

## Attendance and Safety Validation System at Entry

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Date of Submission: 21-06-2020

Date of Acceptance: 13-07-2020

**ABSTRACT:** In the present time of COVID-19 the world has learned a lot of lessons. It has shown that we not only require security against the terror or the cybercrime, but we too need to have security against these pandemics. As these pandemics can only be controlled by breaking the chain of spreading. This can be achieved by identifying the possible people possessing such infection and not allowing them to enter into the common places or to work place. This will help to break the chain and will reduce the rate of infection. This paper proposes an amalgamation of different technologies to achieve this goal. The paper presents an idea about how the attendance of employees can be integrated with the security validation system during the pandemic.

**KEYWORD:** Work Place Entry; Pandemic Safety; Security Validation at Entry; Attendance and Security validation;

### I. INTRODUCTION

A pandemic is defined as “an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people”.<sup>1</sup> Human history has encountered many pandemics even before 21<sup>st</sup> century. Some of these pandemics were Spanish Flu, The Black Death, HIV/AIDS and some more. Before 21<sup>st</sup> century the global mobility of human was not very high as compare to present time. This is due to the advancement in technology with time. Now people can travel from one location to another within few hours that might have taken days if not months before. This is the reason for a rapid increase of infections in today’s time as compared to past. It has been studied that if the travel is reduced unto 90 percent there can be a delay in the epidemic by few days.<sup>2</sup> In modern world were people go to offices and work to earn their living, it becomes important to assure that the working environment is safe by restricting the entry of possibly infected people into the working environment.

It is difficult to check each and every person for the infection during entry, as it will consume lot of time. Factory and offices having lot of employees and few entry points have to face a lot of problem for the attendance of their employees. Not only attendance but the time taken for their check-up and their safety from infected person becomes a big concern.

This paper presents an idea that how the attendance and security validation can be during the time of pandemics, at the entry point with minimum human interaction.

### II. PRELIMINARY RESEARCH

There are mainly two functionalities used. The first part is of the attendance for which Face Recognition and Bluetooth ID mapping is used. The second part is for the Covid-19 check by using the location tracking and the temperature of the person.

#### 2.1 Face Validation:

The face validation consists of two functional components, which is face detection and face recognizer. The face detector searches for human faces and localize the image in background. After the face is detect or localize, the process of recognize will take place to determine the person correctly.

The face detection and face recognition both have a feature extractor and pattern recognition. The feature extractor transforms the image into eigen vectors.

#### 2.1.1 Different algorithms for Face Detection

There are various face detection algorithms are present that claims, to have accurate results in detection. These algorithms are used widely to have a good accuracy in face detection. The algorithms are as follow:

- Linear Discriminant Analysis (LDA)
- Principle Component Analysis (PCA)
- Artificial Neural Network Based Algorithm

### 1) LDA

The LDA is another most popular algorithm used for face recognition. LDA generally comes with the concept of classes. Class in face recognition means a specific person, and the element of the class are his/her face images.

The main goal of LDA is to perform dimensionality reduction while saving as much the class discriminatory as possible.

Also, it searches to find directions along which the classes are best separated. It takes into consideration the scatter within-classes also with the scatter between-classes.

LDA is based upon statistical approach used for classifying samples of unknown classes. This approach aims to maximize between-class (i.e. across user) variance and maximize within-class (i.e. within user) variance. There are large variances between classes, but little variance within classes.

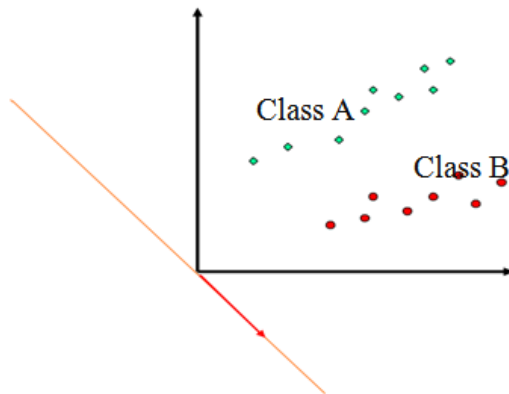


Figure 2.1

### 2) PCA

PCA is also known as Karhunen Loeve projection. PCA calculates the Eigen vectors of the covariance matrix, and projects the original data onto a lower dimensional feature space, which is defined by Eigen vectors with large Eigen values. PCA has been used in face representation and recognition where the Eigen vectors calculated are referred to as Eigen faces. In gel images, even more than in human faces, the dimensionality of the original data is vast compared to the size of the dataset, suggesting PCA as a useful first step in analysis. There are many approaches to face recognition ranging from the Principal Component Analysis (PCA) approach (also known as Eigen faces) Prediction through feature matching. The idea of feature selection and point matching has been used to track human motion. Eigen faces have been used to track human faces.

