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# A Novel Contactless Tracking Approach for COVID19 Patients Using OLED Based Smart Goggles

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**Abstract*:*** The relationship between human health and disease is not a new concept, COVID19 has affected different people in different ways. The best way at this current moment is to combat and contain the spread of COVID19 by breaking the chain. The recent outbreak of COVID19 is similar to the previous outbreaks of SARS & MERS. No previous pandemic has impacted the world as forcefully as the COVID19 has, it is by far the bad public health crisis. All these led to a major public outcry. In order to handle this critical issue of spreading this aerosol virus, a contactless detection and tracking is proposed in this paper. To detect and track the covid19 patient based on the thermal signature which is captured using contactless OLED based Smart Goggles, and it allows to monitor the location of infected patients with the help of a GPS system of goggle map along with face detection in order to provide a message to the concerned health department to identify and track the person whose temperature is above the standard along with the face photo and a GPS location of the person. This approach is best suited to break the chain of spread in crowded areas such as corporate offices, parks, colleges, and most crowded areas in cities and towns. This proposed model helps a healthy person to keep himself safe from infected people around him and also helps to track the patients, to break the chain of spreading among people.

**Keywords:** GPS, COVID19, Smart Goggles.

## 1. Introduction

The epidemic of Coronavirus has had a serious and severe impact on the world as it continues to have an impact on various fronts. Coronavirus is a virus driven by RNA. Since it is an RNA virus, it has the ability to kill the host cell by entering the host body in order to replicate it. The new Coronavirus comes from the same community of viruses that few recognized colds, in particular SARS & MERS. Corona Viruses are from the Ortho coronavirinae subfamily [1]. They belong to the Corona Viridae family and are surrounded by viruses with a positive sense of single-stranded RNA genome and nucleocapsid. Symptoms of COVID-19 can vary from person to person, but typical symptoms include fever, coughing, shortness of breath, exhaustion, chills along with trembling body aches, sore throat and diarrhea [2]. However, there have been a variety of asymptomatic cases. The initial infection was detected in Wuhan, China, in December 2019.

As of 8 August 2020, more than 19.4 million cases of COVID-19 have been reported in more than 188 countries and territories, resulting in more than 722,000 deaths; more than 11.7 million people have recovered [3]. The increasing number of cases of COVID-19 have enforced the government all across the world to take measures to impose lockdown in order to contain and combat COVID-19. The main objective of imposing lockdown was to break the chain.

A number of mitigation measures have been taken by the government across all countries, such as isolating people, wearing masks, washing hands with sanitizers, etc. Face detection and Face Recognition have a number of applications [4]. There are two types of image processing, both digital and analog. Digital image processing makes use of mathematics for modelling and computational algorithms as opposed to analogue image processing in which hard copies, such as photos, are used. In the facial function detection algorithm, nose, eyes, lips, ears, etc. It is recognized in order to authenticate the presence of a person [5].

The main objective of the countries which imposed lockdown was to trace people who got infected with covid-19 and ultimately prevent other people to get infected from COVID-19. In most countries, thermal cameras are used to check people 's temperatures above or below the standard. But there are scores of demerits in this process of thermography. This thermal camera process is inefficient as it requires high initial cost investment, accurate temperature measurements are hindered by varying emissivity, and surface reflections and images are difficult to interpret in specific objects with erratic temperatures. In order to avert this, a better approach is required in order to handle it more efficiently and to curb the probability and possibility of spreading the virus.

In this paper, the Smart Goggles system is designed with the aid and assistance of IOT and Deep Learning. Smart Goggles is an innovative approach to contain and combat the spread of COVID-19. Since the world is grappling and struggling to fight COVID-19, every ounce of different technological stacks will help us to fight this virus effectively. The ambit and scope of Deep Learning has also been developed in the healthcare sector in terms of contact tracing through various apps, portals and websites reflecting information related to COVID-19, etc.

