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Municipal Solid Waste Management Quantification and Route mapping in Bhuj City

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ABSTRACT

Municipal Solid Waste (MSW) is defined as wastes consisting of everyday items such as product packaging, grass clippings, furniture, clothing, bottles and cans, food scraps, newspapers which is come from homes; institutions such as schools; and commercial sources such as restaurants and small businesses. Municipal Solid Waste Management (MSWM) is a term that is used to refer to the process of collecting and treating MSW. It also offers solutions for recycling items that do not belong to garbage or trash. In this study, MSWM for the New Rawalvadi area, Bhuj has been developed. Very first step in MSWM is quantification of the municipal solid waste. MSW generated from the house has been quantified and it ranges from 765 to 1362 gram per capita per day out of that dry waste is quantified as 525 to 810 gram per capita per day and rest of the wet waste. According to that detail characterization of solid waste is carried out. On the basis of characteristics of municipal solid waste, Route mapping has been done for the collecton of MSW.

Keywords – Municipal Solid Waste, Municipal Solid Waste Management, MSW Quantification, Route mapping, Bhuj

I. INTRODUCTION

Rapid industrialization and population explosion in India have led to the migration of people from villages to cities, which generate thousands of tons of MSW daily (Sharholy et al, 2008). A similar situation reflects in the administrative capital of the Kutch district. Bhuj city is spatially situated in the North-West part of Gujarat. Being an administrative capital it has become the center of attraction for the various sector such as industries, retail, and population, these sectors act as a catalyst in the rising quantity of MSW and it strongly calls for a better management system in the Bhuj city. "Municipal Solid Waste Management (MSWM) includes the collection, transfer, resource recovery, recycling, and treatment of waste. The main target is to protect the population health, promote environmental quality, develop sustainability, and provide support to economic productivity" (Rotich et al, 2006). It is predicted that the MSW amount is expected to increase significantly in the near future as the country strives to attain an industrialized nation status by the year 2020 (Sharholy et al, 2008), on the other hand, not proper handling of municipal solid waste strongly accounts for the rise of the environmental issue.

MSW is the set to all wastes generated, collected, transported, and disposed of within the jurisdiction of a municipal authority. In most cases, it comprises mainly food waste, and rubbish from residential areas, street sweepings, commercial and institutional nonhazardous wastes as well as (in some countries) construction and demolition waste are also covered in the MSW. However, the quantity and characteristics of MSW is a variable quantity and constantly varies with respect to population density, the lifestyle of the individual, demographic pattern, spatial position of an

area, and available resources therefore one of the scopes of this study is to estimate the present quantity and characteristics of MSW generated in the Bhuj city. This outcome further becomes the base for the design of various management aspects such as routing of vehicles, assigning the type and quantity of the MSW storage instrument (it actually not covered in our project but we can still consider it). This study initiated by observing the existing situation of MSWM in Bhuj city and follow up by quantifying the present status of MSW by adopting the practical approach. Based on the comprehensive study of past and present context this paper will provide an economically and environmentally sustainable recommendation to enhance the municipal solid waste management system in Bhuj city.

II. MATERIALS AND METHODS

Site and sample: In the present study, solid waste are collected from the randomaly selected houses located at New Ravalvadi relocation site, Bhuj. Solid waste consist of the paper waste, plastic waste, glass waste, cloth waste, rubber waste, metal waste, wood waste, food waste and inorganic waste which is dust. For quantification both dry waste and wet waste are considered.

Methodology: For Quantification of MSW, total number of houses located at the New Ravalwadi relocation site is calculated and randomly houses are selected among them and form those houses MSW are collected in two parts i.e. Dry waste and Wet waste on daily basis. For 7 days samples are collected. All MSW has been segregated manually and segregated MSW has been weighted on the analytical balance. MSW was segregated as paper and plastic waste, glass waste, cloth waste, rubber waste, metal waste, wood waste and inorganic waste from the Dry waste and wet waste is collected and weighted separetaly. Weight of the same has been recorded and average weight of MSW generation has been calculated per capita per day from the all the samples collected. Total quantity of MSW generation was calculated based on the multiplying the average weight of MSW with the total numbers of house present in the New Ravalwadi relocation site. Based on the MSW quantity generated in this area, collection of the same is developed. Various optimized routs has been identified for the collection of MSW which will saved the time for the collection of the MSW as well as it will economically good.

III. RESULTS AND DISCUSSION

Quantity of the MSW generation:

From the samples which were collected, it was calculated that total quantity of the waste generated minimum was 58 gram per capita per day, maximum quantity was 308 gram per capita per day and average quantity was 159 gram per capita per day. It was calculated that dry quantity of the waste generated minimum was 22 gram per capita per day, maximum quantity was 260 gram per capita per day and average quantity was 97 gram per capita per day. It was calculated that wet quantity of the waste generated minimum was 14 gram per capita per day, maximum quantity was maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was per capita per day, maximum quantity was per capita per day, maximum quantity was 14 gram per capita per day, maximum quantity was per capita per day and per capita

158 gram per capita per day and average quantity was 61 gram per capita per day. It has been calculated that average quantity of the paper and plastic waste, glass waste, cloth waste, rubber waste, metal waste, wood waste and inorganic waste were 42, 9, 12, 10, 10, 11 and 2 gram per capita per day respectively and average quantity of wet waste was 62 gram per capita per day. Percentage of the same is display in the following figure 1.



Fig. 1: Percentage of the waste composition

New Rawalvadi relocation site area has been divided into five different zones as Rawalvadi Society, Rotary nagar, Sahyog nagar, Sundram nagar and Rawalvadi relocation site. From all these zones MSW has been collected and disposed off on the Nagore dumping site which is located 5.5 km away from Rawalvadi. Route Map has been done for the all five zone, from that two is shown in the following figures.



Fig. 2: Ravalwadi MSW route

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Fig. 3: Sahyog nagar MSW route

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Smart Vehicle (Two-Wheeler)

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ABSTRACT

Over speeding has been identified as a major cause for traffic accidents. The accidents due to high speed result in crashes, dangerous injuries and death. Most of the teenagers are exposed to the thrills of speed which sometimes results in lethal accidents, as teenagers tend to be impulsive and fearless. They are much more adapt to speed and show off. Parents are always concerned about them. The developed system aims in changing unsafe behaviours and consequently reducing the number of accidents and its severity. With the increasing cases of two wheeler accidents, the measure of casualties is increasing. Due to the absence of any mechanism, that could act promptly at the time of the accident the injuries are turning to casualties. To reduce the number of casualties in road accidents our project introduces a way to prompt an alert about the happening and we can expect a prompter response from emergency services. **Keywords:** Over Speeding, Accident, Injuries, Show Off, Always Concerned, Mechanism, Response.

I. INTRODUCTION

This project is proposed to monitor the Speed of the vehicle, Location of the vehicle, Accident detection if happens by using the Arduino microcontroller. We will make a application which monitors the vehicle Speed, Location and detect Accident and send it's location in the form of an SMS to the nearest Hospital and the family members so that the life of the person can be safe. This project also include Helmet Detection system and alert the driver of the vehicle in the form of an voice notification.

Our aim is to collect important and useful data and information required for our project in the form of tables and finally to create a database. The database comprises of the information like vehicle number, Name of the owner, Owner's address, Contact number, Model number of the vehicle, Company name of the vehicle, Family members details who are authenticated users of the application, Helmet data, etc. The data is fetched by the Arduino which is connected with the sensors and is used to display the information on the application.

We will design two interfaces for the application, one for the person who is driving the vehicle in which the speed information is displayed according to the current location and the driver is instructed by voice. Other is for the driver's family in which following information will be provided - Vehicle number, Owner's name, Current location of the vehicle, Speed of the vehicle at that time.

II. SPEED DETECTION

In this module we proposed to monitor the speed of the Vehicle by using the IR sensor and Arduino UNO. In this project IR sensor is used to calculate the RPM of the wheel and then calculate the speed in km/hr. The IR sensor is connected to Arduino UNO. The Arduino UNO transfers the detected speed through Wi-Fi to the online database. The speed of the vehicle can be seen on the application created for the purpose to display the data on the mobile. The family member or parents can also notified the driver if his / her speed is high by using the application through that application a voice notification can be send to the driver so that he / she can decrease his / her speed.

III. ACCIDENT DETECTION (BLACK-BOX)

As the name, Smart Vehicle Accident Detection and Tracking, suggests before sending the alert, there are two primary

operations: accident detection and tracking the spot. The former is conducted under the assistance of sensors and microcontroller and the later is dealt with the help of GPS. For detection various sensors like Vibration Sensor, Tilt Sensor, Gyroscope, Accelerometer are used which continuously keeps a track. This data is collected in the microcontroller; the microcontroller is in a loop of collecting the set of values and checking whether the consolidated values depict an accident. The set of values collected belongs to the same time slot.

If accident is detected then the other phases, like black box, tracking the spot and initiating response, comes into play and job of this phases is accomplished. Otherwise this loop is continued. The system goes into the loop since the ignition and remains in this unless the vehicle is parked and shut.

In Black Box we fix one camera at the front and one camera at the back so that we can determine the cause of the accident. The cameras record the front and the back view for 2 min during which time if an accident happens then it will save the recorded video in the database and send it to the relatives of that person. When an accident happens the sensors for accident detection start acting we can configure our camera such that when sensors get active then we can save the 2 min recorded video in the database. And if the accident is not happen then after 2 min the recorded video will get deleted from the database. This will help the authorities to determine the cause of the accident.

IV. ACCIDENT TRACKING

Tracking of the accident is based on resulting values that come from multiple sensors, which activate the overall circuit with the help of a microcontroller. Microcontroller is continuously fetches the data from the sensors. These all once reach their favorable conditions, probably when activated all together at that time of instant, system will trigger the Arduino to respond accordingly to GSM unit for delivering the alert message to the relative, Ambulance and Nearby police station.

Message contain multiple information like user vehicle number, longitude-latitude by which location is traced easily by anyone and reduces the chances of Sevier causality. In this system Arduino transfer data to the server and represent these values of the different sensors also reflect on the mobile application for understanding and awareness of the system is on working mode, values from the sensor are continuously measured. If once the accident is reached the system will automatically reset after 30sec and again work as it was working before.

