Understanding the Identity of a COVID-19 Suspect or Victim through the use of Google Glass

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Abstract

Coronavirus disease (COVID-19) is a coronavirus-borne ailment that has just been discovered. In most cases, the infection will cause mild to moderate breathing difficulties. As time goes on, the COVID-19 pandemic continues to get stronger. A wide range of disciplines must therefore provide reliable solutions to the problem of risk mitigation. A useful technology is gaining worldwide acceptance because of the rapid growth of Google Glass. An AR-enabled Google Glass is envisioned in this idea, which details the overall design of the device and key components. It was investigated whether a sensor might be used to monitor a person's temperature from afar. Google Glass receives the temperature reading from the sensor. The GPS coordinates of the wearer will be sent to the cloud if the measured value is higher than the national average. There have been a lot of past studies done with Google Glass and other smart glasses for a range of different applications. We think that if the idea is used in real-time, the death rate can be significantly reduced while maintaining social distance, and many infected patients can be found.

Keywords: Google Glass, Coronavirus, Firestore, IR Thermal Sensor, COVID 19

I. INTRODUCTION

Coronavirus disease (COVID-19) (Organization and others, 2020b, 2020a; Singhal, 2020) is a newly found coronavirus-borne infection. Most patients who contract the COVID-19 virus will suffer mild to moderate breathing problems and recover without specific treatment. Aged and adults with underlying medical conditions such as cardiovascular disease, diabetes, chronic lung disease, or cancer are at an increased risk of developing severe medical conditions. The most effective method of preventing and slowing transmission is understanding the COVID-19 virus, its sickness, and how it spreads. Prevent infection in ourselves and others by frequently washing hands or using an alcohol-based rub and refraining from touching the face.

Globally, the COVID-19 pandemic has claimed many lives and posed unexpected threats to public health, food systems, and workplace safety. With the pandemic, tens of millions of people are poor, and the number of undernourished people could rise to 132 million by the end of the year. Nearly half of the world's 3.3 billion workers face unemployment. Informal workers are highly vulnerable, as they lack in social protection, adequate health care, and productive assets. The pandemic has destroyed sources of livelihood for millions. Hunger and malnutrition threaten millions worldwide, especially in low-income nations and among the most marginalized communities such as local producers and native tribes. And yet, millions of agricultural workers – both salaried and self-employed – are routinely exploited, abused, and malnourished while feeding the world. In addition to transportation, work, and living hazards, migrant agricultural workers struggle to access government assistance. This crisis touches on food security, public health, employment and labor issues, particularly worker health and safety (Paul et al., 2021). To address the crisis' human dimension, all industries must adhere to safe and healthy work practices, and labor rights must be protected. Immediate and purposeful action to save lives and livelihoods should include universal health coverage and income support for the poorest. COVID-19's effects are most severe in countries facing humanitarian crises. The rapid pandemic response is critical to getting humanitarian and recovery aid to those in need. Global solidarity and support are urgently required, especially for the most vulnerable in the emerging and developing world. We can only overcome the pandemic's intertwined health, social, and economic consequences by working together, avoiding a prolonged humanitarian and food security catastrophe that could undo previous development gains. We are committed to pooling our expertise and experience to help countries respond to crises and achieve

SDGs. We need long-term, sustainable solutions for the health and agro-food sectors. Achieving universal social protection, safe migration pathways, and formalizing the informal economy should be prioritized over addressing the underlying food security and malnutrition issues.

Many strategies and tactics have been planned, organized, and executed by the globe to avoid and demolish the pandemic. Still, it is a nightmare for to whole scientists and the globe. As modern solutions for the epidemic, a variety of therapies, including vaccinations, are being offered. Nonetheless, those are only temporary fixes, and the world has realized that the Covid19 is a permanent problem. As a result, instead of focusing on a temporary remedy, the world focuses on a long-term solution to prevent the risk. The most valuable therapy for avoiding risk from the virus is perfectly utilizing technologies. The virus has defeated the essential solutions and grows stronger by the day. As a result, trustworthy avoidance solutions are required from a variety of fields.