In order to improvise and improve the detection and diagnosis of COVID-19, the model of smart Goggles has been proposed in this paper. Smart Goggles is highly productive and constructive in terms of handling the spread of Covid-19. SMARTGOGGLES, just like any other glass, contain two frames. One frame is made of an OLED screen. OLED screen is OLED glasses which connect via USB and can be set up for IoT capabilities for commercial customers to synchronize to their own platforms. The location can then be tracked with GSM and GPS. Once a location is tracked, a notification will be sent to the respective authorities and contact-tracing will be done. The algorithm used is Graph Data Structure.

## 2. Literature Survey

There are different approaches to all this. There are flurry of methods for facial detection, such as Haar Cascade [6], MTCNN [7] and Dlib[8]. Similarly, for the detection of COVID-19, thermal camera [9] is used in majority of the countries. They 're being used on a wider scale. Image Processing [10] is used for facial detection and recognition [11]. Essentially, even in Image Processing, the images are compressed, then trained, and information is finally extracted from it. On a wider scale, Face Detection is part of Face Recognition. Face detection effectively helps to identify the image of a particular person in order to check the presence of a human being. Face Recognition is used to confirm the identity of a human being. Face detection is also used in different groups:

Moreover, colour processing is a fast algorithm because, according to the light features, colour is invariant in orientation. The RGB vector can be converted to a normalized [r, g] vector, which is essentially used to detect colour in the skin. Its application can be flexible in almost all domains, such as surveillance and security. Face Detection and Face Recognition have brought revolution to the world of biometrics [10]. Essentially, facial detection is part of FACE recognition. For Face Detection, the position of the face, the colour of the skin and the different facial expressions are several formidable challenges.

Haar Cascade is one of the approaches used in Deep Learning. Face Detection, a cascade function is trained in a lot of positive and negative images. Then we extract the features of the trained positive and negative images. Haar Cascade Algorithm is used by many developers. It says the dataset need to have a flurry of positive and negative images initially [12]. Positive images are images of faces and negative images are images without faces. Features are extracted from both positive and negative images. These are apparently called Haar Features. These are more or less like Convolutional kernel. Each feature is a single value obtained by subtracting the sum of the pixels under the black rectangle.

Essentially, the algorithm can be subdivided into four parts.

a. Haar Feature Selection
b. Creating Integral Images
c. Adaboost Training
d. Cascading Classifiers

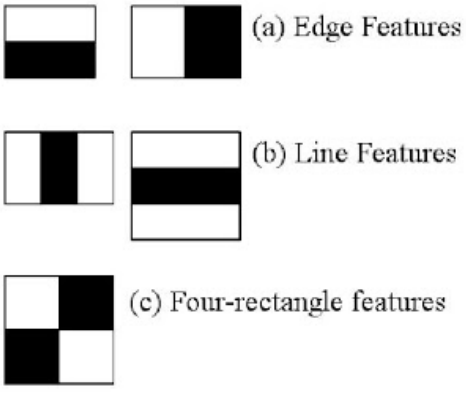



Figure 1: Haar Cascade Face Detection

First step is to collect the Haar Features. A Haar feature implies series or an array of adjoining rectangular regions with sums. A Haar feature considers pixel intensities adjacent rectangular regions at a in every region and virtually the difference between these sums.

**2.1 MTCNN**

MTCNN [14] is a Deep Learning approach to facial detection and has better performance in terms of accuracy and speed. Essentially, MTCNN is a Face Detection is a non-trivial computer vision problem that identifies and locates faces in images. Face detection can be performed using a classic cascade classifier based on features, using the OpenCV library. The state-of-the-art face detection can be achieved through the CNN Multitask Cascade via the MTCNN Library. Dlib Algorithm is mainly used for the detection of facial landmarks in the face. It is based on two principles, v.i.z, Histogram gradients and Linear SVM.

Well, not only are HOG and SVM available, this paper also have a CNN based approach to Dlib Algorithm. Meanwhile, the CNN-based detector is capable of detecting faces almost at all angles. Unfortunately, this is not appropriate for a real-time video. It's meant to be run on a GPU. A powerful NVIDIA GPU to get the same speed as the HOG-based detector might be needed.