V. HELMET DETECTION

This project also include Helmet Detection system and alert the driver of the vehicle in the form of an voice notification. Two-Wheeler accidents have been rapidly growing through the year in India. This problem can be avoided if we can notify the driver. This not only ensures road safety, but also allows the driver to be a little more ease while driving on tricky or new roads. The main objective of this is to develop a system to enforce helmet wearing.

To detect the Helmet we will fix one camera above the speedometer of the Two Wheeler such that the face of the person is visible in the camera. We use already train dataset to detect if the individual is wearing the helmet or not. If the person is not wearing the Helmet then a value in terms of 0 and 1 is saved in the database. 1 is use to define that the person is not wearing the helmet. After detection it sends a message to their family members and rider also (in the form of an voice notification). Message warn the rider that you are not wearing a helmet and if rider ignores the message then after 8 minutes a message is send to the Traffic Police in the form of an SMS and rest of the work is done by Traffic Police.

1 Helmet Detection Method & Analysis

We are using YOLO object detection algorithm with Open CV to detect if the person is wearing the helmet or not. YOLO is a state-of-the-art object detection algorithm that is incredibly fast and accurate. YOLO algorithm is an algorithm based on regression, instead of selecting the interesting part of the image, it predicts the classes and bounding boxes for the whole image in one run of the algorithm. First of all we use YOLO labelling tool to create the dataset by labelling the helmet in the images. Now we take our trained model and make inference on test images. After training has completed, model weights will save in weights. For inference we invoke those weights along with a conf specifying model confidence and a inference source. Source can accept a dictionary of images, individual images, video files, also a device's web cam. We are giving a person 8 min to wear the Helmet. After 4 min a message is send to the family members. If the person doesn't wear the Helmet in 8 min then after 8 min the message will be send to the authorities which contain's the person details along with his photo click at that time.

VI. CONCLUSION

This paper include the ways to reduce the accidents that happen due to High speed driving and not wearing any protective gears such as Helmet and also detect the accident if happens and send the details to the authorities these details include the information such as the location of the accident and the recording saved in the database at the time of the accident to find the cause of the accident.

This paper's main motive is to make a Smart Vehicle Two -Wheeler that reduces accident. This Research paper proposed a way by which we can make Helmet compulsory for Two-Wheeler users. As we are fixing a camera in such a way that can detect the Helmet after detecting the helmet it sends a message to their family members and rider also (in the form of an voice notification). Message warn the

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rider that you are not wearing a helmet and if rider ignores the message then after 8 minutes a message is send to the Traffic Police in the form of an SMS.

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COVID PRECAUTIONS DETECTION

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ABSTRACT

As, we are facing this pandemic situation of Covid-19 which make us to take some precautions always like wearing Mask, sanitize our hands and keep some distance. But, nowadays, as the country has started to unlock amid surging COVID-19 cases, maintaining social distancing has become a key issue. It creates a major obstacle that how to monetize the meeting places, whether the people are wearing mask or not.

So here our team takes an initiative against this. We are preparing such a system that will keep an eye in public place (i.e. College, Banks, Marts etc.) and then search whether a person is wearing mask or not. It also checks whether a person is maintaining social distancing or not. And this can be done in a very effective and efficient way. So, it can help in stopping spread of Corona Virus'.

Keywords: Face mask, Social distancing, Python, OpenCV, Tenserflow

I. INTRODUCTION

Social Distancing is a term that has taken the whole world in surprise and is changing the way we live. It is also called physical distancing, which means to keep a safe space between yourself and other people. As the process of unlock has started in the country to amid surging COVID-19 cases, maintaining social distancing has become a key issue.

The biggest fear revolving around the COVID-19 situation is how quickly the infection disseminates from one individual to another through contact or even being within proximity of an infected person. Thus mask and Social Distancing are here to stay more farsighted than expected to fight Covid-19.

So, this is what our team thinking to develop a model that detects if people are following social distancing and at the same time are wearing masks or not. As we know the face mask is another key solution in prevention of this virus. So, our initiation is to take crowd together under the eye that monitor whether a person is following the precautions or not.

On the norms given by WHO that gives information about how one can protect self and other people from COVID-19.

Firstly maintain at least a 2 feet distance amongst yourself and other people to bring down the risk of infection when they speak, sneeze or cough. Also try to maintain a greater distance between yourself and others even when indoors. The more distant away, the better.

Make an individual to wear a mask as a normal part of being around other people. [1]



Fig. 1: Precautions by WHO

This can be achieved in the following steps:

Firstly, read data consisting all photographs of mask wearing person or not. We just go throw it and reach out all the outliers if exists.

Then we train it with the help of some machine learning algorithms. Now, we test and implement our efforts in real world.

So here is a sample of the outcome of the model:

Red bounding boxes indicate that the Person is in the proximity of another person so it will generate a message as "Alert" and the Green bounding box indicates the person is wearing masks and maintain social distancing. [2]



Fig. 2: Mask Detection

Similarly red bounding boxes and green bounding box indicates whether social distancing is maintained or not.



Fig. 3: Social Distancing

II. PROBLEM STATEMENT

The aim of this project is to create a COVID precautions detector to distinguish whether a person wearing mask or not and also

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following 2 feet distance or not. This will judge the real-world data and compare with pre-trained data, on the basis of trained data it will recognize whether crowd follow precautions or not.

Our project is well trained & tested over the real data set and also work over data captured by the camera. Basically a ML based project that is working over real time dataset.

III. PROPOSED METHODOLOGY

We have problems related to real-time data set and it needs image processing / facial recognition for detecting does mask is wear properly or not. So here we use OpenCV and Tensorflow for our project.

The various machine learning algorithms that can be applied to trained data and return a result with great accuracy. Here we use TensorFlow which is an open source end-to-end platform for machine learning. It also uses another library OpenCV to read the real-world data and images for training and testing of the model. [4]

To achieve this task we have utilized the triangle similarity approach, which requires us to know two important parameters before applying our algorithm:

The height or width of the object in some distance measure, such as meters or inches, we are using as a marker.

Next calculate the distance of the camera to the marker in step 1.

After that, Image processing and Computer vision algorithms can be used to automatically determine the perceived width/height of the object in pixels and complete the triangle similarity and give us our focal length. [3]

In regards of Facial detection having mask or not we have follow these steps:

Step: 1

Firstly, we read data, consisting all photographs of mask wearing person. We just go throw it and reach out all the outliers if exists. Step: 2

Then we train it with the help of some machine learning algorithms

Step: 3

Now, we test and implement our efforts in the real world. Here below are the flowcharts for the modules. [5]



Fig. 4: Flow chart for training data





IV. SIMULATED RESULT AND DISCUSSION

In our project we have designed two modules. Both the modules are working on same data set to judge the precautions accompanied by the people or not. This whole project for mask detection and social distancing work over python and ML algorithms.

First module will judge whether a person has mask on face or not. The mask should be on the mouth covering the nose too otherwise it will return that person as suspect.

While, Second module will detect the 2 feet minimum distance as system catches more than 2 feet, it will return same thing as suspect. And then it gives a warning to follow the precautions seriously.

It will return the red box over the suspect and green box over the person who follow all the precautions of this epidemic.



Fig. 7: Mask detection



Fig. 8: Crowded area



Fig. 9: Distance capturing by camera

V. CONCLUSION

As this pandemic, is become part of our life and we have to live with it. Here we are supposing to give a small support that lead to provide an ease in keeping an eye over the crowd and public places. This project will judge the suspect easily and gives the result efficiently. This project helps in judging all the parameters like distance between objects (Persons) and face of a person (mask covering part) as shown in figure below: [6]



Fig. 10: Output review

VI. FUTURE DIRECTION

Here we are proposing a detector that detects the mask on their face and distance of at least 2 feet between two people. It can be enhanced and advanced by adding more features such as not just by detecting it can recognize that particular person too by personality detector and AI frameworks.

This project implements by using the machine learning techniques but it can be implemented using another techniques like CNN, deep learning.

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Smart Attendance System Using Face Recognition

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ABSTRACT

The main objective of this paper is to make an improved intelligent attendance system for our institute that make use of face recognition. The face recognition system is the main technology that works behind the smart attendance system. The main feature that can uniquely identify an individual is a human face. We have created face databases that provide data to the algorithm that recognizes the face. Faces are compared against a database during the attendance taking session. Attendance will be taken automatically if an individual is identified and necessary information is saved in excel sheet. At the end of the class, the excel sheet containing each students' attendance information is mailed to the respective faculty

Keywords: Smart Attendance System, PCA, OpenCV, Python.

I. INTRODUCTION

A system based on Facial Recognition technique is a computerized biometric system used to identify or verify a person by comparing the patterns of their face. Now a days Face recognition is a most active field of research which is based on computer digital technology. The systems based on Face recognition techniques have done lot of improvements in the past years and now such systems are used in many areas such as security, shopping malls, educational institutes and many others. In schools and colleges Face recognition based attendance systems can be very effective and useful for marking attendance as it resolves the shortcomings of traditional way of marking attendance. This is because in traditional way there is a high probability of marking proxy of other person which is completely resolved in face recognition based automatic attendance system. Face recognition based systems are widely used in security areas and can easily be differentiated with iris or fingerprint based biometric recognition systems. With the increase in number of

students in schools and colleges as well as increase in number of employees in various organizations, the needs of better and effective attendance system also increasing day by day. The smart attendance system proposed by us in this paper will definitely resolve the problems associated with current attendance system. In the system proposed in our work the number of students in a classroom is identified and then each student is recognized and its information is stored in a separate file.

II. PROBLEM STATEMENT

- (a) Maintaining the attendance of each student is a hectic and important task for every school and college. Traditional manner for maintaining attendance in which teacher call student by its name or roll number is not effective as chance of proxy is very high as well as its time consuming.
- (b) If the duration of any subject is approximately 50 minutes and to record attendance will takes about 5 to 10 minutes

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by each teacher than it's a waste of time. Time wasting by this old way of taking attendance is a very crucial point which is to be consider and resolve with high priority.

- (c) Managing the student attendance is a high load on each teacher if they uses old method of taking attendance.
- (d) Identifying proxies is also results in wastage of another 4-5 minutes of class.
- (e) To overcome from these losses, an automatic computerized system is proposed in this paper which make use of digital image processing. The system proposed in this paper make use of two techniques, Face detection and Face recognition. The face region in the image is located by the Face detection process and recognition of face is done by face recognition technique. Finally the attendance of the student or individual is marked and record is saved in the file.

