Covid -19 Fencing And Alert System

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***Abstract*--Covid-19 is an extremely communicable disease. It becomes extremely hard to control once it begins to spread. One of the most important and effective steps to break the chain and keep healthy people from getting infected is social isolation/distancing. When an infected person comes into contact with a healthy person, that person becomes infected as well, and the chain reaction continues. To curb this, COVID-19 fencing and alert system is developed. This system uses a GPS module to create a Geo Fence around the infected area and the healthy area. The live/current GPS location/coordinate is compared with the hotspot co-ordinates. The GSM module with Sim800L will send an alert to healthy people when they come into contact with virus-infected areas. The device comes with a GPS, GSM module with Sim800L and an OLED which displays the alert message. The device can be fit into any public or private transport, so that the healthy person will be prevented from entering the hotspot zones unnecessarily, thereby blocking the virus spread.**

Keywords—Global Positioning System (GPS), Geo-fencing, Hotspot.

I. INTRODUCTİON

COVID-19 is a virus or disease caused by the acute respiratory syndrome. They're nicknamed "Corona" because the disease's surface has crown-like spikes. It is a highly contagious and easily transmitted virus that can be difficult to manage once it has spread. It has the potential to induce moderate to severe respiratory disease, and even leads to death. Getting vaccinated, wearing mask through periods of strong transmission, maintaining 6 feet apart, disinfecting often, and avoiding ill persons are the greatest protective and preventive measures.

COVID-19 Fencing is a technique named Geo-Fencing [4]. Whenever a mobile device or Active RFID enters or tries to leave a geological boundary, recognized as a geo-fence, a platform program which uses radiofrequency identification (RFID), Wi-Fi, GPS, or other cellular data is triggered and the targeted action is notified. Geo-fencing is the process of using a geo-fence, and one instance is when a destination aware device belonging to a location-based service (LBS) client enters or exits a geo-fence. This conduct could result in a device user receiving a notification as well as a message being sent to the geo-fence controller. As Covid-19 is a very contagious disease. Once it starts to spread, it becomes exceedingly difficult to manage. Social isolation/distancing is only essential and effective ways to break the chain and prevent healthy persons from becoming infected. When an infected individual comes into contact with a healthy individual, the healthy person becomes infected as well, continuing the chain reaction. To curb this, COVID-19 Fencing and alert system is developed, such that the GPS module is used to create a Geo Fence between the infected area and the healthy area, by comparing the current location with hotspot co-ordinates in which the GSM module with Sim800L, will alert healthy people when they come into contact with virus-infected areas [1]. The GPS module is utilized to build a barrier between the infected and healthy areas, keeping people informed about infected areas and interrupting the propagation cycle. This helps to inform people who are unaware & tries to enter the affected area. With the help of this, we can break the chain of healthy people getting affected.

The paper is outlined as follows. Section 1 describes the works related to COVID -19 fencing and alert system. Section 2 outlines the proposed system model, the hardware and software specifications. In section 3, a detailed discussion on the results is made followed by conclusion and future scope.

II. RELATED WORKS

Rahate, S.W. and Shaikh (2016). “Geo-fencing infrastructure: location- based service”. In this paper a geo-fence is created which acts as a virtual barrier that surrounds a physical location. A geo-fence can be constructed based on the needs of the user by considering various radius values, or it can be a fixed set of limits. Geo fencing is a feature that defines geographical borders using the global positioning system (GPS).

San Hlaing, Naing, M.and San Naing,S (2019).“GPS and GSM based vehicle tracking system”. This paper proposes a vehicle tracking system which can be used to track a vehicle's travel from any location and at any time. The proposed solution made good use of widely available technology that combines a smart phone and an Arduino UNO. The device is designed to interact with the Global Positioning System (GPS) and the Global System for Mobile Communication (GSM) technology, which is one of the most frequent ways of vehicle tracking [3]. The gadget is

installed in a car, and its location can be identified and tracked in real time. The GPS receiver and GSM module are controlled by an Arduino UNO. The GPS module is used by the vehicle tracking system to get geographic coordinates at regular intervals. The GSM module is used to send and update the position of the car to a database. The GPS coordinates are obtained by the Arduino UNO, which then delivers this information to the user through text SMS. The latitude and longitude of the vehicle's position are included in this SMS. As a result, a user may use their smart phone to continually watch a moving vehicle and predict the distance and time it will take to get at a certain destination.