The famous and highly impactable technologies of current trends are the Internet of Things (IoT), Artificial Intelligence (AI), Image Processing, Cloud Computing, Swarm Intelligence, Wireless Sensor Networks, Robotics, Deep Learning, Data Science and Mobile applications. These cutting-edge technologies are highly classified and deliver timely service. Those technologies are used in various fields, including health, agriculture, transportation, education, and libraries, and they achieve near-perfect accuracy.

In addition to those classified technologies, Google Glass is a growing, unexpected handy technology that most people of the globe like and accept. Nowadays, people do not like carrying an additional device in their hand; instead, they prefer easiness. Of course, google glass eliminates that problem and provides more solutions than a smart mobile device. Current statistics show that more than 21.15 million people have been using google glass since 2018 (Google Glass Usage, 2021). Which indirectly indicates the acceptability of google glass among people. This technology's flag is rising in almost every domain. Education, health, military, and supply chain are a few of those domains.

Though there are countable mechanisms available to identify and protect from covid infection, this paper critically proposes a concept to avoid the infection in advance by reading the temperature of the people coming in front. Google glass is being used for this purpose with significant modifications.

II. LITERATURE REVIEW

The software industry incorporates with the University College Cork (UCC), which developed a Covid-19 Remote Early Warning System (CREW) using digital thermometer sensor to monitor the body temperature of the front-line staff of the hospitals that further can work with wearable and IoT devices via cloud computing (Cusack et al., 2020). Meanwhile, a review article summarized that the drone with the temperature sensors could identify and screen COVID-19 patients in any crowded places (Khan et al., 2021). Likewise, the DOHA international airport developed a Smart Screening Helmet (SSH) for their staff to identify passengers' temperature and COVID-19 affected travellers (Jay Singh, 2020). Similarly, in Malaysia, an intelligent AI helmet was developed using various sensors based on AI to detect human temperature in real-time (Al-Humairi et al., 2020). Likewise, research proposed a system to detect human temperature using a thermal infrared camera and send the details to the relevant authorities via a mobile app if a person's temperature is more than the typical case (Mohammed et al., 2020).

A wearable oura ring device was developed to identify COVID-19 affected people with various sensors build-in, which also used temperature fingerprint sensors to measure the body temperature (Poongodi et al., 2021).

A Japanese older man used a robot to avoid COVID-19 transmission from others that also used to measure the temperature of a human using infrared sensors (COCO LIU and CHAN, 202AD). Comparably, in China, Public Health Clinical Center (SPHCC) used a real-time patient monitoring system that used VivaLNK's temperature sensor to monitor COVID-19 patients (Dean Koh, 2020). Furthermore, China uses infrared temperature sensors installed in drones to monitor human temperature across the country to avoid human interaction in public places (Jaime Perez, 2020). In addition, they have upgraded their facial detection into a contactless temperature detection system to identify fever patients in crowded places (Pratik Jakhar, 2020). Similarly, in the US, dragonfly drones were used to identify COVID-19 affected people using various sensors such as temperature sensors and cough sensors (Cozzens, 2020). Likewise, the Italian government

implemented LoRa temperature detector devices to find the human temperature in real-time (David Maliniak, 2020).

A study proposed a framework to develop a smartphone app based on AI techniques, especially for the healthcare staff to identify COVID-19 symptoms via sensors, which included identifying human temperature (Maghdid et al., 2020). Similarly, research was proposed to reduce the false results in finding COVID-19 patients via temperature sensors using smart devices (Magesh et al., 2020).