III. OBJECTIVES

To resolve the problems associated with the previous system there is a need to develop new system which should be better and more effective. The new system will definitely reduce the paperwork as well as decreases the amount of time required in taking attendance. The new face recognition based system not only reduces the time required in taking attendance rather also eliminates the possibility of proxy attendance.

- (a) Develop a transferable, automatic face recognition based smart Attendance System, which is very effective and easy to use.
- (b) The resulting attendance system must be very fast in term of recording the attendance in compare to the previous attendance system.
- (c) The system must have sufficiently large memory in order to store the attendance record in the database.
- (d) The proposed system must recognize the face of each student with high accuracy.
- (e) Attendance taken by the proposed system must also be shared with the parents immediately. So that parents should also aware of their child attendance record on daily basis.
- (g) To develop an interface of the proposed system which should be very user friendly.
- (h) The proposed system must have facility to add new students in the database very easily and friendly manner using GUI.
- (i) Acknowledge to the user by giving a pop-up message whether the face- recognition process is successful or not.

IV. PROPOSED SYSTEM

This project is totally based on image processing where the project work on two major phases i.e face detection and face recognition. To find the position of face region face detection is used and for making the understudy's attendance with the help of face recognition.

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(Computer Science & Information Technology)

In present years, several attendance management systems based on face recognition have launched in order to upgrade the performance of students in different institute. In Jomon Joseph, K. P. Zacharia proposed an attendance system with the help of using image processing, PCA, Microcontroller, Eigen faces, based on MATLAB. But the system is work only with front face images and they need those method who accept all the direction of the faces. Ajinkya Patil with their partners suggested an attendance system with the help of face recognition face recognition, Viola jones algorithm and Haar cascades are used to detect faces in images and execute recognition through Eigen face method. An attendance management system with 3D face recognition was suggested by MuthuKalyani K. and A. VeeraMuthu has suggested that they marked attendance with monthly progress of each student.

V. IMAGE PROCESSING

The facial recognition process takes two stages: first processing is done before detection require face detection and alignment and second by using extraction and matching steps, recognition is done.

A. Face Detection

In this step, the main function is to finish whether in each image the human faces appear, and to know the location of these faces. In the input images each face contains expected output patches. In this way we get a more strong and easily designable system.

B. Feature Extraction

In images human face patches extraction is done followed in face detection. The change of face patch is done after the step into a set of landmark points or vector with fixed coordinates.

C. Face Recognition

The representation of faces in the last step is to recognize them. We need to build a face database for computerize recognition. From each person various images are taken, and their characteristic are extracted and stored in the database. When we store the input images, and the characteristic extraction is performed for the face detection and its characteristics of each faces is differentiate.

VI. ALGORITHM

For face recognition various algorithm are used.

A. Eigen faces

In images human face patches extraction is done followed by the face detection and the changes in face patches is done into a set of landmark points.

B. Local Binary Patterns Histograms

The training part is dealing with the images in the gray scale method. This algorithm is differentiated to other algorithms is not a universal approach.

(i) Parameters

Local Binary Parameters Histograms uses the following parameters:

- (*a*) **Radius:** Around the central pixel shows the radius which is set on one of the circular local binary patterns.
- (b) Neighbour: The central pixel which is surrounded by 8 number of sample points. The number of sample points will increase with the computational cost.
- (c) Grid X: It is represented by the number of cells through the horizontal direction. The increment in numbers of cells, the grid becomes finer which results in increment of dimensional feature vector.
- (*d*) **Grid Y:** It is represented by the number of cells through the vertical direction. The increment in numbers of cells, the grid becomes finer which results in increment of dimensional feature vector.

(iii) Algorithm Training

When the faces are matched with the input images of database, then required a unique ID of each people for providing the output on the excel sheet, when the images are same required the ID.



Fig. 1: Flowchart of attendance system

As shown in the flow chart in Fig 1. By the camera of the phone we can study the input image. After the image processing it is converted into gray scale. When the images are predicted they match from the database and the faces are shown in a green box with their student names and excel sheet will be generated. Save attendance otherwise the absent text will be sent to their parents/students. In Fig. 6 the total process of smart attendance system is shown.

VII. METHODOLOGY

There are a set of data needed to be inputted into the system which is consist of the single basic information which is their ID and their faces before the attendance management system. With the Camera we can capture the image of face of the student. In this way the system will detect the presence of a face in the captured image, if there are no face detected, the system will notify to the user to capture their face again until when the certain number of 10 images is required for each student. Then, the images will undergo many pre-processing procedures to obtain a gray scale image and cropped faces of equal sized images because those are the prerequisites of using the Eigen faces Recognizer. Both processing is represented in Fig. 2.



Fig. 2: Face recognition process

VIII. SOFTWARE DESCRIPTION

a. OpenCV

Open CV is an open sources computer vision software library for the uses of machine learning. Open CV was developed to bring the motive of computer vision applications and to stimulate the usage of machine approach in the commercially viable products. It comes with C++, Python, Java and MATLAB and assist Windows, Linux, Android and Mac OS.

b. Pandas

Data analysis gives the diverse tools for the open source package of python. Many varied data formulation tasks are used for package consist of different data structure. A range of methods includes data analysis, python work on data science and machine learning problems. Both basic and complex arithmetic operations and functions are formulated mathematically.

c. Idle

IDLE stands for Python's Integrated Development and Learning Environment. IDLE is running in Python with the help of tkinter GUI toolkit. It works mostly in Windows, Unix and macOS. Input and output code and fault messages are colorized by python shell window. There is a multi-window text editor with multiple undo, Python colorizing, most intent, call tips, accomplishing, and other appearances.

d. Microsoft Excel

It is an application that includes the spreadsheet programs under the Microsoft office suite, i.e. Microsoft excel in figure.5. Both basic and complicated arithmetic operations and functions are

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formulated mathematically, and spreadsheets prompt tables of ethic organized in rows and columns.

IX. RESULT ANALYSIS

The interface for the automatic face recognition based Smart Attendance system has been created. Using the interface, the images of the students present in class is recorded and stored in the training dataset Fig. 3. Simultaneously their information is stored in the database i.e. excel sheet. Finally, the images of the students are being tracked and recognized Fig 4.



Fig. 3: Different folders created



Fig. 4: Students images are matched.



Fig. 5: Students name saved in the students details excel sheet



Fig. 6: This pictures shows how the process is completed

X. CONCLUSION

This paper proposes a new automatic computerized smart attendance system which make use of digital image processing. The system proposed in this paper make use of two techniques, Face detection and Face recognition. The face region in the image is located by the Face detection process and recognition of face is done by face recognition technique. Finally the attendance of the student or individual is marked and record is saved in the file. The proposed system uses the most valuable face recognition method of OpenCV available for attendance management. The resulting system is implemented by make use of LBPH algorithm. The resulting attendance system is very effective in

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marking attendance of students in class that eliminates proxies and reduces time required in taking attendance.

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Surveillance Robot Manual and Automatic

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ABSTRACT

This project involves development of robot for surveillance of human behavior in unfavorable physical conditions. The robotic surveillance vehicle works as manually controlled and independent vehicle by using internet communication medium. This robot contains multisensors that detects presence of enemy capture in camera and provide live streaming to the authorized person. **Keywords:** Robotic vehicle, cameras, surveillance

I. INTRODUCTION

In today's world, when we need to secure anything, surveillance is major thing. People are getting bored so it may be risky to observe all things needed to make a robot. This robot vehicle can detect and provide live streaming of it to an authorized person. The work will become easy and more accurate because of technological demands and proper monitoring. The project implementation resolves the problem of replacing humans to surveillance the robot to reduce loss of human resources. Robots are generally small in size, so that they are capable to enter in tunnels, mines and small holes in building and also have capability to survive in harsh and difficult climatic conditions for life long time without causing any harm. Military robots were designed from very short time. Nowadays, majority of systems uses a mobile robot and a camera for surveillance. The camera mounted on the robot can move to different Locations. These types of robots are more flexible than the fixed cameras. Mostly used surveillance robots are wheel robots. The Wheel based robots are more suitable for flat platform detection. With the development in facilities of wireless communication and internet, the videos captured by wheel robots can be seen remotely on computer.

II. HARDWARE

The hardware components used for designing this system are -

- 1. Arduino Uno 2 pcs
- 2. Motor driver L298
- 3. IR Blasters
- 4. Wifi camera
- 5. GSM module 900
- 6. Bluetooth module
- 7. Belt for two side
- 8. Wheel 4 (slot for belt)
- 9. Wires male to female and female to female
- 10. Battery 12 volt
- 11. GPS

A. Arduino Uno

Arduino UNO is an <u>open-source component with microcon-</u> <u>troller board</u>. This microcontroller board is equipped with a set of analog and digital <u>input/output</u> (I/O) pins which can be

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interfaced to several <u>expansion boards</u> or shields and other circuits.[1] The microcontroller board has 6 analog I/O pins and 14 digital I/O pins.

The microcontroller board can be supplied power by an external <u>9-volt battery or by</u> a USB cable. It accepts voltages between range 7 volts and 20 volts. So the two Arduino UNO are used in the system- one UNO is used for controlling the robot and the second UNO is used for sending SMS if the robot detects any human being.



Fig. 1: Transmitter Circuit Mine Robo

B. Motor Driver L298

The module L298N Motor Driver comprises of a L298 Motor Driver IC, capacitor, resistors, 78M05 Voltage Regulator, 5V jumper and Power LED in an integrated circuit. The component 78M05 Voltage regulators will enable only when jumper is placed in it.

The internal circuitry will be powered by the voltage regulator and the 5V pin can be used as an output pin to power the microcontroller, if the power supply is equal to or less than 12V. When power supply is greater than 12V, jumper should not be placed. Also a separate 5V should be given via 5V terminal to power internal circuitry.

The ENA & ENB pins are the two speed control pins that are used for Motor A and Motor B, Whereas, IN1 & IN2 and IN3 & IN4 are the direction control pins that are used for Motor A and Motor B.