Alqrnawi and Myderrizi I, (2021), "COVID-19 Quarantine monitoring based on Geo-fencing Technique". Smart phone and satellite network coverage enables a variety of beneficial apps that improve people's lives on a daily basis. People may be traced in real time at a given place using the satellite's Global Positioning System (GPS). When it comes to infectious disorders like COVID-19, containing the disease is the most critical step in limiting its spread. Quarantine is frequently used as a remedy, and any surveillance system may be used to pinpoint the whereabouts of infected individuals. However, because quarantined regions are dispersed over the globe, tracing the borders inside accommodation is challenging. For the quarantine and surveillance of COVID-19 carriers, a geo-fenced GPS system with an effective border security system is proposed.

El-Medany, Al-Omary, Al-Hakim, Al-Irhayim, and Nusaif, (2010). "A cost-effective real-time tracking system prototype using integrated GPS/GPRS module". This paper describes a real-time tracking system that gives precise vehicle location information at a reasonable cost. The GM862 cellular quad band module is used to implement the system. To observe the current location of a car on a specific map, a monitoring server and graphical user interface on a website have also been created using Microsoft SQL Server 2003 and ASP.net. The system gives data about the vehicle's status, including speed and distance.

III. PROPOSED SYSTEM MODEL

The proposed system model for the COVID -19 fencing and alert system is shown in Figure 1. The Neo-GPS module locks on to the satellite and starts receiving the current geo coordinates, which is fed to the Arduino microcontroller board. The red-zone or the hotspot coordinates are collected from https://www.covidhotspots.in/ website and fed to the Arduino controller. The Arduino then compares the current coordinates with the given red-zone coordinates and estimates the distance between the user and the danger zone.

When the distance reaches the pre-set threshold it starts sending alerts to the user's mobile through SMS using SIM800l, and shows up an alert on the OLED display indicating the user that they are close to the danger zone and shows their distance from danger zone(SSD1306 0.96 inch I2C OLED display).

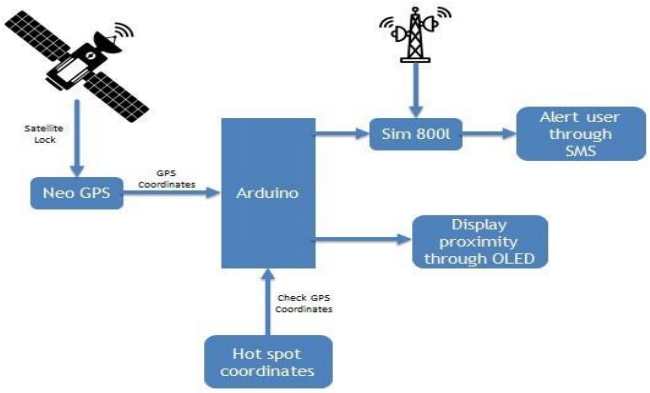

Fig.1. Proposed system model

The setup is used for monitoring the live location of the user and alert user through SMS if the user nears a hotspot zone. The connection of NEO 6m GPS module with Arduino is fairly simple. With the NEO-6M GPS module one can track 22 satellites and identify locations anywhere in the world [2]. The following are the features of NEO-6M GPS;

- 5Hz position update rate.
- Supply voltage: 3.3 V
- Separated 18X18mm GPS antenna
- The cold start time of 38 s and Hot start time of 1 s.
- Configurable from 4800 Baud to 115200 Baud rates (default 9600).