A systematic review article mentioned that a biosensor was under the developing stage called 1AX with minimum cost that can help read and store the human temperature in real-time in terms of early detection of COVID-19 symptoms (Javaid et al., 2020)

S.No	Device/ Application	Thermal Detector	Technology used	LR
1	Covid-19 Remote Early Warning System (CREW)	digital thermometer sensor	Internet of Things (IoT), Cloud Computing	(Cusack *et al.*, 2020)
2	Pandemic drone	plasmonic sensor	Drone	(Khan *et al.*, 2021)
3	Smart Screening Helmet	infrared thermal imaging	Artificial Intelligent (AI), Augmented Reality (AR)	(Jay Singh, 2020)
4	Dual-functional plasmonic photothermal	plasmonic sensor	dual-functional plasmonic biosensor	(Qiu *et al.*, 2020)
5	Temi (Home Nursing robot)	Infrared sensor	AI, Google Voice	(COCO LIU and CHAN, 202AD)
6	Smart Helmet	Thermal infrared Camera	IoT, Global Positioning System (GPS), Arduino IDE	(Mohammed *et al.*, 2020)
7	Patient monitoring system	VivaLNK's temperature sensor	IoT, Bluetooth	(Dean Koh, 2020)
8	Smartphone app	Temperature fingerprint sensor	AI	(Maghdid *et al.*, 2020)
9	Biosensor	1AX	Wireless	(Javaid *et al.*, 2020)
10	Dragonfly	Any temperature sensor	Drone, Computer vision	(Cozzens, 2020)
11	Temperature auto-sensing robot	Thermal sensor	IoT, Wireless, AI	(Advantech, 2020)
12	Airborne infrared cameras	Infrared sensor	Drone	(Jaime Perez, 2020)
13	AI-enabled fever detection system	Thermal sensor	AI	(Pratik Jakhar, 2020)
14	LoRa temperature detection device	Infrared sensor	IoT, Wireless	(David Maliniak, 2020)
15	Temperature detection device	Infrared (IR) sensor	AI	(Magesh *et al.*, 2020)
16	Smart AI helmet	Adafruit Thermal (IR) Camera	AI, Raspberry Pi OS, Wireless	(Al-Humairi *et al.*, 2020)
17	OURA ring	Temperature fingerprint sensor	Machine Learning (ML)	(Poongodi *et al.*, 2021)

It was confirmed that the innovative materials with the sensor technologies could identify COVID-19 that can develop at a low cost (Erdem et al., 2021). Similarly, the efficiency and cost-effectiveness of Google glasses help increase their use in the medical sector (Dougherty and Badawy, 2017).

The authors discussed how wearable and robotics technologies could measure human temperature via different thermal sensors (Tavakoli, Carriere and Torabi, 2020). Likewise, another article proposed a system to detect significant symptoms of COVID-19 via sensor-enabled smartphones, including body temperature (Stojanović, Škraba and Lutovac, 2020).

Google Glass is a wearable device working on the Android operating system. It can be worked with the help of AR. It has built-in Wi-Fi, Bluetooth, audio, and video devices. Furthermore, it has a semitransparent screen. Also, it can implement machine learning and computer vision (Steele, 2019). In addition to that, it permits to implementation of sensors within it as it operates (Pennic, 2014).

A Technology expert strongly confirmed that the wearable devices demand increasing during the COVID-19 pandemic, especially Google glasses (Maffei, 2020). Furthermore, the TemPredict study was conducted to prove that the OURA ring with thermal sensors can monitor fever patients (Smarr et al., 2020). Further, A study pointed out that IoT-based smart glasses can be used to identify people with higher temperatures in crowded places (Nasajpour et al., 2020).

A study reported that A Google glass with Biosensors and actuators can be used to measure temperature in real-time via wireless transmission (Zhang et al., 2016). Similarly, China was developed AR glasses to measure human temperature (Emory Craig, 2020). Further, an analysis study supported that Google glass can be used in journalism (Ware, 2018). Likewise, it can be used as a personal assistant to deaf and visually impaired persons (Berger and Maly, 2019). Similarly, Google Glass was used in education and medicine, too (Dafoulas, Maia and Tsiakara, 2018), (Munusamy et al., 2020).