C. IR Blasters

An IR Blaster is a device that imitates an IR Remote [2] Control in its features. This device is used to control Surveillance Machine with through PC. Commands can be given to the Machine with the help of IR Blasters.

D. Wifi Camera

The Wifi Camera is used to take real time surveillance pictures which are sent by camera through internet and shown to any connected devices.

E. Gsm Module 900

The GSM Module is a GSM Modem (like SIM 900) that is connected to a PCB with various types of output taken from the microcontroller board. For example, RS232 Output to interface immediately with a personal computer and TTL Output (for Arduino 8051 and other microcontrollers). The microcontroller board also contains provisions or pins to attach speaker and mic, to take out +5V or other values of power supply and ground connections. These types of pins vary in their capacity and performance with varying modules.

There are a variety of GSM modules and GSM modem available in market to choose from. In this project we have connected a GSM module or modem to Arduino UNO. Therefore, we can send and receive SMS using Arduino. It is more effective to choose an Arduino UNO compatible GSM Module.



Fig. 2: Circuit Diagram GSM and GPS with Mine Detector

F. Bluetooth Module

Bluetooth is a wireless technology standard that is used to exchange the data between mobile and fixed devices over small

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distances by using UHF radio waves in the scientific, industrial and medical radio bands, from a range between 2.402 GHz to 2.480 GHz, and thus building personal area networks (PANs). Bluetooth technology was originally conceptualized as a wireless alternate to RS-232 data cables. A Bluetooth device, HC-05, is used for wireless communication with other Bluetooth enabled devices (like smartphones). It intercommunicates with microcontrollers using the serial communication, USART. The default settings of the Bluetooth module HC-05 can be altered using certain AT commands.

G. Belts For Two Sides

Belts are used for the two sides.

H. Wheels

Wheels are used as a component is this system.

I. Wires Female To Male And Male To Female

Jumper wires have three versions: female-to-female, male-tomale and male-to-female. The difference between each of the type of jumper wire lies in the end point of the wire. Female wires ends do not have a pin protruding and are used to plug things into. Whereas, Male wire ends have a pin protruding and can plug into things.

J. Battery 12 Volt

A 12 Volt battery is also used as a component in this designed system.

K. GPS

The Global Positioning System or a GPS tracking unit is a navigation device contained by a moving person or vehicle that uses the Global Positioning System to trail device's movements and find out its geographic position.

III. WORKING MODULE

A. Manual Module

In manual module every operation is performed manually.

B. Automatic Module

For making more efficient surveillance systems, two transmission modules, Wi-Fi and Bluetooth are used. The Bluetooth Module is used to intercommunicate with the system by applying commands with the help of an Android Application. Whereas, Wi-Fi is used to transmit the data such as videos and pictures through live field. As the transmission requires more bandwidth, so Wi-Fi is used because it provides more bandwidth for transmission than Bluetooth.



Fig. 3: Mine Robo Circuit



Figure 3: Block diagram of the proposed system

Button	String	Result
Left	L	Left motor backward
		Right motor forward
Kight	R	Lett motor forward
		Right motor backward
Up	F	Left motor forward
		Right motor forward
Down	в	Left motor backward
		Right motor backward
Stop	S	Left motor off
		Right motor off
able 1:1	Instructio	ons programmed to Arduin

Fig. 4: Block Diagram and instructions

The complete system is fractioned into two parts, Wireless Surveillance Robot [3] and User Interface. The User Interface

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is responsible for acquiring the access & commands from user that will be associated to the robot through both Bluetooth and Wi-Fi. The Bluetooth Module is used to perform actions & the Wi-Fi Module is used to get the desired Output of surveillance.

The Controller Interface



Fig. 5: The Controller Interface

System Testing

All the components have been tested and it is seen to be working properly. The robot is active by looking at the red light of the Bluetooth module and green light of the Arduino. During the final testing [4] shown in everything worked as expected. After testing, the wires are soldered to the breadboard for reliability.

Algorithm

Robot

Step1: Initialize the pins, motor driver and L298.

Step2: Arduino communicates serially with L298 at 38400 bps.

Step3: If L298 receives string then process the string to control the motors through motor driver.

Controller

Step1: Firstly pair up the robot with the application, and then enter a key if necessary.

Step2: Next customize buttons according to the strings defined.

Step3: Finally the corresponding string is send when button is pressed.

Camera

Step 1: Firstly the camera is connected to a Wi-Fi network, like a mobile hotspot.

Step 2: Run the application and then view the footage.

IV. CONCLUSION

In conclusion we can say, wireless surveillance robot can for certain be a future market for many security purposes and defense applications like surveillance and wireless security in hot spots, military reconnaissance mission, maneuvering in Hazardous environment or Search and rescue operations. This will be helpful in saving valuable human lives as well as it will cut down the time and resources required for such operations. We can use both Wi-Fi and Bluetooth for the manual control and the transmission of video footage (Depending on the intention of surveillance). Moreover, further enhancements can be included to improve functionality and features of this project, that will further reduce human resources and efforts required.

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Occupancy Counter: A Precaution Against Corona Virus Pandemic

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ABSTRACT

The most current topic prevailing all over the world is the Corona Virus. It has made life of the people more difficult than before. People fear while stepping outside their homes. All the precautions have been taken by them from not being affected by the virus. The most harmful among is handling of the crowd at public places. We use this Room Occupancy Counter for this purpose. It keeps to follow the no. of person in a room or building by increasing a counter when people enter and decreasing the counter when people leave. This can prevent buildings and rooms from being over crowded, which can help to limit the virus spread by making social distancing easier to practice.

Keywords: ARDUINO board, Ultrasonic sensor, 4digit display, Buzzer.

I. INTRODUCTION

A virus named COVID-19 or Corona has become the global health crisis recently. We all are facing very hard times because of this. The spread of COVID-19 is increasing rapidly day by day so it is very difficult for everyone to go out for their respective work and offices and other public places. It has affected the health of people very much and one must be careful about this. Though we cannot trust anyone on this because this disease is very fatal So the way for limiting the spread of this pandemic Covid-19, is to maintain social distancing.

The aim is to turn down the spreading cases through carrying and retarding the widespread peak. Social distancing is a way of keeping distance with other person. It has been recommended that there is a marked reduction in carrying of most flu virus strain like COVID-19 while maintaining a distance of approx. 2m from another person. In practice, this means that by staying away from other people will help out to slow down the extend of contagious disease.

The Corona virus pandemic is a bigger problem and practicing social distancing or staying away from others is especially important. However, it is hardt to do in surrounded and crowded areas. Here , the Occupancy Counter can help. It keeps to track the arrival and departure of the no. of persons into the room by increasing a counter when people enter and decreasing the counter when people leave. In this project, LCD display is used to display the no. of persons. Once the number of people in an area exceeds the maximum number of people allowed (which can be set by the user), an alarm will go off until the number of people is within bounds again. This can prevent places from being over crowded, which can help to limit the virus spread by making social distancing easier to practice

II. METHOD AND MATERIAL



Fig. 1: Block Diagram of Room Occupancy Counter

III. MATERIALS REQUIRED

1. ARDUINO NANO Board:

The ARDUINO NANO is a micro-controller board. It is based on Atmega 328. It is having an operating voltage of 5V and the input voltage changes from 7V to 12V. It comprises of 14 digital pins, 8 analog Pins, 2 Reset Pins & 6 Power Pins. It has a crystal oscillator of frequency 16 MHz. It is used to maufacture a clock of precise frequency using constant voltage. It doesn't have DC power jack.



Fig. 2: Arduino NANO

2. Ultrasonic Sensor:

HC-SR04 Ultrasonic sensor is 4 pin module named as- VCC, Trigger, Echo and Ground respectively. This sensor is used to detect the distance of the object from the obstacle. Ultrasonic transmitter sends the ultrasonic wave in air and when it reflects back towards the sensor, the this reflected back wave is observed by this module.



Fig. 3: Ultrsonic Sensor

3. TM1637 4-Digit Digital Display:

TM1637 DISPLAY module comprises of four 7- segment displays working together used for displaying numbers and It has named 'TM1637 display' because the module working is based

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on 'TM1637' IC present internally. It is a four -terminal device. It consists of four pins- VCC, GND, DIO, CLK.



4. Buzzer

A Buzzer is an audio signal device. It is used in alarm devices, timers, etc.



Fig. 5 : Buzzer

IV. RESULTS AND DISCUSSION



Fig. 6 : Circuit Diagram of Room Occupancy Counter

V. WORKING

Two ultrasonic sensors are used for detecting the person's entry and exit movements through the door. The VCC pin of both sensors are given power supply and Trigger, Echo pins are input and output pins connected to digital pins of ARDUINO NANO, which will produce an output required according to the input condition given. The 4 digit digital display used to display the count of persons entering into the room, the clock pin and data input output pins are connected to the digital pins of ARDUINO. The buzzer is also added in the circuit for alerting the person to be stopped as it reaches to maximum limit. the positive pin of buzzer is connected to D9 pin of ARDUINO NANO and negative pin is connected to the GND. As soon as, the limit of person in the room reaches upto maximum, the buzzer will start beeping.

VI. CONCLUSION

This project helps to track of how many people enter and exit a room, and alerts them if there are too many people and protect the persons from corona virus. This project can prevent buildings and rooms from being over crowded, which can help to limit the virus spread by making social distancing easier to practice and helps the society to break the chain of COVID-19.

VII. FUTURE SCOPE

Maintaining occupancy limits for social distancing in a commercial setting is a crucial benefit that people counting solutions are providing in the current climate However, the adoption of this measure not only serves as a crisis plan for a future pandemic or epidemic but also provides a range of benefits that your business can take advantage of in the long term.

Currently, and going forward, workplaces have adopted people counting technology to assist with the requirements of enhanced hygiene and social distancing in order to help protect and make employees feel safe when they are returning back to the work. We can add various loads depending on applications such as fans, tube lights, A/C, kitchen exhausters, heater etc, by using circuit and proper power supply .

We can achieve a task of opening and closing the door by modifying it.

We can achieve a task of automatically sanitizing people entering in the room by modifying it.

Expansion of cameras through with considering the picture can be put away accurately.