Arduino 5V is connected to VCC & GND is connected of NEO-6M GPS. The SIM800L GSM/GPRS module is a miniature GSM modem that can be integrated into a large number of IoT devices. The module can be used to accomplish almost anything that a normal cell phone can do such as sending SMS messages, making phone calls, connecting to the Internet via GPRS, and much more. And to top it all off, the module works almost everywhere in the world because it supports quad-band GSM/GPRS networks. The working voltage is in the range of 3.4V to 4.4V.

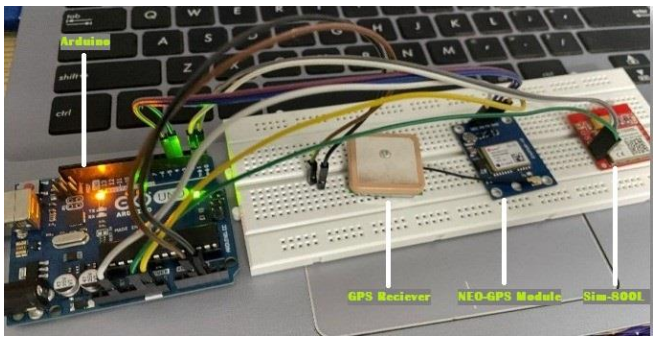

Fig.2. Hardware Setup

The module supports baud rate from 1200bps to 115200bps with auto-baud detection. The Sim800l has 4 pins that have to be connected to Arduino. Connect the Arduino's GND pin to GND and the VCC pin to 5V of Sim800l. Connect its Tx, Rx pins to analog pins A0 and A11 of Arduino. The I2C communication protocol is used by the OLED display, thus wiring is fairly straightforward. The Vin is connected to 5V, GND is connected to GND, SCL to A5 and SDA to A4 pins of Arduino.

The program codes are written in the Arduino IDE software. The output will be displayed in the Arduino IDE software and OLED. Figure 3 shows the satellite view of an area with hotspot zones highlighted in red. The current location of the users will be compared with the nearest hotspot zone and the user will be alerted when they go near to it.

The regions with more reported covid cases are marked as hotspot or red zones using multiple GPS coordinates. Zone 1 is marked as a hotspot zone with 5 coordinates and the biggest zone (zone 2) is fenced with the help of 20 different coordinates from around the zone to calculate the distance to it more accurately. The smaller zone 3 is fenced using 3 coordinates and the distance to the zone is calculated by triangulating from the zone. The 4th zone is fenced by setting 5 coordinates around it.

Fig.3 Hotspot zones (Satellite Image)

IV. RESULTS AND DİSCUSSİON

This section discusses the results obtained. Figure 4 shows the live coordinates of the user in a particular geographical location with the date and time information. When the satellite positions get locked, it will be notified by a Led in the GSM module.

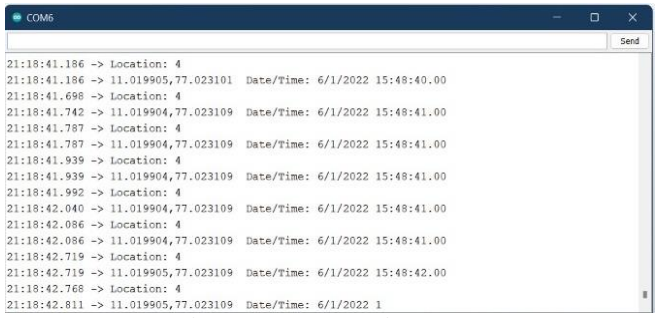

Fig.4. Co-ordinates of the current location of user with date and time

The latitude and longitude coordinates will be displayed on the command prompt of the Aduino IDE. When the users moves, the coordinates will be updated accordingly. Figure 5 shows the distances of the user from the hotspot. i.e., the distance between the live coordinates and the marked hot-spot zone. It also shows the distance from the safe zone and the current location along with three different hotspot zones distances in the Arduino IDE.