In most scenarios, the architecture of all Face Detection algorithms is difficult to create. But over the years, due to the rich research and development in the arsenal of Face Detection, pre-formed architecture and pre-formed models are present that can be easily used for Face Detection.

**2.2 Thermal Camera**

Thermal camera is more or less like a heat sensor capable of detecting the body temperature. Usually the temperature of the body is detected using thermal camera to produce images of infrared radiation, heat. In fact, the sensors are connected to the ones that can make the composite images. These sensors can show that the heat emitted by the object is, consequently, in infrared images. One of the main drawbacks of thermal cameras is Thermal imaging products require high initial investment costs. Images are difficult to interpret in objects with erratic temperatures. Accurate temperature measurements are hindered by different surface emissivity and reflections.

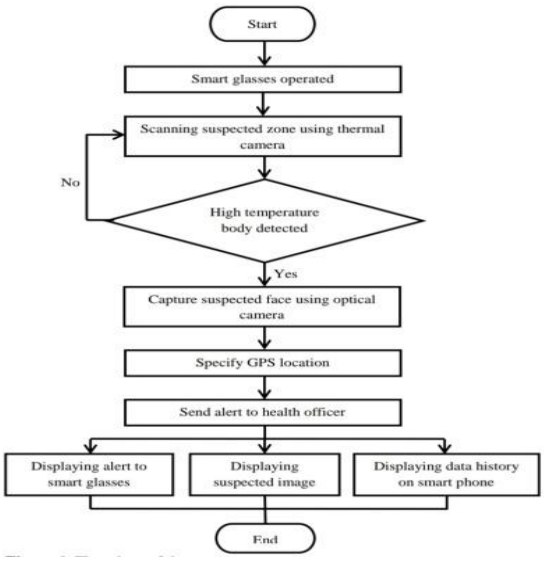
Table 1: [Name]

| Author | Technique Used | Finding | Accuracy |
|---|---|---|---|
| Paul Viola &Micheal Jones | Boosted Cascade of Features Using OpenCV | Haar Cascade | 79% |
| Kaipeng Zhang | Multi-task Cascaded Convolutional Networks | Mtcnn | 90% |
| AleksandrRybnikov | Single Shot MultiBox Detector, reduced ResNet-10 model | Dnn Open cv | 97% |
| Davis E. King | Histogram of Oriented Gradients (HOG) and Linear SVM | Dlib | 88% |
| Physicist KalmanTihanyi | Thermal Camera Heat Map | Human Body Temperature | 87% |

## 3. Methodology

The symptoms of covid-19 infected patients begin to appear within 2-14 days of infection. However, as the number of cases has increased, it has become clear that there are cases with no symptoms. Coronavirus enters the body and attacks the healthy cells of the body and then multiplies them.

Figure 2: System Flow Chart




The best solution to this viral disease is the vaccine, but it is impractical as it may take time to find the vaccine for the same. However, in-depth, robust research is underway on the potential development of vaccines and drugs. Few of them are in the final stage of development. In order to contain and combat the spread of the virus, almost all countries have put a lockdown for days together and isolated the infected patients in order to break the chain. This section will stress and press more on the working flow of our model-SMARTGOGGLES. This is one of the most innovative ways of detecting COVID-19. The technology stack used here is Machine Learning, Deep Learning and IOT.

First and foremost, the step here is that once someone wears the Smart Goggles [11]. Goggles is going to be operated. Smart Goggles made up of an OLED display screen will have an optical camera attached to it

The Smart Goggles are equipped with two OLED screen frames. The OLED screen or display consists of organic material which appears to reflect, rather emits light as well as the use of electricity. The main reason for using an OLED screen with our model is that it is more efficient as it is easier to make, emits better quality light and the viewing angle is higher. The OLED display is shining when we jab it with electricity. The specific electroluminescent materials used in OLED displays are organic compounds, which means that they contain carbon plus some other ingredients. A different organic compound is required for each colour. Now

a. Displaying alert using Smart glasses
b. Displaying suspected image
c. Displayed data history on the phone

Once the location has been tracked, a notification will be sent to the respective authorities about the issue with the GSM module. The authority will be in a position to obtain the data of the suspected person and the necessary steps will be taken. The main objective of this paper is Contact Tracing. One of the most unique approaches to contact tracing and tracking suspected individuals is the use of Graph Algorithm. Here, a Graph Algorithm is used to track and track a person whose temperature is above the standard. A graph is a data structure which represents pictorial representation of a set of objects where some of the pairs of the objects are connected by links.