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Water Automation for Hydroponic Pot

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ABSTRACT

Water is the most essential boon to mankind. There is no life without water. Everyone understands its requirement where water is not easily available. In manual systems, people are used to check the water level of the tank. The free use of water leads to the wastage of water and cause water scarcity. Water automation is the technique in which the flow of water can be controlled automatically. The basic goal of water automation is to confirm the proper usage of water and reduces human attempts. It is used in various fields like irrigation in agricultural sector, water pump controlling in domestic and commercial use. 'Water Automation for Hydroponic Pot' basically in hydroponics, plants are grown with water instead of soil. In this particular project, 555 timer IC and relay is used to perform the functioning of water pump. Three wires are submerged in water pot in which two wire specify two levels - high & low level and the third one is +VCC i.e. +12V. When the water level reduces, it will automatically start filling the water into the pot until it reaches to the top level. After reaching at the top, the pump will get stop.

Keywords: Water, a Water pump, 555 timer IC, Relay.

I. INTRODUCTION

Hydrponics is the system of extending the plants with the help of water instead of soil. This system rises rapid growth & superior quality. When the plants are expanding, its roots are continuously searching for the water and nutrition to support the plant. If the plant's root is directly susceptible to water and food, then the plant doses not have to push any energy in encouraging itself. Hydroponic creations have proven that it is more effective to directly expose the plants to nutrient -filled water and considered to be the unique method of growth than traditional irrigation.

The objective of this project is to growing plants using water automatically and reduces the cost .The water automation for Hydroponic pot is designed on the basis of the water automation process.in this project, 555 timer IC & relay are used to perform the working of water pump to control the level of water. Three wires are dipped in water pot out of which two wires specify two levels - high and low level and the third one is of +12V. It is the property of 555 timer IC that the output will increase only when the output voltage of triggered pin is less than of 1/3 of VCC. It works in such a manner that when the water level falls, 555IC provides the high output which will trigger the relay coil and LEd starts to glow and simultaneously water is to be filling in the pot, whereas when the water rises upto high level, 555 IC provides the low output and reset the flipflop in IC due to which signal on relay is cutoff and pump will get stop.

II. METHOD AND MATERIAL



Fig. 1: Block Diagram of Water automation for Hydroponic Pot

III. MATERIALS REQUIRED

1. NE555 Timer IC

The NE555 IC is an intergrated circuit which is used for timers , delay , pulse generation and oscillator uses. It is 8-pin IC

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confuigred in dual -in-package (DIP-8). 555IC works on three operating modes - monostable, astable and bistable mode.



Fig. 2: NE 555 Timer IC

2. Relay

A relay is an electrically operated switch. It has five terminals - Com(Movable Contact), Coil terminals, Normally Operated(NO) and Normally Closed (NC).



Fig. 3: Relay

5. Water pump

A water pump is a device for circulating or moving the water. Some uses of water pumps include:- Obtaining water from ground wells for drinking, cooking, and other purposes.



Fig. 6 : Water Pump

IV. RESULTS AND DISCUSSION



Fig. 8: Water Automation for Hydroponic pot

3. Transistor

Transistor is an electrically controlled device. The BC547 is a NPN transistor means when power is applied to base , it will flow from the collector to the emitter. NPN transistors are used to "switch ground" on a device i.e. they are placed after the load in a circuit.



Fig 4: Transistor

4. Diode

1N4007 is a rectifier diode which are needed to convert AC to DC .It can pass current of up to 1A, and have a peak inverse voltage (PIV) rating of 1,000V.



Fig. 5: Diode

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V. WORKING

In this project, 555 timer ic and relay which is used here to control the flowing of the water through the pump. It is the property of 555IC, the output will increase only, the voltage at the triggered pin is less than 1/3 of VCC. In this particular project, three wires are submerged in the pot, two of which specify the level - high and low level and the 3^{rd} one wire is of +12V. It works in such a way when the water level falls i.e. the pot gets empty, then the high output of 555 will be obtained due to which LED blinks and it triggers the relay through which pump is connected and the water starts filling the pot. When the water level goes high i.e. pot is completely filled then the low ouput of 555 IC will be obtained which reset the flip-flop in the IC due to which it stops the flowing of water through pump.

VI. CONCLUSION

This project presents an automatic water level control in the functioning of the proper growth of Hydroponic plants. Experimental work has been carried out carefully.

Hence, we are controlling water pump level in which NE555 timer ic and relay are used for the functioning of the water pump. All the inherent parts of the circuit performed consistently. It helped us to come out with good judgement.

VI. FUTURE SCOPE

Hydroponic is the fastest growing sector of agriculture and it could be very useful for thr food production in the future. As the population is increasing day by day, people shift their focus on new technology like Hydroponics and Aeroponics to feed the Nation.

Automatic water level monitoring system has a good scope in future especially for agriculture sector. There are any areas where we need water level controller. It could be agricultural fields, overhead tanks. We can make this project wireless by using NRF transmitter and receiver.

The sytem can be further modified using IOT technology and by adding more nutrients to the pot through fertilizers i.e. NPK for the excessive growth of plants.

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Robotic Arm to take Sample of Infected Person for COVID-19 Test

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ABSTRACT

A Robotic arm is fabricated and kinematic analysis of the fabricated robotic arm is presented in the paper. The Robotic Arm which we have fabricated can be used to take sample for covid-19 patient. The main purpose of our project is taking sample of covid-19 patient without physical contact. An electric robotic arm is mainly consisting of servo motor, dc gear, pcb, end effector, flex sensor, accelerometer, battery and Arduino uno etc. These all are the parts used in assembling of robotic arm. In this robotic arm all parts are connected with each other. Firstly, we send the signal from left hand with the help of flex sensor, the dc gear will move the hand vertical as well as horizontal direction, by the help of these steps we can do different task according to our requirement. This system can be used by devices like tablets and smart phones to control the functioning of robotic arm because of the programming of Arduino uno in it. It has many advantages such as it is easy to move, less maintenance, low cost, and eco-friendly with the environment.

Keywords: Robotic arm, displacement analysis, regression analysis.

I. INTRODUCTION

A Robot is a self-controlled programmable device consisting of electronic, electrical, and mechanical units. For some work functions, robots are extremely useful because they never get tired, unlike humans. Repetition does not bore them, and they cannot be separated from the task at hand. Robots is derive from the word Czechoslovak. robata or Robotnik which meaning is slave, servant, or labour, in 20th entury actual word Robot was invented. Early industrial robots treated radioactive material in atomic laboratories and were named master / slave manipulators. They were connected together with attached directly and steel cables. Current robots have complex sensory systems that transmit data and appear to act as if they have brains. In fact, a form of computerized artificial intelligence is their "brain" Current robots have sophisticated sensory systems that process data and seem to function as if they have brains. In reality, their "brain" is a type of computerized artificial intelligence.

Objectives of the paper

- 1. Fabrication of electrical controlled robotic arm.
- 2. Displacement analysis of robotic arm.
- 3. Kinematic analysis of robotic arm.

II. MATERIALS AND METHODOLOGY

The mechanical structure of the robotic arm includes of a robot manipulator that reproduces the action of the human arm. In particular, the robotic arm system consists of joints, actuators, sensors and controllers. One end of the link is connected to the root base to form the kinematic chain and the other end is connected to the hand gripper and end effector.

(a) Servo Motor-

The servo motor is a rotary actuator or linear actuator that precisely controls the angular or linear position, velocity and acceleration.



Fig. 1: Servomotor.

(b) Flix Sensor

A Flex sensor is a sensor that measures the amount of deflection or bending.



Fig. 2: Flix Sensor.

(c) Accelerometer

It is an electromechanical tool used to calculate the forces of acceleration. Like the continuous forces of gravity, such forces can be static.



Fig. 3: Accelerometer

(d) Endeffector

It is use to grip or hold something; it connects with the servo motor processing.

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Fig. 4: End effector.

(e) DC Gear Motor

A Gear drive is an all-in-one arrangement of an engine and a gearbox. Adding a gear head to a motor decreases the velocity while increasing the output of the torque.t



Fig. 5: DC Gear Motor.

III. RESULTS

Robotic arm structure is consisting of gripper, base and elbow assembly. The robotic arm is capable to locating the replacement parts of robot. As a whole, it is easy to assemble and manage machinery. Robotic Arm Material required according to Mechanical characteristics like toughness, density, strength and others. Because of the low -density feature and affordable cost PVC Plastic was chosen to build the structure.



Fig. 6: Robotic Arm

In the robotic arm, which is relation 1, relation 2, relation 3, there are 3 degrees of freedom, These attachments to the robotic arm also make movement more flexible.

1. Regression Analysis

FOR X-AXIS



Fig. 7: Practical analysis in x direction

FOR Y-AXIS

In this graph we have changed certain things such as angle and we have taken different different direction in x axis and as well as in y direction.



Fig. 8: Practical analysis in Ydirection

IV. CONCLUSION

The project first goal was to develop a working electrically operated robotic arm is able to sense pick and position. The idea of a functioning robotic arm that is electrically operated with the ability to perform various functions. The Robotic arm Fabricated successfully and it was able to there all function. The robotic arm overall successful rate for properly executing its function was 70%. The second objective of the project is to do the Kinematic analysis of the arm. To Know the input and output parameter relations. Thirdly The calculations of Robotic arm is compared practically as well as theoretically among different links.

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Experimental Investigations on Squeeze Casting of Brass Alloy

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ABSTRACT

In present research an experimental investigation was performed to study the influence of squeeze casting parameters on hardness and surface roughness of IS319 (BS 249) brass alloy. The parameter studied includes squeeze pressure, temperature of die, squeeze time and temperature at which metal is poured of casting material. Experimentation and analysis were performed using Taguchi method. The optimum squeeze casting parameters for obtaining best values of quality characteristics of brass castings were found. Comparison of producing brass alloy casting was also performed between squeeze casting, gravity die and sand casting process. Results of present investigation claim the suitability and proposing great scope for processing IS319 brass alloy using squeeze casting method.

Keywords: Squeeze casting, Brass alloy, Taguchi method, Hardness, Surface roughness

I. INTRODUCTION

Squeeze casting is a modern casting technique compared to conventional sand casting process, which dates back to around 2000-3500B.C.[1]. Squeeze casting (SC) is a common term for describing a manufacturing technique where solidification is encouraged under high pressure inside a reusable die. It is a metal forming technique that incorporates permanent mould casting with die forging into a single process in which molten metal is solidified under hydrostatic pressure. [2]. Squeeze casting is also known as a manufacturing route for net or close net-shape. The near net shape output potential of the squeeze casting process needs to generate the part that can be used in services immediately and does not combine expensive secondary processes such as machining, polishing, shot blasting, plating and ball burnishing. [3].

