mixtures at different charging pressures can be applied for creating maximum temperature difference across the stack. Furthermore effect of gases with high value of adiabatic index (k), specific gas constant (R), to increase the acoustic velocity can also be considered.

11. Optimizing the performance of stack and heat exchangers

Theoretical and experimental analyses have revealed that the actual COP of TAR is less than the COP of conventional VCRS. The COP of the TAR is based on performance of heat exchanger and stack. In order to increase the COP of the system the performance of the stack has to be optimized further. The variation in the stack material considering its thermal conductivity and specific heat capacity, combinations of various types of stack geometries used, its design and shape are some factors that can be experimented to reduce the heat flux.

Further, the design of the heat exchanger considering its effectiveness and efficiency needs to be improved. The design of the heat exchanger with respect to the cooling load requirement of a specific space needs to be addressed. The limitation in the design of heat exchanger include, heat exchangers with higher thermal contact area which eventually increase the heat exchange between the fluid and the stack, and hence it reduces the refrigeration effect created by the stack. Therefore optimization process is required in the design of the heat exchanger with respect to its ability to increase the refrigerating effect of the TAR. Further the rate of heat transmission between the stack and heat exchangers should be improved to increase the cooling load and hence the COP.

12. Conclusion

The analysis of the research presented is not a complete record of the ideal thermo acoustic refrigeration system, but is only a review of the investigations and optimization in the field of TAR. Even though every attempt is a significant addition to thermo acoustic refrigeration, the research information presented is implicit optimization in regular intellectual approach. In each prospect of the design presented, the parameters optimized were with respect to specific optimum considered for single variable, without varying other variables. In order to design and develop more effectual system at low cost and higher COP, enhancements are required in the design of resonator tube, stack, compact, and effective design of heat exchanger etc. Furthermore, the design of the TAR should be oriented towards application of TARS for systems having waste sound energy. Applications include extraction of waste acoustic energy form steam turbines, aircraft and automobile engines etc. The prospects of TAR are expected to be more of application oriented, reduced in size, and having commercial, household and industrial significance. These are the certain aspects which will formulate the TAR an interesting refrigeration alternative in the future.

CRediT authorship contribution statement

Sajid Siddiqui: Conceptualization, Data curation, Formal analysis, Methodology. **Akash Langde:** Project administration, Supervision, Validation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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FTIR spectral analysis of glycine doped ammonium dihydrogen phosphate (ADP) crystal

FTIR spectral analysis of glycine doped ammonium dihydrogen phosphate (ADP) crystal

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Abstract. Ammonium Dihydrogen Phosphate crystals doped with Glycine (GADP) has been grown by slow evaporation method, Rotation method and Sankaranarayanan - Ramasamy (SR) methods with different molar concentration. The Fourier Transform Infra-Red (FTIR) studies have been investigated on the as grown GADP crystals. The FTIR spectrum shows the interaction between ADP and the dopant by the additional peaks which corresponds to the functional groups of Glycine. The standard spectrum statistics of FTIR confirms the presence of all the functional groups. The spectrum for ADP crystals doped with Glycine grown by Rotation and SR methods have similar peaks with slight variation as that of conventional slow evaporation method grown Glycine doped ADP crystals.

1. Introduction

Crystal growth is an elementary component of material science and engineering. The immense majority of work done on crystal growth has been concerned with practical methods rather than with hypothetical investigation. Advancement in the growth of crystal is extremely needed for the production of higher efficiency PV cells for surrogate energy. Crystals of an appropriate dimension and precision are essential for initial data acquirement and for devices used for practical purpose such as IC's and sensors etc. Adding tiny formerly prepared crystals offer nucleating sites to the prepared solutions. Single seed crystal would results in the crystal of larger size [1-2]. Depending on the phase conversion method, techniques of crystal growth can be classified as growth from solid, vapour, melt and solution [3]. The various methods of solution growth are studied by many researchers [4]. As the crystal growth is conceded at the room temperature, the structural impurities in the crystals grown by solution method are quite less [5].