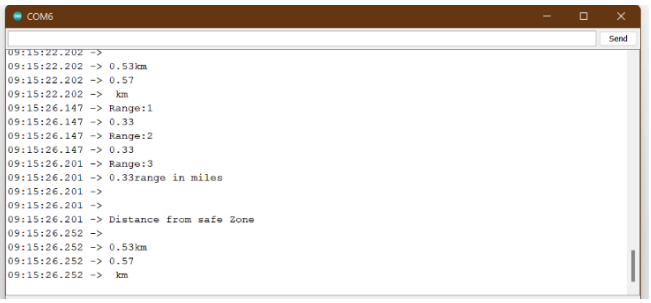

Fig.5 Distances from hotspot

Figure 6 shows the notification or alert text in the OLED when the user is near or about to enter a hotspot zone. To control the OLED display, the adafruit_SSD1306.h and the adafruit_GFX.h libraries are to be installed.

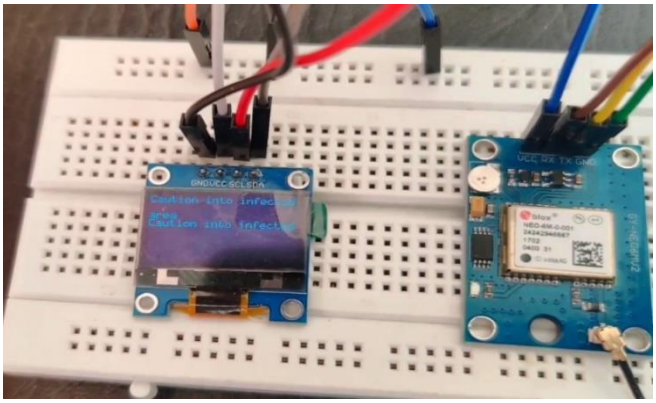

Fig.6 OLED Caution notifications

Figure 7 shows the message notification to mobile phone using Sim800l. To send AT commands and communicate with the SIM800L module, Serial Monitor is being used. Once the code is uploaded, open the serial monitor at baud rate 9600. You output should be visible on the serial monitor. Next basic connection has to be established with the SIM800L module by sending AT commands [5]. The phone number has to be entered to send an SMS. In the string “ZZxxxxxxxxx”, and ZZ has to be replaced with the county code and xxxxxxxxxx with the 10 digit phone number.

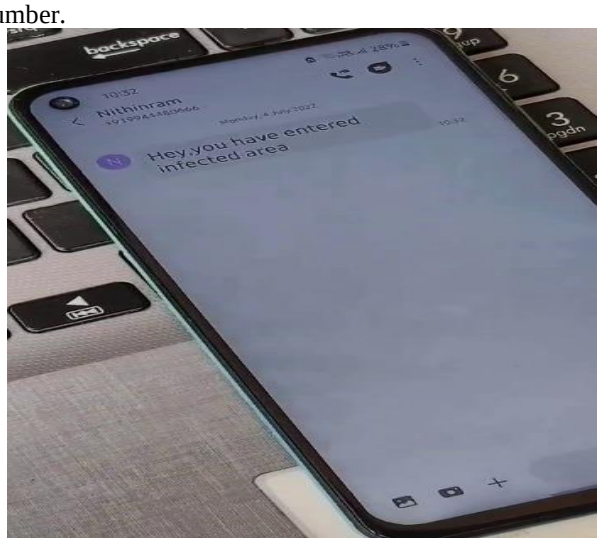

Fig.7 Message notifications in mobile

V. CONCLUSİON AND FUTUREWORK

Our goal with this project was to create a low power, economical, easily configurable, and portable system that could alert the user whenever they get near a hotspot location. Nowadays the modern viruses are evolving fast into different types which are prone to easy transmission and become uncontrollable as they spread. So, to prevent this, our system can help stop the virus spread by monitoring the live location of the user and constantly check for any hotspot breaches thus avoiding entry into high-risk regions.

Moreover, subsequent development as a future work to this device can be used to fence affected people from getting in contact with others and log the locations of travelers who enter known hotspot areas so that it will be easy to trace interactions and quarantine affected people.

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