Dong et al. [4] examined the effects of iron and strontium additions on squeeze cast LM25 alloys by comparing results of gravity cast specimens with a top poured squeeze casting. Maeng et al.[5] The effect of processing parameters on the microstructure and mechanical properties of the modified direct squeeze casting B390 (Al) alloy was investigated using the heat transfer analysis commercial finite volume method code and MAGMA soft for cooling curves. For an unique applied pressure in this model, the heat transfer was deemed constant. An attempt was made by Raji and Khan [6] Effects of squeeze parameters on the characteristics of squeeze castings and ideal parameters for the development of Al-Si alloy squeeze castings. The effect of process parameters on the mechanical properties of process parameters was the subject of Vijian and Arunachalam[7]. LM24 aluminium castings produced using squeeze casting. Maleki et al.[8] examined the effects of applied pressure, melt temperature and die temperature on the microstructure of squeeze cast LM13 alloy. In order to compare cast microstructures and mechanical properties of aluminum silicon alloy components cast by various means, Raji[9] conducted a report. For this reason, sand casting, chill casting and squeeze casting methods were used to manufacture related articles of the same shape and scale from an Al-8 percent Si alloy. From Fan et al. [10] studied the impact of casting temperatures on the squeeze-cast Al-Zn-Mg-Cu alloy's microstructure and mechanical properties. Lus [11] The effect of casting parameters on the microstructure and mechanical properties of the A380 aluminium die cast alloy squeeze cast was examined. Senthil and Amirth agadeswaran[12] carried out A study in which an attempt was made to prepare non-symmetrical part AC2A aluminum alloy castings by means of a squeeze casting process. Souissi et al. [13] established In a squeeze casting 2017A (wrought aluminium alloy) using the Taguchi system,

the relationship between the ultimate tensile strength, hardness and process variables. Senthil and Amirthagadeswaran[14] To refine the squeeze casting process to obtain high-quality AC2A aluminium alloy castings, experimental research was conducted. Yang [15] investigated the effect of casting temperature on the properties of cast aluminium and zinc alloys by considering two casting processes, Gravity casting and Squeeze casting. Yang [16] In squeeze casting and gravity casting of aluminium (LM6) and zinc (ZA3) alloys, the impact of solidification time has been experimentally investigated. Li et al. [17] An attempt was made to investigate the effect of particular pressure on the microstructure and mechanical properties of the ZA27 alloy squeeze casting. Aweda and Kolawole [18] Calculate the output of permanent steel moulds during the squeeze casting of aluminium and brass alloys for temperature control. Goh et al. [19] Research the effect of the parameters of squeeze casting on the mechanical properties of alloys of AZ91-Ca Mg. Vijian and Arunachalam [20] An experimental study of squeeze gunmetal casting was performed. An attempt was made by squeeze casting to prepare solid and hollow components of commercially pure bronze and to examine the resulting mechanical properties and structure of the grain. Lokesh et al.[21] studied of characteristics of Metal matrix composites (MMCs) using squeeze casting method. Sukumaran et al. [22] performed studies on squeeze casting of Al 2124 alloy and 2124-10% SiCp metal matrix composite. Aluminium 2124 alloy and its composite with 10% SiC particles of average particle size of 23 µm were squeeze cast at different pressures. Ravi kumar et al. [23] optimized the squeeze casting parameters for casting of AC2A Ni coated SiCp composite using Taguchi technique. Tirth et al. [24] The effect of squeeze pressure on aging and mechanical properties of AA2218-5 wt Pct Al2O3(TiO2) composites was investigated and indicated that there was a reduction in cell size and porosity with the application of squeeze pressure during casting of melt-particle slurry in the pressure range from 100 to 220 MPa. The ductility of the composites has also been increased across 14 pressure levels.

The literature shows that The main research work was performed on the squeeze casting of Al, Mg, Zn alloy and metal matrix components. Very little work on the castability of the copper-based alloy has been done. Due to its strength and corrosion resistant properties and also having strong castability, brass is commonly used in engineering applications. Most importantly, plumbing fittings, pressure valves, gears and bushes are produced using brass (IS-319) alloy. These components are generally produced using sand casting and die casting processes. Capability of casting IS-319 (BS 249) brass alloy using squeeze casting process needs to be addressed.

In this report, research was carried out on casting brass (IS-319) alloy using the squeeze casting process. In order to ensure the capability of producing near-net shape brass (IS-319) casting using the squeeze casting technique, this investigation was necessary. Parameters of the most dominant squeeze casting method, such as squeeze pressure, die temperature, squeeze time and pouring temperature, are highly affected by the quality of squeeze cast

components. Proper control of these parameters is essential for obtaining better results of quality characteristics of castings. In present research work optimum values of squeeze casting process parameters were obtained using Taguchi Method

1.1 Objectives

For brass castings, to decide the best squeeze casting parameters to achieve maximum hardness and better surface finish.

II. METHODOLOGY

Following methodology steps (Fig. 1) have been planned to perform this research work:



Fig. 1 : Steps of methodology planning

2.1 Taguchi Design of Experiment Method

Taguchi method is a set of experimentation techniques based on statistical principles and utilizing engineering knowledge developed by Japanese quality expert, Dr. Genichi Taguchi]. For the experiment with "optimum settings" of control parameters, he developed a method based on "Orthogonal Array" experi-

ments that gives much reduced "variance". Orthogonal arrays are unique factor setting structures typically used in the design of experiments to achieve the maximum amount of data by using the least number of experiments.. Before selecting a particular OA to be used for conducting the experiments, the following two points must be considered [26].

- The number of parameters and interaction of interest.
- The number of levels for the parameters of interest.

The number and level values of process parameters have already been defined and are given in Table 1.

In order to limit the analysis, it was agreed not to analyze the relationship between the parameters in the second order. Each three level parameter has 2 degrees of freedom (DOF) (level-1 number), the total DOF needed for four parameters is 8 = 4x(3-1)] at three levels each. The total DOF, as per Taguchi's form,

Control factors	Designa- tion	Level 1	Level 2	Level 3
Die Pressure (MPa)	А	80	120	160
Die Temperature (°C)	В	50	100	150
Pouring Tempera- ture (°C)	С	900	950	1000
Squeeze Time (sec- onds)	D	15	30	45

Table 1: Factors and their levels selected for research work

Experiment No.	Die Pressure (MPa)	Die Temper- ature (°C)	Pouring Tem- perature (°C)	Squeeze Time (seconds)
1	1	1	1	1
2	1	2	2	2
3	1	3	3	3
4	2	1	2	3
5	2	2	3	1
6	2	3	1	2
7	3	1	3	2
8	3	2	1	3
9	3	3	2	1

Another definition of the Taguchi method is the S/N ratio, which is the critical component of the parameter design of Taguchi since its equation is related to the understanding of the ratio signal or numerator as the capacity of the process to create a successful product or to properly perform the process. The term signal reflects the desired target and the undesirable value is represented by noise. The greater value of the S/N ratio is desirable because the greater S/N ratio contributes to a smaller variation of the product around the target value. The level with the highest S/N ratio is therefore known as the optimum control factor level. You may divide the S/N ratios into three categories[27]:

Larger the better-

$$\frac{S}{N} = -10 \times \log_{10} \left\{ \frac{1}{n} \sum_{i=1}^{n} \frac{1}{Y_i^2} \right\} \qquad \dots (1)$$
$$\frac{S}{N} = -10 \times \log_{10} \left\{ \frac{1}{n} \sum_{i=1}^{n} Y_i^2 \right\} \qquad \dots (2)$$

Where **n** is the number of measurements and Y_i is the observed characteristic value.

Nominal the best-

N

$$\frac{S}{N} = 10 \times \log_{10} \left(\frac{\mu^2}{\sigma^2} \right) \qquad \dots (3)$$

Where μ (Mean) = $\frac{1}{n} \sum_{i=1}^{n} Y_i^2$; $\sigma^2 = \frac{\sum_{i=1}^{n} (Y_i - \sigma)^2}{(n-1)}$

 $\mathbf{n} = No.$ of observations; Y is the observed data; S/N unit: dB

Analysis of the variance (ANOVA) was used to determine the influence and relative importance of the selected parameters on the desired quality characteristics i.e. hardness and surface roughness of brass squeeze castings. The equations and terms related to ANOVA(such as Correction factor (C.F.), Total sum of squares (SS_{n}) , Sum of squares due to a parameter (SS), Error sum of squares, Mean square or variance (V), F-ratios) presented in literature [25][26]were used to analyze the obtained experimental data.

III. EXPERIMENTATION

For this research work, IS319 (BS249) brass alloy was used for casting. The configuration of IS319 is presented in Table 3. Metal die of tool steel was used for casting purpose (shown in Fig. 2). Hydraulic power press was used to apply the pressure for squeezing the molten metal in the die (shown in Fig. 3). Resistance furnace was used for melting the brass alloy and muffle furnace was used for pre-heating the die. After degassing, molten brass was poured in pre heated die and squeeze pressure was applied and maintain according to the parameters values given in experimental design table (Table 4). After solidification, castings were removed from the die and allowed to cool in atmospheric air in the foundry shop. The step by step procedure for obtaining brass casting using squeeze casting process is presented in Fig. 4.

Vicker hardness tester (VM 50PC make- FIE, India) was used to measure the hardness of obtained squeeze cast components as shown in Fig.5. As per the standards (ASTME 92-82; 2003), a load of 5 kgf was applied for duration of 10 seconds. The hardness measurements were obtained using Vicksys computer software directly interfaced with the testing machine.

Surface roughness of the squeeze casting components was measured using a surface roughness tester (SJ-201P) of Mitutoyo Corporation, Japan (Fig. 6). The tests were performed on the basis of the ISO-4287 norms with The average Ra value, which

is defined as the arithmetical mean of the roughness profile deviations along the measurement from the central line. Average of three observations was obtained for each experiment.