Ammonium Dihydrogen Phosphate crystals have been extensively used as the 2nd, 3rd and 4th harmonic generators for different laser applications which require short pulses of laser. ADP crystals have found many applications in Nonlinear optics, electro-optics, and transducer devices. It is also used as Monochromator in X-ray fluorescence investigation. Numerous researchers have studied properties of pure and doped Ammonium dihydrogen phosphate crystals [6-7]. Amino acids with various molar concentrations have been used as an additive to grow ADP crystals [8]. Glycine (NH_2CH_2COOH) is considered to be the simplest amino acid among the 20 protein amino acids. In this research module; we have used amino acid Glycine as an additive in ADP in different molar

concentrations. We have employed slow evaporation growth method, crystal rotation method and Sankaranarayana-Ramasamy method to grow pure and glycine doped ADP (GADP) crystals.

2. Synthesis of G-ADP Crystals

ADP crystals have been grown by the method of conventional slow evaporation. Calculated amount of Ammonium Dihydrogen Phosphate (GR-grade) was dissolved in the water. Aqueous solution containing Ammonium dihydrogen phosphate was made based on the solubility curve of salt at the constant temperature under saturation state. Magnetic stirrer was used for stirring the solution. The solution was then stirred constantly for 8 hours to attain stability. Filter paper of 11µm dimension and filtration pump was used to filter the prepared solution.

The above process was repeated for calculated mole % of Glycine (Merck) dopant which was dissolved in Ammonium dihydrogen phosphate solution. Crystals of ADP and GADP with optically superior quality have been grown in the span of 20 - 30 days. The photographs of ADP and GADP crystals have been shown in figure 1.

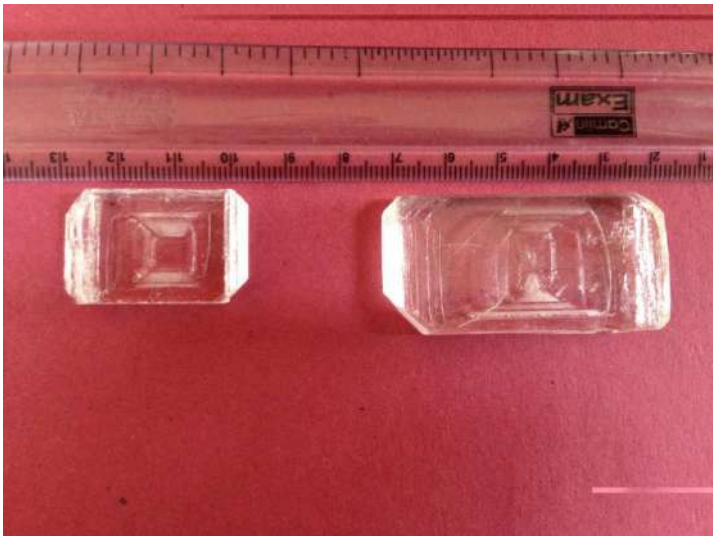

Figure 1. Photographs of GADP (left) and ADP (right) Crystals.

G-ADP crystals have been also grown by crystal rotation method and Sankaranarayanan-Ramasamy (SR) method [9].

3. FTIR Spectral Analysis

The grown crystals were grounded in pestle mortar to get fine powder. The fine powdered samples were then utilized for FTIR Spectral Analysis. Fourier Transform Infrared (FTIR) spectrum shows a fingerprint of the material with the peaks that correspond to the vibrational frequencies amongst the bonds of the atoms building up the substance. In IR spectroscopy, Infrared rays are allowed to pass through a target material. Several IR rays are absorbed by the material but few of them are transmitted through it. The ensuing spectrum thus represents the structural fingerprint of the material. Similar IR spectrum could not be produced by two distinctive molecular structures thus making IR spectroscopy helpful for various types of quantitative examinations.