Meanwhile, it can be used during the pandemic as it has a remote access mechanism (Scales, 2020). Similarly, the same feature is available from the smart glass too (Proceedix, 2020); likewise, It was used for virtual ward round using telemedicine during the pandemic crisis (Market Insight, no date), (Martínez-Galdámez et al., 2021). Meanwhile, a study proposed a framework to estimate body temperature via infrared-installed smart glasses (Ruminski et al., 2016).

S.No	Technology used	To/ by	Device	Purpose	LR
1	Text-To-Speech	Blind and Deaf	Google Glass	Watch, Listen	(Berger and Maly, 2019)
2	Remote Access	Onsite Employees	Google glass, Smart Glass	Virtual Access or Monitoring	(Proceedix, 2020; Scales, 2020)
3	Augmented Reality	Doctors	Smart Glass	Virtual Monitoring	(Market Insight, no date),(Martínez-Galdámez *et al.*, 2021)
4	Infrared Sensor	Anyone	Smart Glass	Temperature Measure	(Ruminski *et al.*, 2016)
5	Bio Sensor	Anyone	Google Glass	Temperature Measure	(Zhang *et al.*, 2016)
6	AR, Infrared sensor	Anyone	AR Glass	Temperature measure	(Emory Craig, 2020)

Research work pointed out that the thermal scanner is not recommended to diagnose COVID 19 patients since it can only detect the temperature more than fever temperature, and COVID-19 patients can have less temperature (Madurai and Pugazhendhi, 2020). The previous statement supported by (Surya and Teja, 2020). Furthermore, Google Glass has negative issues such as low battery endurance, data protection issues, and interruption during network problems (Muensterer et al., 2014)

III. METHODOLOGY

This section explains the overview of the system suggested as a concept in this paper and the architecture of Google Glass. The suggested system is based on modular architecture as it includes several modules of programs to handle the different tasks. Section 3.1 describes the architecture and the components of Google Glass, and section 3.2 explain the suggested system overview.

A. Architecture and Components of Google Glass

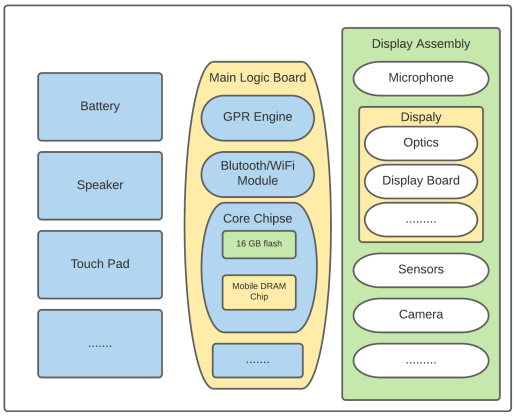

Figure 01(b): The General Architecture of Google Glass

Google Glass is a wearable, voice- and motion-controlled Android device that looks like a pair of eyeglasses and shows information right in front of the user's eyes. The augmented reality experience

offered by Google Glass provides relevant information through visual, audio, and location-based inputs. It is possible to implement, for example, automatically showing the current flight status as a user enters an airport. As it is a very tiny computing device, its architecture and components are a bit complex. Figure 1 (a) and (b) show the internal components of the Google Glass.

not a monolithic system where equally distributed small components are built. We examined Google Glass more closely and discovered that it is made up of many assembles that are loosely dependent on one another. First, we unpack the primary assemblies such as the main logic board, display assembly, battery, speaker, etc. Figure 3.2 shows the general architecture of google glass. Many of

Figure 1(a): All the components of Google Glass. (b) The side opened view of the Google Glass (Google Glass Teardown)

Google Glass consist of several tiny modules in it such as the touchpad, main CPU board, behind-ear module, speaker, display assembly, display, optics, camera, battery, logic board, US dime, built-in Wi-Fi and Bluetooth and some sensors (accelerometer, gravity, gyroscope, light, linear_acceleration, magnetic_field, orientation (deprecated), and rotation_vector)(Interpreting the Evolution of Google Glass).

the components that Google Glass is made up of are not created solely for Google Glass. Nearly all of them have been with us for quite some time.