 Table 3: Composition of IS-319 Brass Alloy (wt%) used in experimental work

Element	Copper	Zinc	Lead	Iron	Total imp excl. iron
Percentage %	56.69	39.38	3.02	0.26	0.65



Fig. 2: Metal die used in research work



Fig. 3 Hydraulic power press used to squeeze the molten metal



Fig. 4: Step by step procedure for obtaining brass casting using squeeze casting process



Fig. 5: Computerize Vicker hardness tester used in research work



Fig. 6: Surface roughness tester used in research work

IV. RESULTS AND DISCUSSIONS

4.1 Effect of squeeze casting parameters on hardness

The average values of hardness and their corresponding S/N ratio computed after experimentation are presented in Table 4. The

higher -the- better S/N ratio was used to analyze the hardness of obtained castings. The mean values of computed S/N ratio of hardness for each factor at levels 1,2, and 3 are presented in Table 5. The mean of the S/N ratio at each level of various parameters were used to draw the main effect plots. The main effect plots of hardness are shown in Figs. 7 (a - d). It is clear from the figures that the maximum values of computed S/N ratio are observed at the levels of the factors A1, B2, C3 and D1 and these levels are considered as the optimum levels for obtaining maximum values of hardness of brass castings using squeeze casting process. Correspondingly, optimum conditions within the selected parameter values were found as die pressure (80MPa), die temperature (100°C), pouring temperature (1000°C) and squeeze time (15 Sec). In order to determine the significance and contribution of parameters, ANOVA was performed for hardness.

Table 6 shows the results of ANOVA based on S/N ration computed for hardness. From the F- distribution table [27] in relation to present case, $F_{0.05}$ at 95% confidence level, it wasfound that the all parameters of squeeze casting selected in present research had a significant effect on the hardness. Among all parameters, pouring temperature was found to be the most significant squeeze casting parameter due to the highest percentage contribution (61.799%), next significant factor was die temperature having a percentage contribution of 30.312%. Percentage contribution of die pressure and squeeze time was 4.486% and 2.837% respectively (Fig.8).

The results of the current investigation show that because squeeze pressure is the important parameter, the effect of pouring temperature and die temperature has more influential parameters on the hardness acquisition using the squeeze casting method. Ghomashchi and Vikhrov[2] also claimed that the most dominant process parameters of squeeze casting process are die temperature and pouring temperature, and superheat, although the level of applied pressure is also important. The hardness results are also supported by the microstructures obtained from all castings. The microstructure of castings obtained at pouring temperatures 900, 950 and 1000°C at 80 MPa die pressure shown in Figs.9 a ,b and c respectively show that fine grains obtained with the increase in pouring temperature, which consequently increase the hardness. Similar results are obtained at 120 MPa (Figs.9 d-f) and 160 MPa (Figs.9 g-i). Microstructures also showed no deficiencies in all experimentations and claimed the potential suitability of processing of brass alloy using squeeze casting process.

 Table 4: Experimental results of hardness and corresponding S/N ratios

Experi-	Die	Die	Pouring	Squeeze	Harc	lness
ment	Pres-	Temp.	Temp.	Time	Mean	S/N
number	sure (MPa)	(°C)	(°C)	(sec)	(HV)	ratio
	(IVII a)					(dB)
1	80	50	900	15	184.33	45.28
2	80	100	950	30	199.33	45.99
3	80	150	1000	45	191	45.61

4	120	50	950	45	190	45.49	
5	120	100	1000	15	209	46.39	
6	120	150	900	30	167.67	44.43	
7	160	50	1000	30	198	45.92	
8	160	100	900	45	178	44.98	
9	9 160 150 950 15 180.33 45.11						
overall mean of hardness = 188.63 HV overall mean							
of corresp	onding S	S/N valu	e = 45.47 o	iΒ			

Table 5: Response Table for S/N ratio for hardness

Level	Die Pres- sure	Die Tem- perature	Pouring Tempera- ture	Squeeze. Time
L1	45.62	45.56	44.89	45.59
L2	45.43	45.78	45.53	45.44
L3	45.33	45.05	45.97	45.36
Δ (max – min)	0.29	0.73	1.08	0.23
Rank	3	2	1	4
III2 and I3 rer	recent aver	age S/N value	e at levels	1.2 and 3

L1,L2 and L3 represent average S/N values at levels 1,2 and 3 respectively

*The optimum levels of the control factors are presented in bold.











(d)

Fig. 7 (a-d): Main effect plots based on S/N ratio for hardness

Table 6 Result of ANOVA for Hardness									
Sym- bol	Factors	DOF (D)	Sun of Squares (ss)	Variance (V)	Cor- rected sums of squares (ss')	Contri- bution (P %)	Rank		
Α	Die Pres- sure	2	0.13	0.065	0.1268	4.486	3		
В	Die Temp.	2	0.86	0.43	0.8568	30.312	2		
С	Pouring Temp.	2	1.75	0.875	1.7468	61.799	1		
D	Squeeze Time	2	0.08347	0.041735	0.08027	2.837	4		
Error		2	0.0032	0.0016		0.566			
Total		10				100			



Fig. 8 Percentage contribution of parameters for Hardness

4.2 Effect of squeeze casting parameters on surface roughness

The average values of surface roughness and their corresponding S/N ratio computed after experimentation are presented in Table 7. The lower-the- better S/N ratio was used to analyze the surface roughness of obtained castings. The average values of surface roughness and their corresponding S/N ratio computed after experimentation are presented in Table 7.

 Table 7 Experimental results of surface roughness and corresponding S/N ratios

Ex- peri-	Die Pres-	Die Tem-	Pouring Tempera-	Squeeze Time	Surface ro (µm	ughness 1)			
ment num- ber	sure (MPa)	perature (°C)	ture (°C)	(sec)	Mean	S/N ratio			
						(dB)			
1	80	50	900	15	2.42	-7.9			
2	80	100	950	30	2.35	-7.4			
3	80	150	1000	45	2.28	-7.2			
4	120	50	950	45	1.75	-4.9			
5	120	100	1000	15	1.80	-5.1			
6	120	150	900	30	2.30	-8.02			
7	160	50	1000	30	2.05	-6.23			
8	160	100	900	45	2.40	-7.6			
9	160	150	950	15	2.97	-9.9			
overall n	overall mean of surface roughness = 2.25 overall mean of corresponding S/N value = -7.13 dB								

The mean values of computed S/N ratio of surface roughness for each factor at levels 1,2, and 3 are presented in Table 8. The mean of the S/N ratio at each level of various parameters are used to draw the main effect plots. The main effect plots of surface roughness are shown in Figs. 10 (a - d). It is clear from the figures that the maximum values of computed S/N ratio are observed at the levels of the factors A2, B1, C3 and D3 and these levels are considered as the optimum levels for obtaining maximum values of surface roughness of brass castings using squeeze casting process. The optimum conditions within the selected parameter values were found as die pressure (120MPa), die temperature (50°C), pouring temperature (1000°C) and squeeze time (45 Sec).

Level	Die	Die	Pouring	Squeeze	
	Pressure	Temperature	Temperature	Time	
L1	-7.5	-6.34	-7.84	-7.63	
L2	-6	-6.7	-7.4	-7.21	
L3	-7.91	-8.37	-6.17	-6.56	
Δ (max–min)	1.91	2.03	1.67	1.07	
Rank	2	1	3	4	
L1,L2 and L3 represent average S/N values at levels 1,2 and 3 respectively					

Table 8 Response Table for S/N ratio for surface roughness

*The optimum levels of the control factors are presented in bold.











Fig. 10 (a-d): Main effect plots based on S/N ratio for surface roughness

Table 9 shows the results of ANOVA based on S/N ration computed for surface roughness. From the F distribution table [27] in relation to present case, $F_{0.05}$ at 95% confidence level, it is found that the all parameters of squeeze casting selected in present research have significant on the Surface roughness. Among all parameters, die temperature was the most significant squeeze casting parameter due to the highest percentage contribution of 36.41% (Fig.11). Die pressure having the percentage contribution of 31.12%. Percentage contribution of pouring temperature and squeeze time are found to be 23.13% and 8.81% respectively. The application of high pressure on solidifying material tends the casting material to flow closely with the die surface which results better surface finish of cast components.

Pure sum Contri-Control (DOF) Sum of Rank Sym-Variance bol Factor squares of squares bution (V) (SS) (SS') (P %) Die Pres-2 6.02 3.01 6 31.12 2 Α sure В Die 2 3.52 7.04 7.02 36.41 1 Temp. 2.24 С Pouring 2 4.48 4.46 23.13 Temp. 3 D 2 1.72 0.86 0.82 8.81 4 Squeeze Time 2 0.02 0.01 0.53 Error 10 100 Total Die pressure 8.81 31.12 ∎ Die 23.13 Temperature Pouring

Table 9 Result of ANOVA for surface roughness



36.41

Temperature

Squeeze Time

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4.3 Confirmation Test

The confirmation test is recommended for the verification of experimental conclusion. Confirmation test was performed using the obtained optimum parameters and compared with the predicted value of quality characteristic. The predicted values of quality characteristics (hardness and surface roughness) were obtained using equation number 4.

$$\left[\frac{S}{N}\right]_{predicted} = \left[\frac{S}{N}\right]_{m} + \sum_{i=1}^{n} \left(\left[\frac{S}{N}\right]_{i} - \left[\frac{S}{N}\right]_{m}\right) \qquad \dots (4)$$

Where $[S/N]_m$ is the total mean S/N ratio; $[S/N]_i$ is the mean S/N ratio at the optimal level, and **n** is the number of the main design parameters that affect the quality characteristics. Table 10 shows the predicted and experimental values of hardness and surface roughness obtained in confirmation test.

Table 10 Predicted and experimental results obtained in confirmation test

	Optimum param- eters	Predicted value	Experimental value	
Hardness	Die pressure - 80MPa	212.5 HV	211.33 HV	
	Die temperature - 100°C			
	Pouring tempera- ture- 1000°C			
	Squeeze time -15 Sec			
Surface roughness	Die pressure - 120MPa	1.52 µm	1.49 µm	
	Die temperature - 50°C	·		
	Pouring tempera- ture- 1000°C			
	Squeeze time -45 Sec			

From Table 10, it is found that the estimated values of surface roughness and hardness of casting obtained using squeeze castingare close to the experimental values and hence the obtained experimental results (optimum factors and their levels obtained from the experimentation) are confirmed.