3.1. Results and Discussion

The Fourier Transform Infrared (FTIR) studies have been done on the crushed samples of pure Ammonium Dihydrogen Phosphate and Glycine doped ADP crystals. The FTIR spectra were observed in the region 400 to 4000 cm^{-1} with the use of KBr pellet. The standard spectra of functional group were used to match the functional groups of pure and doped ADP crystals have been acknowledged. Functional groups of Pure ADP and Glycine doped ADP (GADP) crystals developed by conventional slow evaporation methods with different concentrations [1M% - 6M%] are shown in figure 2.

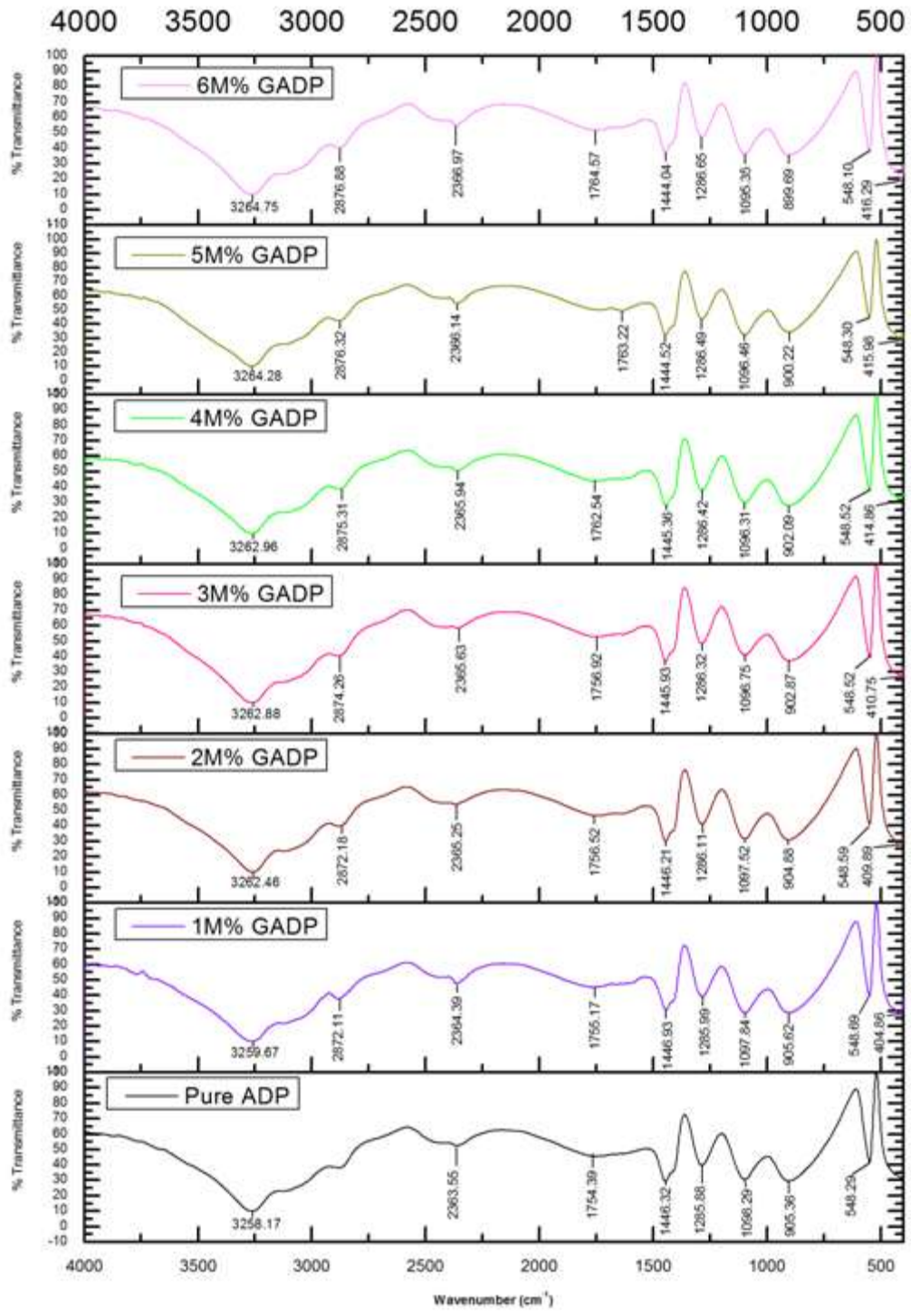

Figure 2. FTIR Spectrum of ADP and GADP with Various Concentrations.

The spectra reveal the interface between ADP and protein amino acid through the supplementary peaks which correspond to the functional groups of Glycine [10]. Standard FTIR spectrum statistics verifies all the functional groups present in the crystal. The above FTIR graph shows variations in the absorption frequencies due to variation in the bond length between O-H and P=O. Owing to the variation in the bond length between P=O and O-H, change in the wave number (cm^{-1}) was observed in FTIR spectrum. Owing to the feeble force of attraction amongst the P=O and O-H bonds, optical characteristics of pure