### 3) Artificial Neural Network Based Face detection Algorithms

The face detection using neural network is done in two major steps:

#### A. Neural Network based filter:

The filtering algorithm is worked in such a way that the algorithm is passed with the window of image, and the window is then passed to the neural network which detects whether the window consist of face or not.

The linear function will take care of taking only those components from the window which place a better resolution in the image and neglect those pixels which are less contributors to the image, and after that the image is proceed to further layers.

#### B. Merging Overlapping detection:

This step helps in removing the errors in detection of image in first attempt and helps in improving the errors in the image. Because of a small amount of position and scale invariance in the filter, real faces are detected at multiple nearby positions and scales, while false detections only appear at a single position. By setting a minimum threshold on the number of detections, many false detections can be eliminated. A second heuristic arises from the fact that faces rarely overlap in images. If one detection overlaps with another, the detection with lower confidence can be removed.

#### 2.1.2 Steps involved in Facial Recognition

- Step 1: Face Detection  
To begin, the camera will detect and recognize a face, either alone or in a crowd. The face is best detected when the person is looking directly at the camera. The technological advancements have enabled slight variations from this to work as well.
- Step 2: Face Analysis  
Next, a photo of the face is captured and analyzed. Most facial recognition relies on 2D images rather than 3D because it can more conveniently match a 2D photo with public photos or those in a database. Distinguishable landmarks or nodal points make up each face. Each human face has 80 nodal points. Facial recognition software will analyze the nodal points such as the distance between your eyes or the shape of your cheekbones.
- Step 3: Converting an Image to Data  
The analysis of your face is then turned into a mathematical formula. These facial features become numbers in a code. This numerical code is called a faceprint. Similar to the unique structure of a thumbprint, each person has their own faceprint.

- Step 4: Finding a Match  
 Your code is then compared against a database of other faceprints. This database has photos with identification that can be compared.

The face ID is mapped with the Bluetooth ID and a secured combination key is generated, which is securely shared with the user in private. By this key user enters in an institution and then the ID is activated. When the person leaves the office then the combination key is inactive. Also, by this the time spend by the user in the office is also tracked.

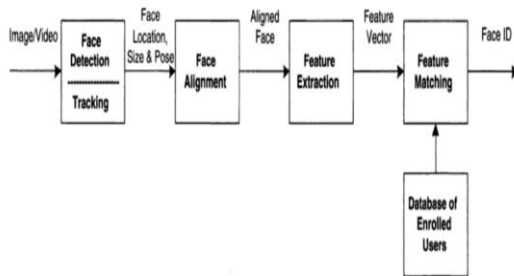


Figure 2.2: Face ID Generation

### 2.2 Bluetooth ID mapping:

Bluetooth is a wireless technology used for interchanging data between devices over short distances with the help of ultra-high frequency radio waves in the frequency band of 2.402 GHz to 2.480 GHz and forming personal area networks. Bluetooth technology uses master and slave architecture. A master can communicate up to 7 other devices. A device could be a master or a slave depends on the operation and service.

During COVID-19 social distancing is a must. Bluetooth technology can help in maintaining social distancing. In today’s time, every single person owns a smartphone having Bluetooth technology. It can help in detecting the presence of a person in a particular place e.g. school, college, and in an organization with the help of unique Bluetooth id.

Recently Indian Government developed an application “Aarogya Setu” which helps in detecting the contact of an uninfected person with the Corona positive person and send this data to the server. Here Bluetooth is used to discovering the presence of an individual. The same idea can be used to know the presence of a person. It needs to install the master Bluetooth devices in the entrance of an organization. Whenever a person having a Bluetooth enabled smartphone came in the range of master Bluetooth device, it can detect it if it was preregistered.

### 2.3 Location Tracking:

Location tracking is done by real-time location sharing service of Firebase. Firebase server will store the last 14 days location data of every individual to know that if that person is coming from or recently visits in the red zone area. An application needs to be installed in every individual’s smartphone that will share the real-time location to the firebase server with a unique id which should be same as the Bluetooth id.

A tracking period of more than 14 days is required, as the virus shows symptoms from anywhere in between 1-14 days. Normally it shows symptoms within 5-6 days after getting infected.<sup>6</sup> So the location of the person is checked for the last 14 days.