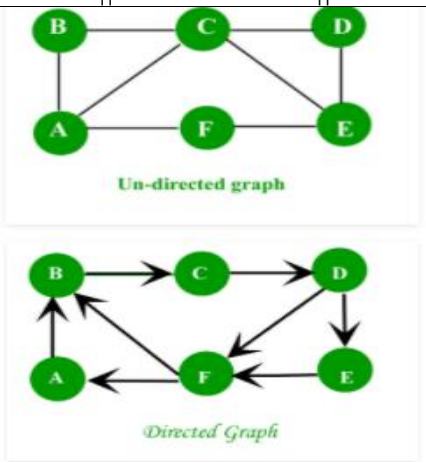



Figure 3: Graph - Contact Tracing

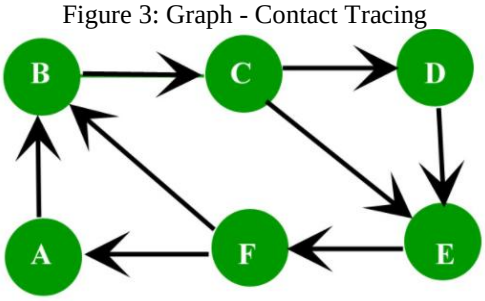



Figure 4: Directed Graph for Contact Tracing

With GPS attached to our Smart Goggles, the well-being is capable of tracing and tracking the location of the people who came in contact with me. Proposed system going to fix using the Timestamp data type. The images are uploaded to the cloud. The Timestamp data type is used with our Smart Goggles. Smart Goggles will fix Timestamp in such a way that every 24 hours, the data will be recorded in the cloud. Each node is going to act as a block. Each block will contain information about the person in the form of images and locations detected from the GPS.

Each node is going to have a unique ID. This unique ID will make it easier and smoother to identify. Whenever the goggles detect a person's temperature higher than the standard, the data will be recorded and sent to the cloud. This system will also use the Timestamp data type to detect the exact time slot for the same. A database management system will be integrated with Smart Goggles. When the person's information is uploaded to the database the fulcrum of this kind of database using Graph Algorithm is that will be able to do contact tracing.

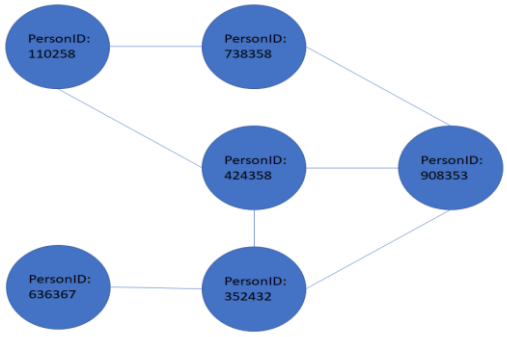



Figure 5: Unique ID generation for Face Detection & Contact

There is a flurry of issues with other Bluetooth devices that is used by the majority of apps; the app allows users to access internal files on the device; multiple WEB API calls are possible because Web Firewalls do not support them well. With GSM, the location of the person whose standard is above the standard is sent as a notification through STMP module and then the respective authorities take action.

## 4. Results & Discussion

Apparently, this paper reflects the Thermography, a process used to scan the temperature of an individual rather than of large sections of people.

