

Review Article

Development of IoT Primarily Predicated Observance System for Home Quarantine Person throughout COVID-19

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A B S T R A C T

COVID-19, a widely spread virus, which was originated in the Wuhan, has become a matter of inconvenience for the world by taking its rage form. As a superior cure over the further spreading of the infection, considering its ability to get spread quickly by human contact and not demonstrating manifestations inside a substantial time, authorities of various nations, particularly India, have pronounced lockdown throughout the nation, to accomplish social distancing. But due to multiple reasons Home-Quarantine people that are not allowed to go out of their houses still peregrinating in the society allowing the virus to spread further due to increasing social contacts. Thinking about every one of these components, and IoT based system that can be implemented to achieve social distancing. IoT being an emerging technology, using it is smarter and safer than traditional ones is demonstrated. Through this paper, an IoT based model comprising of least number of parts in particular ESP32 modules and a GPS module is proposed which can be executed to follow the specific area of the Home-Quarantined persistence. Likewise, an application to be specific Fight COVID-19 is built, through which all the data of the patient is gathered, for example, his subtleties, symptoms, etc. and spared to the primary server. The doctors can analyze it and make the necessary moves required to be made. It will reduce the efforts of collecting data of the individuals which makes the system more productive.

Keywords: COVID-19, Internet of Things (IoT), GPS Tracking, Quarantine

Introduction

The well-known virus COVID-19, originated in Wuhan, has spread all over the world too rapidly. It has become an international concern of and produced anarchy in medical

health due to its rage form. All CoVs have crown-shape peplomers with 80-160 nanometers in size and 27-32 kb positive extremity. The virus can spread widely through respiration, sneezing, coughing, and personal human

contact with the prior affected people. The droplets from their saliva and respiratory discharge can transmit the virus on a large scale.

The virus is considered more dangerous due to its long duration of showing symptoms to the patient. The majority of the individuals influenced due to this infection recuperate with no extraordinary treatment yet those fundamental clinical issues like a cardiovascular disease; diabetes, chronic respiratory sickness, and malignancy are bound to create genuine disease. Scientists are trying at their best to develop a vaccine that can protect human survival from the virus. As per the Indian Situation Update Report, COVID-19 has affected in 29 countries, with 3577 confirmed cases and 83 deaths till 5th April 2020. In Maharashtra and Telangana more than 400 cases have been recorded to date. World Health Organization (WHO) has declared a high-risk assessment for India. Day by day, the situation in India as well as worldwide is getting worse. Chloroquine and Hydroxychloroquine have shown some promise in the treatment of COVID-19. The Government of India is coming up with quick financial packages for improving the infrastructure and procuring more number of testing kits and developing more number of testing labs. Also, Prime Minister of India has declared 21 days lockdown from 25th March 2020, as a prevention measure over the further transmission of the virus. Within this lockdown, people are strictly allowed not to get out of their houses to achieve Social Distancing. This is because; Social Distancing can be an only effective way to control the increasing chain of the COVID-19 virus. It will break the further increase in the number of affected people due to the break-in social contact of the people. Currently, the people who are affected due to the COVID-19 are isolated and those who have travelled from abroad recently, are strictly warned to stay Home-quarantined. Doctors have marked the stamp of Home-Quarantine on their hands. Those are not allowed to make any social contact with any other person unless and until their test report comes out to be negative. But still, due to the lack of awareness among people, they are roaming outside in the society to buy groceries, as well as Medical stuff even in the lockdown period, by breaking the rule.

To stop this, a better solution is found. This paper proposes and implements the Quarantine patient location tracking system which is easy to implement. An IOT based module is developed to continuously locate the quarantined patient. This system gives the exact location (including the present and past location) of the quarantined patient to the doctor and the police so that his monitoring becomes easier than to keep a constant eye on him. The system helps doctors and police to view the present and the past positions recorded by a patient on Google Map through the internet. The quarantine patient is provided with a GPS module which he is warned to keep in a stable internet connection. This

GPS module is in connection with the ESP32 module, which is required to connect with the Arduino. As an output, through this system, the doctors will get the latitude and longitude in the form of numbers and that should copy it to the browser window. It will give the exact location of the patient so that his monitoring will become easier than the traditional methods. Also, an android application is developed to record the data of the individual patient. The quarantine patient has to login to the application through his email address, in the login window. After that, he has to put all the personal as well as health-related data into it. The health-related data will include information such as whether he is underlying some medical treatments, whether he is going through problems like diabetes, blood pressure, cancer, or any other disorder. Also, he has to mark the symptoms, if he is observing within himself with the help of checkboxes provided. Along with it, he has to mention the places that he had visited within the last couple of months. After submitting this information, it will be collected by the main server and the doctor can easily go through it. After analyzing the information provided by the patient, they will make a report of it and send it to the patient again so that he will be aware of what precautions he has to take within this quarantine period. If the condition is more serious, then the doctor will take the necessary actions required to take so that he can get the treatment as soon as possible. Also, a sensor is attached to the patient's body which senses whether any other person comes in contact with him and gives an alarm in the form of sound. So that another person will get a notification of not to make any contact with the quarantine. It will help to break the chain further due to the success in maintaining social distancing. In this way, this system will increase the efficiency of both the doctor and cops by reducing their efforts.