and doped Ammonium Dihydrogen Phosphate crystals are modified [11]. Amino acid doped ADP crystals were studied by many researchers [12-13]. Observed reallocation in the positions of the peak of PO_4 and P-O-H vibrations in the FTIR spectra confirms the interaction of ADP and amino acids. The FTIR spectra of pure ADP and GADP crystals have been shown in figure 2. In this research module, the FTIR spectrum of ADP shows that the O-H stretching vibration of H_2O was observed at 3258.17 cm^{-1} and CH_2 stretching mode just below 3000 cm^{-1}. Stretching of P-O-H at wave number 1098.29 cm^{-1} and ammonia N-H stretching at wave number 2363.55 cm^{-1} was observed. The peaks at 548.29 and 405.5 cm^{-1} show PO_4 vibrations and these results agree with the reported results [14-15].

The FTIR spectrum of Glycine (1, 2, 3, 4, 5 and 6 moles %) doped ADP (GADP) crystals disclose that due to the existence of Glycine into Ammonium Dihydrogen Phosphate, the position of the peaks have been moved to other wave numbers. The PO_4 vibration of the ADP is moved from 405.5 cm^{-1} to a maximum value of 416.29 cm^{-1}. Likewise, vibrations of P-O-H at 1098.29 and 905.36 cm^{-1} of the ADP are moved to lower side i.e., 1095.35 and 899.69 cm^{-1}, which confirms the existence of Glycine in the ADP crystal lattice.