### 2.4 TEMPERATURE

A recent study of laboratory confirmed Covid-19 cases has shown that around 88.7 percent of the infected people were having fever.<sup>3</sup> This is one of the many signs of having infected by Covid-19 virus. So the thermal screening can help in identifying people that may suffer from covid-19 and can be taken for further examination. There is not any specific upper limit for the normal body temperature, but temperature above 37.2°C and 38.3°C is considered for fever.<sup>4</sup> Some institutes have issued to consider 37.8°C and above as fever during the time of covid-19.<sup>5</sup> In today’s world of IOT there are many devices that can read the body temperature and can directly send it to the system.

## III. METHODOLOGY

In this section the working idea is presented. For the practical implementation the user has to download a mobile app. This app will be mapped to the user that will contain the data about the user. Apart from personal information the app will also store the location of the user and the Face ID of the user will be mapped with the Bluetooth ID of the app. The user will get the Bluetooth ID while downloading the app that will be mapped with the organizations main system (or attendance system).

The user will arrive at the entry point, where the Bluetooth signal will be received and then the face validation will be done. If face validation results positive then the main system will fetch the location of the person for past 14 days through Bluetooth ID mapping and location tracker. Then the visited location will be checked against the red zone issued by the government. If visited location mapped to the red zone then the user is not allowed entry and the security is alerted for manual check. If the visited location is not in

the red zone then the person is checked for the fever. If they have fever then again security is alerted, else they are allowed for entry.

If a person's face does not get recognized or has visited a red zone or having fever, in all these conditions the security is alerted and the person has to go through manual checking. Figure 3.1 shows the flow chart of the methodology described above.

Different organization can use their own manual checking procedures. They may look for certain symptoms of Covid-19 in them by examining them. Some highly common symptoms of Covid-19 are fever, tiredness and dry cough. Some lesser common symptoms are nasal congestion, aches and pain, headache, sore throat, loss of taste or smell, diarrhea or a rash on skin. These symptoms are usually mild and begin gradually. Some people become infected but only have very mild symptoms.<sup>7</sup>

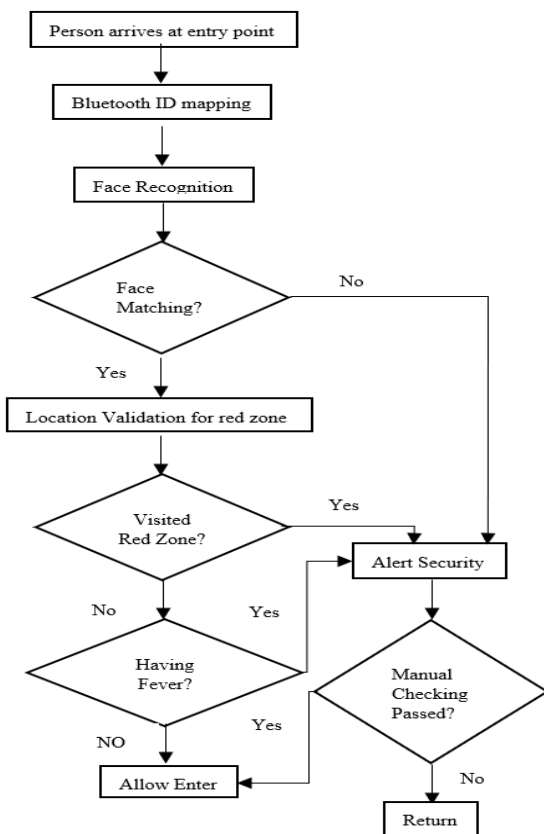


Figure 3.1- Flow Chart

At the time of exit only the Bluetooth ID will be mapped and then the exit of the user will be updated in the main system.

#### IV. CHALLENGES

There are some challenges in the implementation of the method, which are as follows: -

- Each and every person entering in the organization is required to have the app.
- Availability of smartphone to the employee.
- Asymptomatic Covid-19 patients.
- Accurate measurement of body temperature.

#### V. CONCLUSION

This paper has presented a method that can be used for attendance system during the time of Covid-19. With enabling least human interaction, so reducing the chances of Covid-19 to spread. The methodology can be easily implemented in organization having huge employees and less entry point. As it uses very few variables for this purpose, it can be easily implemented.

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**International Journal of Advances in  
Engineering and Management**  
**ISSN: 2395-5252**



# IJAEM

**Volume: 02**

**Issue: 01**

**DOI: 10.35629/5252**

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