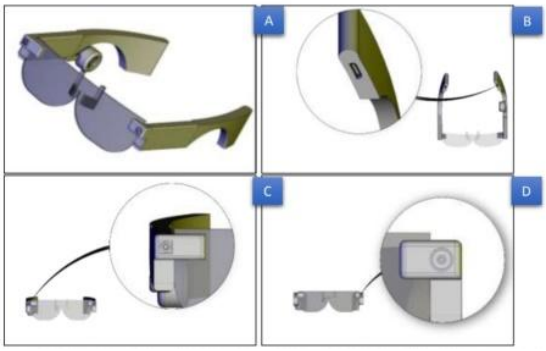



Figure 6: System Configuration

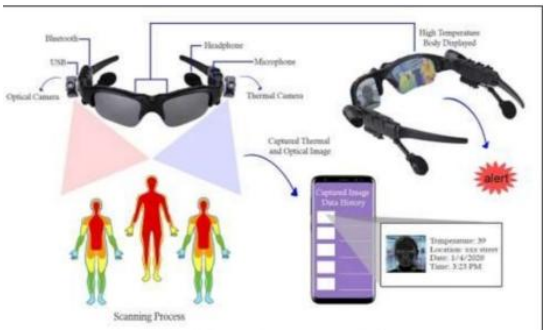



Figure 7: Working System Components


Figure 8: Temperature Detection with Smart Goggles

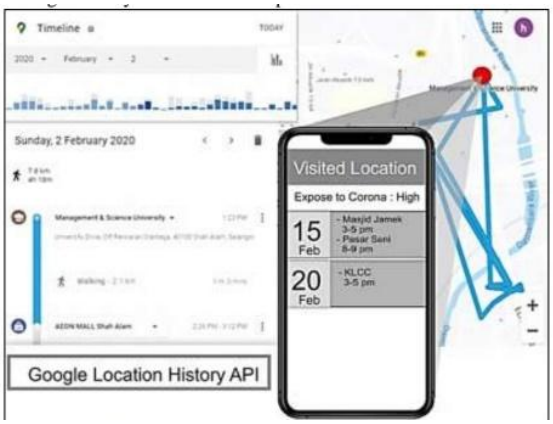



Figure 9: Google Location History

Current innovation to check if the temperature is higher than the standard has many drawbacks, such as requiring high initial investment costs. Images are difficult to interpret in objects with erratic temperatures. Accurate temperature measurements are hindered by differences in emissivity and surface reflection. Smart Goggles are an innovative approach in which will be able to detect if the temperature of the person is above the standard.

With the help and assistance of the GPS, the location of the person whose temperature is above the standard is detected and the location of the person is monitored. The GSM will be notified to the respective authorities of the person who is infected. This allows the person who is infected to be identified effectively. It is an innovative and reliable approach to testing, tracking and treating an infected person. The result of screening images will be captured and uploaded and stored in the cloud or database. The person will then be recognized using the Face Detection algorithm.

## 5. Conclusion

There are a number of ways in which clinical trials are being developed at a rapid rate for testing, monitoring and treatment. Getting fully interpretable and unbiased results from these trials is really a difficult task. A retrospective analytical survey crystal clearly shows how to contain and combat the spread of infection, apparently breaking the chain of the best way to deal with any pandemic. The accurate, reliable and rapid approach to testing, tracking and treating infected patients is truly critical and crucial for the containment and control of the spread of the virus. With an innovative approach to daytime temperature detection above the standard using Smart Goggles, the healthcare authorities will be able to track and isolate the infected person in order to break the chain.

Since Smart Goggles helps to identify a person whose temperature is above the standard, it will be handy for security personnel, such as cops, doctors, etc. The proposed methodology also includes GPS navigation, which will help the location of the people and with GSM, the authorities to obtain the information. The preliminary study and the proposed methodology have the potential to address the issues of COVID-19. It also reduces the time of screening apparently less human interaction, henceforth the probability and the possibility of reducing the spread of COVID-19.

Apparently, the model proposed in this paper will help in the detection and diagnosis of suspected COVID-19 patients by improving efficiency in terms of better results in the detection of COVID-19, lower costs and accurate information. This innovative approach will take less time to diagnose COVID-19 and ultimately fight and contain the spread of the virus.

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