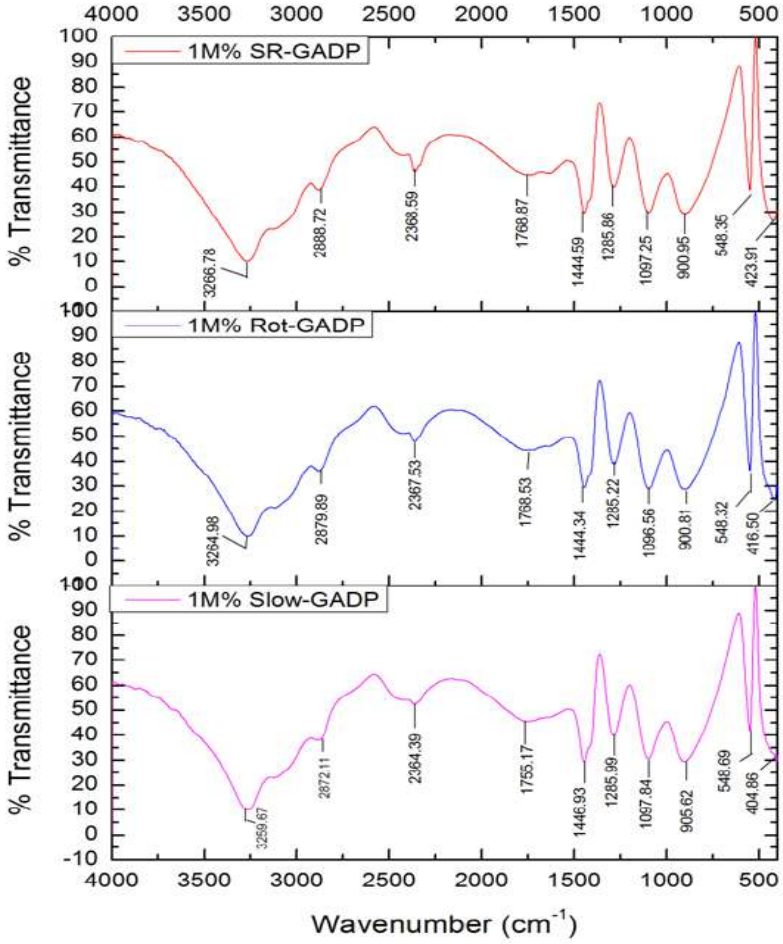

Figure 3. FTIR Spectrum of Glycine (1M%) Doped ADP Crystal by Different Methods.

Functional groups of Glycine doped ADP crystals grown by different methods are shown in figure 3. C = O stretching of –COOH group is assigned in the absorption range 1700-1800 cm^{-1} and CH_2 vibrations of glycine give their peak in the range 2872.11 to 2876.88 cm^{-1} which are missing in pure ADP spectrum [16]. Due to high concentrations of dopant, the -NH group hydrogen stretching which was observed at

wave number 3500 - 3000 cm^{-1} is broadened to some extent. Some kind of interaction amongst -NH group of the ADP and the dopant is indicated by the shifting of peak from 2363.55 cm^{-1} to a maximum value of 2366.97 cm^{-1} [12]. The spectrum for Glycine doped (1M%) ADP crystals (figure 3) grown by Rotation (Rot-GADP) and SR (SR-GADP) methods also have similar peaks with minor difference as that of slow evaporation (Slow-GADP) method grown Glycine doped ADP crystals with slight variations. The PO_4 vibration of 1M% GADP crystal developed by slow evaporation, rotation and Sankaranarayan-Ramasamy methods are found to be at 404.86, 416.50 and 423.91 cm^{-1} respectively. Also, the P-O-H vibrations are found at 1097.84 and 905.62 cm^{-1} for 1M% Slow GADP, 1096.56 and 900.81 cm^{-1} for rotation and 1097.25 and 900.95 cm^{-1} for SR method grown GADP crystals, which again confirms that Glycine is present in ADP crystals. CH_2 vibrations of glycine give their peak at 2872.11, 2879.89 and 2888.72 cm^{-1} for slow, rotation and SR grown GADP crystals respectively. The vibration frequencies shows that hydrogen bonding results in O-H group stretching frequencies of ADP and COOH group of Glycine [17].

4. Conclusion

The Fourier Transform Infra-Red (FTIR) analysis was performed on the grown ADP samples. The effect of Glycine used in this research module on the vibration frequency assignments of functional groups of ADP and GADP crystals have been recognized by Fourier Transform Infrared (FTIR) Spectroscopy. Matching of functional groups with the standard spectrum was done. The FTIR spectra validate the interaction between ADP and the dopant by the extra peak which corresponds to the functional groups of Glycine. The peaks analogous to C = O stretching of –COOH group and CH_2 vibrations of glycine confirms the incorporation of dopant into the ADP crystal lattice. The variation in the values of SR grown GADP crystal shows that it can modify the transparency and strength of the Ammonium Dihydrogen Phosphate crystals, better than the crystals grown by slow evaporation and rotation methods. Fourier Transform Infrared (FTIR) spectra of the specimens validate the presence of functional groups in them.

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