The intelligent eyewear considers motion and voice recognition, helping the wearer manage his/her day. Another option is the pad that is located on the glasses' rims. To get the information they need, the device sends the information to the wearer using a small package of information which is projected on the wearer's skin using a micro-projector, through a private channel of communication that only the user can access. To see the image in the captured colors, Google Glass uses a field sequential color (FSC) liquid crystal on a silicon (LCOS) system. The term FSC denotes a television system that employs continuous images to carry out color processing and then combines what the viewer sees with his or her natural capabilities to create a color image. LCOS is a method of creating video displays

Any architecture specifies what system modules will be included and what they will be used. It is

B. Suggested System Overview

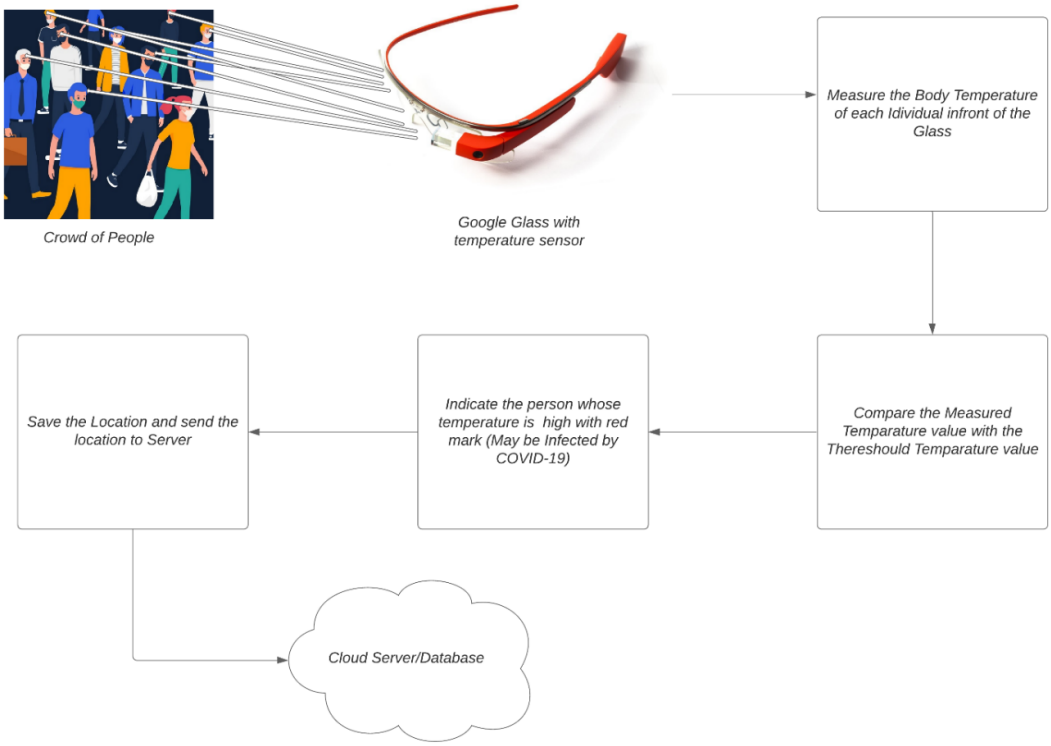

Figure 02. The Suggested System Overview

Figure 0-3 shows the proposed architecture of the potential concept of this study. As shown in the figure, a security guard of the organization wears google glass at the security gate. Whenever crowded people enter the gate, he/she use this glass to measure the body temperature. This study looked at using a sensor to assess body temperature from a distance—the sensor embedded with google glass to do this task. Here the sensor measures the body temperature and passes that value to google glass. Which immediately compared that value with the average human body temperature. If the value is greater than a typical threshold value, the person will be suspected of being Covid-19, and security measures will be taken to avoid entering the building. If not, they can move to the building without any interruption. Also, if the measured value is higher than average, then the locations of the person will be updated to the cloud by google glass to notify the responsible person. Generally, google glasses have multiple features compared with other Virtual reality glasses, and location passing to the cloud easily done by google glass than other devices