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Challenges of Corona Vaccination in India

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ABSTRACT

Corona viruses are a large group of viruses known to cause illnesses that vary between the common cold and more severe diseases to include severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). A novel corona virus was identified in December 2019 in Wuhan city, Hubei province, China. This virus represents a new strain that has not been previously identified in humans. The virus is now known as the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) and the resulting disease is called corona virus disease 2019 (COVID-19). The World Health Organization (WHO) declared the novel corona virus outbreak a global pandemic in March 2020. Despite rigorous global containment and quarantine efforts, the incidence of COVID-19 continues to rise, with more than 1,948,617 laboratory-confirmed cases and over 121,846 deaths worldwide. Currently, no specific medication is recommended to treat COVID-19 patients. However, governments and pharmaceutical companies are struggling to quickly find an effective drug to defeat the corona virus. In the current review, I summarize the existing state of knowledge about COVID-19, available medications, and treatment options and the challenges of corona vaccination.

I. INTRODUCTION

The **COVID-19 pandemic in India** is part of the worldwide pandemic of corona virus disease 2019 (COVID-19) caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The first case of COVID-19 in India, which originated from China, was reported on 30 January 2020. India currently has the largest number of confirmed cases in Asia, and has the second-highest number of confirmed cases in the world after the United States with more than 10.3 million reported cases of COVID-19 infection and more than 150,000 deaths as of January 06, 2021 The per day cases peaked mid-September in India with over 90,000 cases reported per day and have since come down to below 40,000 in December.



On 12 January 2020, the WHO confirmed that a <u>novel corona</u> <u>virus</u> was the cause of a respiratory illness in a cluster of people

in Wuhan, <u>Hubei</u>, China, which was reported to the WHO on 31 December 2019.

On 30 January, India reported its first case of COVID-19 in Kerala, which rose to three cases by 3 February; all were students returning from <u>Wuhan</u>. Apart from these, no significant rise in transmissions was observed in February. On 4 March 22 new cases were reported, including 14 infected members of an Italian tourist group. In March, the transmissions grew after several people with travel history to affected countries, and their contacts, tested positive. On 12 March, a 76-year-old man, with a travel history to Saudi Arabia, became the first COVID-19 fatality of India.

A Sikh preacher, who had a travel history to Italy and Germany, turned into a "super spreader" by attending a <u>Sikh festival</u> in Anandpur Sahib during 10–12 March. Twenty-seven COVID-19 cases were traced back to him.¹ Over 40,000 people in 20 villages in Punjab were quarantined on 27 March to contain the spread.

On 31 March, a <u>Tablighi Jamaat</u> religious congregation event in Delhi, which had taken place earlier in March, emerged as a new <u>virus super spreader event</u>, after numerous cases across the country were traced back to it. On 18 April, the Health ministry announced that 4,291 cases were directly linked to the event.

On 2 May, in <u>Punjab</u>, around 4,000 stranded pilgrims returned from <u>Hazur Sahib</u> in <u>Nanded</u>, Maharashtra. Many of them tested positive, including 27 bus drivers and conductors who had been

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part of the transport arrangement. As of 13 May, 1,225 pilgrims had been tested positive



II. INDIA DURING LOCKDOWN

The death toll due to the corona virus disease 2019 (COVID-19) in India was of 356 as of Apr 14, 2020. Since Mar 24, 2020, India has been under a nation-wide lockdown, now extended by the Government to at least May 3, to curb the spread of the new virus. India is not among the worst-hit countries, but its grossly under-funded and patchy public health system, with huge variations between different states, poses special challenges for the country's disease containment strategy. Over the past few weeks, there have been several reported instances of patients trying to flee isolation wards in government hospitals and hide travel history. Many with exposure to suspected cases of COVID-19 and infected persons have also tried to dodge the mandatory home quarantine.

These are worrying developments in the backdrop of India's latest containment plan, a 20-page document, which specifically talks about "non-pharmaceutical interventions". "Quarantine and isolation are important mainstay of 'cluster containment," the document states. Quarantine refers to separation of individuals who are not yet ill but have been exposed to COVID-19 and therefore have a potential to become ill. Isolation refers to separation of individuals who are ill, suspected, or confirmed COVID-19 cases.

There have been repeated reports of people escaping hospitals or quarantine in the past week. How can this impact the ongoing control measures for COVID 19? One key issue is the trust deficit in the public health system in many parts of the country. Other important factors include fear of isolation and stigma attached to those who are being quarantined and isolated.

Epidemiologists and public health experts say that increasing expenditure in the public health system is key to building trust. Escaping quarantine is mostly out of fear and stigma, and wanting to be with one's family since it is for a prolonged time as well as lack of income. It is difficult for people in India to understand the importance of isolation and quarantine, even though it is a response to a pandemic. The faith in the public health system cannot emerge immediately as a response to the pandemic.

An overstretched public health-care system forces millions of Indians to turn to the unregulated private health-care sector. The Indian government's expenditure on health as a percentage of GDP still hovers around 1.5%, one of the lowest in the world. For

around 52% of households in urban areas, and 44% of households in rural areas, the private sector is the main source of health care when they are sick, according to government data.

III. ROADMAP OF CORONA VACCINATION

- India aims to achieve vaccination for 30 crore people in the next few months
- Health workers, frontline workers, such as safai karmacharis, police and paramilitary, home guards, disaster management volunteers and other jawans in civil defence will be vaccinated first.
- The second state of vaccination will include, those above 50 years of age and those below 50 of age with co morbidities or with high risk of infection.
- State governments will not have to bear any cost towards vaccinating three crore health care workers and frontline workers.
- Co-Win digital platform to assist vaccination drive and issue digital vaccination certificates
- Approved vaccines are highly cost-effective in comparison to other vaccines from across the world.
- With the help of Aadhaar, beneficiaries will be identified as well as timely second dosage will be ensured.
- Co-Win will be sued to store real-time data related to the vaccination.
- On January 5, the Drugs Controller General of India (DCGI) announced approval of two vaccines -- Oxford-AstraZeneca's Covishield manufactured by Serum Institute of India (SII) and Bharat Biotech's Covaxin -- against COVID infection.

IV. CORONAVACCINE AND INDIA'S PREPARATION

As India reports one of the lowest daily Covid-19 cases and daily deaths per million population in the last 7 days is also on the decline, the state governments are gearing up to inoculate the people once a vaccine for the novel coronavirus gets a nod from the Centre. With first priority given to healthcare, f and those highly vulnerable to the infection. The Centre on Tuesday said three <u>COVID-19 vaccines</u>, developed by Bharat Biotech, Serum Institute of India and Pfizer, are under active consideration of India's drug regulator and there is hope that early licensure is possible for all or any of them.

Let's take a look at how states and UTs are preparing to administer Covid-19 vaccine doses:

Kerala

Covid-19 vaccine will be made available free of cost to all people in <u>Kerala</u>, Chief Minister Pinarayi Vijayan said. "No one will be charged for the vaccine. This is the stand of the government," he said.

Tamil Nadu and Madhya Pradesh

States, including Tamil Nadu and Madhya Pradesh, have already made a similar announcement of providing Covid-19 vaccine free of cost to all people.

Telangana

Telangana government has constituted four committees for the coronavirus vaccination mechanism in the state. The committees are - State Steering Committee, State Task Force, District Task Force and Mandal Task Force. According to an order from Telangana's health and family welfare department dated December 11, 2020, the Telangana government has constituted four committees for planning, execution, supervision and monitoring of COVID-19 vaccination program in the state.

Haryana

The Haryana government has written to the Centre to have public representatives including MPs and MLAs listed among the priority groups for Covid vaccination once it begins, Health Minister Anil Vij on Saturday. He also said the state government is making all preparations in terms of building database of priority groups, cold chain infrastructure; identification and training of vaccinators for rolling out vaccination.

Punjab

Punjab gears up for the mega exercise with a total of 729 cold chain points. Besides one state-level vaccine store, 22 district vaccine stores and 127 block level vaccine stories are being prepared for the roll-out of the vaccine in Punjab, which will also have 570 cold chain points. Besides one walk-in freezer at Ferozepur, the Government of India has decided to provide one more at Chandigarh. In addition, the state will have one walk-in cooler each at Amritsar, Hoshiarpur and Ferozepur, with more to be received from the Centre. In addition, the state has 1165 Ice Lined Refrigerators and 1079 Deep Freezers.

Jammu and Kashmir

The Srinagar district administration has prepared a micro plan for COVID-19 vaccination under which the entire population of the district will be vaccinated within four months, an official spokesperson said.

The COVID-19 vaccine, when it is available, will be collected and stored at 50 cold chain points or CCPs located in areas spread across Srinagar, the spokesperson said.

From CCPs, the COVID-19 vaccine will be transported in vaccine carriers to 123 sites identified as points of inoculation where vaccination will be administered to people as per a separate plan based on a database of prioritised groups of beneficiaries being compiled, he said.

Maharashtra

The Maharashtra government is preparing to vaccinate over 30 million residents over three phases in six months.

Uttar Pradesh

The state will have 35,000 vaccination centres and vaccinators will record the data of people who are administered doses on an online platform.

Meanwhile, Union home secretary Ajay Kumar Bhalla on Thursday reviewed with top officials of state governments the arrangements for the roll-out of vaccines when these are available and asked them to prepare a database of frontline workers like police personnel who will be administered on priority.

The meeting came days after three vaccine manufacturers sought emergency approval for rolling out their vaccines.

Prime Minister Narendra Modi had on November 28 visited Ahmedabad, Hyderabad and Pune to review the development and manufacturing process of coronavirus vaccines at facilities in these cities.

The central government has been putting in place measures for quick and effective distribution of coronavirus vaccine when it becomes available.

V. CONCLUSION

The Coronavirus has become a major humanitarian challenge and requires a lot of sacrifices to combat the disease. It has been declared a global pandemic by the World Health Organization (WHO) and the virus continues to spread rapidly around the world through myriad active centers of transmission. The disease is highly transmissible and disproportionately affects those with underlying conditions. It has led to a global breakdown and affected almost all major countries of the world bringing a slowdown and recession in the economy due to consistent lockdowns by the nations.

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