IV. RESULT AND DISCUSSION

This section will focus on the necessary sensors and working procedure of the given concept in the methodology part.

A. Equipment and Working Procedures

1) IR thermal sensor

The sensor is used to gather the body temperature at a distance. Generally, IR thermal sensors can absorb the body temperature of a human or object with radiation. The mechanisms by which heat is transferred from one body to another are conductivity, diffusion, and radiation. Radiation is when a hot object radiates heat energy in electromagnetic waves, which are absorbed by fabulous. Although some of it reaches the visible light spectrum, most of this radiation is in the electromagnetic spectrum's infrared (IR) section (Saha, Dewangan and Dasgupta, 2016).

IR thermal sensor encompasses three components: optical components, IR detector, and electronics. When the item emits infrared energy, optics transmits it to the IR detector, converting it to an electronic signal. The electronic signal is transformed to a temperature after a sequence of electronic procedures (SESOR TIPS, 2021).
When infrared photons collide with the human body or any other object, heat energy is reflected, absorbed, or transmitted. When the reflected heat energy reaches the sensor, it is measured using its three components.

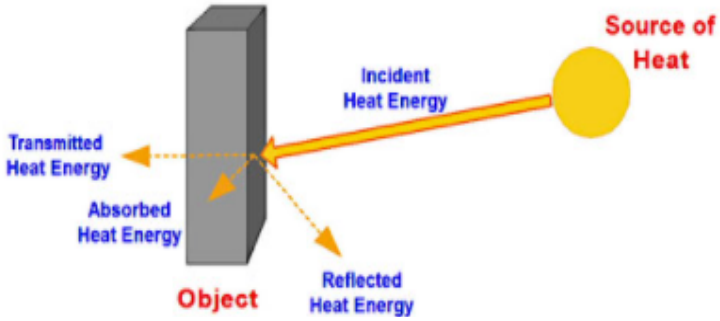

Figure 03: Working mechanism of IR temperature sensor

$$WInc = WRef + WTra + WAbs$$

WInc – Incident energy
WTra – Transmitted Energy
WAbs – Absorbed energy
WRef – Reflected energy

3) *Android application for a location transfer*

When the temperature coming from the IR sensor needs to be stored in the google glass OS, it needs applications to move on further. Here we suggest some interfaces with the android operating system as below.

When we check Figure 05, we can recognize the two interfaces. In each interface, the longitude, latitude, and average temperature are static. Longitude and latitude are used for getting the location purpose of the covid 19 infected patients. Those will be vary based on the place. The data coming from figure 05 will be passed to this interface as quickly as possible to update the value to the cloud to notify the needy person. Here green circle implies the pass information of the gate

Figure 04: Google glass view with IR thermal sensor

2) *Google glass camera view with IR thermal sensor*

When the security guard looks at the people by the google glass, they will get Figure 04. When the security guard identifies the blue tag as in the figure, it is normal and has a green signal to enter the gate. If it is red, they will have become a suspect of covid 19

4) *Cloud database with location information*

Figure 06 merely shows the cloud database and the method of information stored in it. When we look at the figure, it sends the detail with temperature. It will further be shared with the responsible person from this point. The emergency team will reach the spot as soon as they get the message from the database.

V. CONCLUSION

Smart wearable devices play a significant role in the current pandemic situation in monitoring COVID-19 patients in the health sector. Throughout the study, we have proposed a timely remedy for identifying COVID-19-affected humans in crowded places while following social distance measures. Most previous research studies were conducted using Google Glass and Smart glasses for different purposes. However, research studies on these devices for the temperature measurements of moving humans during the pandemic have yet to be completed. However, working with Google Glass has many features compared with the recent VR and AR glass applications. Though the said idea is a potential concept, it has higher robust throughput when it is implemented. Also, in the wearable devices of the Android OS, we can have thermal sensors for measuring the body temperature; hence, this study proposed a possible way to implement the IR sensor with google Glass due to its infrastructure. We strongly believe that the concept implemented in real-time, a high number of infected cases can be found while keeping social distance measures, and death rates can be reduced considerably without any suspects. Furthermore, this study can be extended to find the affected human with the help of the inbuilt camera of Google Glass and notify the relevant authorities about the victim using the image processing technique. It was very tough to find the related studies since the concept is very new, and very few articles were found related to COVID-19 and Wearable devices

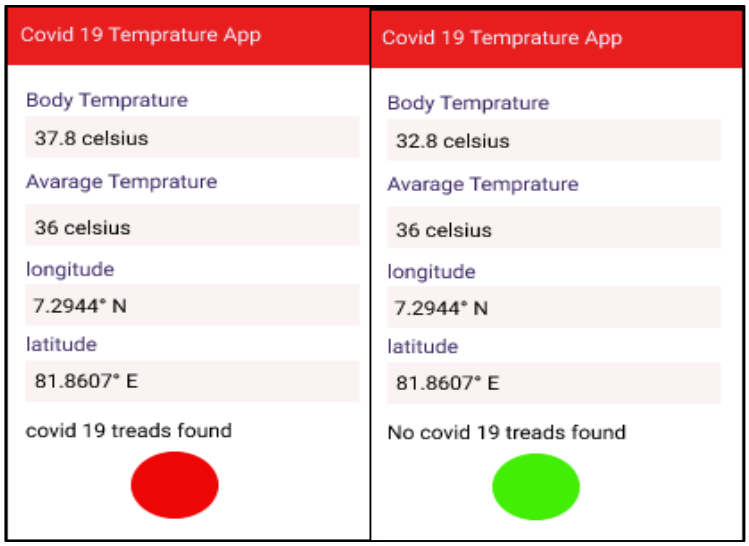

Figure 05: Sample Interface of google glass for Covid 19 detection

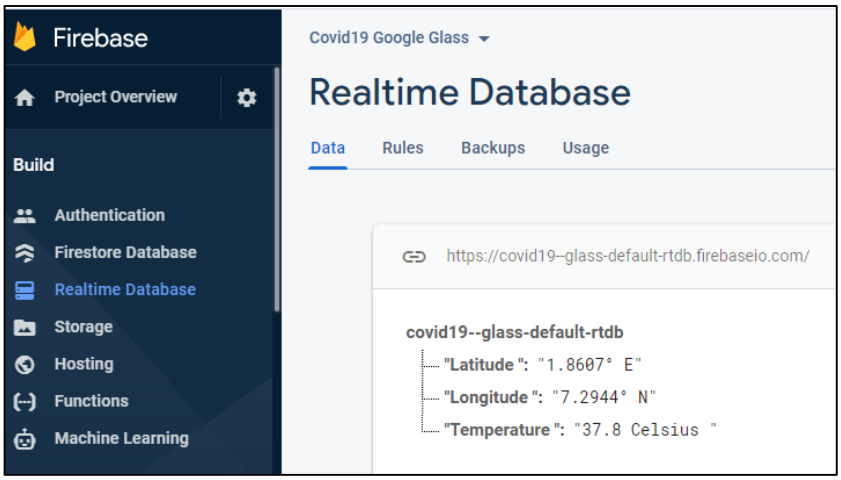

Figure 06: Location shared in the real-time database

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