Components of Technology

ESP32 Module



Figure 1.ESP32 Module

This is a basic ESP32 module with the ESP32-D0WDQ6 chip on board 1`1 ESP32-S2. It is a general-purpose development board, embeds ESP32-S2-WROVER, 4 MB flash, with pin header (Figure 1).

GPS Module



Figure 2. GPS Module

Literature View

- Novel Coronavirus Situation Report 13^[1] World Health Organization has published the Novel Coronavirus situation report 13, as dated by 2nd February 2020. In this report, they have mentioned the current status of the COVID-19 affected countries. Also, they have given the public guidelines that should be followed by them.
- Rajan Gupta and Saibal K Pal^[2] The authors have presented the overall scenario of the outbreak of COVID-19 in India. Also, the study relates to the trend of spreading of viruses. This data is much useful in determining the future scenario of the COVID-19 virus so that necessary actions can be taken.
- Md. Palash Uddin, Md Nadim, Masud Ibn Afjal^[3] A GPS based android location tracking system is being developed by the authors. This cost-effective and multidimensional system has built-in features like GPS service. This technique developed for location tracking of a gaggle of individuals with a proximity alert system using various latest demanding tools and technology like Jason, Java, AVD and LAMP, etc.
- Subha Koley, Prasun Ghosal^[4] A real-time location tracking system has been developed. Internet of Things is an emerging technology having the power to vary the way we live. IoT gave has given approach that may provide timely communication and location tracking services of individuals have also been summed up to the proposed system to observe the precise condition in real-time basis.
- Khondker Shajadul Hasan, Abul Haque^[5] They need to implement a coffee cost object tracking system using

GPS and GPRS. This system allows a user to look at the current and therefore the past positions recorded of a target object on Google Map through the net. The system reads this position of the thing using GPS, the info is shipped via GPRS service from the GSM network towards an online server. The object's position data is then stored within the database for life and past tracking the GPRS service which made our system a coffee cost tracking solution for localizing an object position and standing.

- Inurina Ibrahim, Engku Mohammad Nazreen B. Engku Azman^[6] They need to do a pilot study on the development of Location Detection and Human Tracking Application via GPS & GSM Service.

Working and Implementation

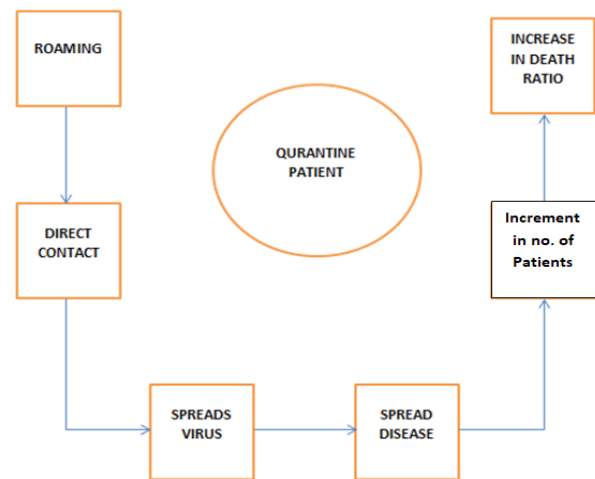


Figure 3. Problem Statement

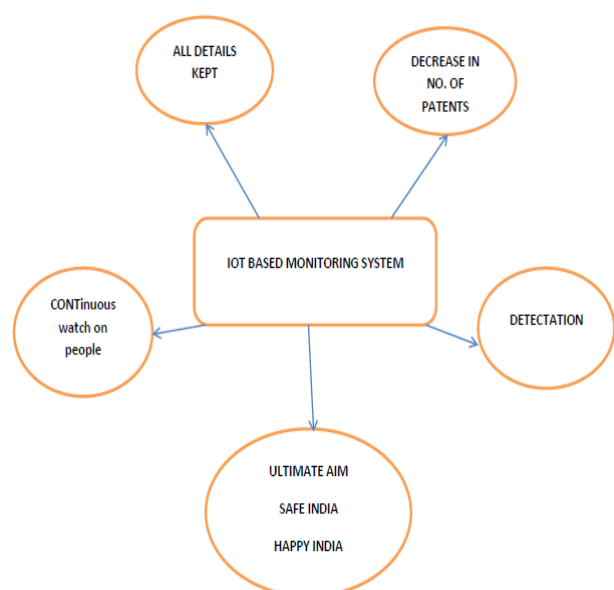


Figure 4. How to Overcome

An android application is developed, that should be installed on the Home Quarantine persons' smartphone. In this application, the patient has to login with his E-mail address (Figure 3). After successfully logging in, through the next windows patient has to fill all the personal information such as name, contact number, residential and professional details, etc. Then with the help of the next window, he has to fill information about his travel history within the last two months. Also, he has to mark weather he is underlying any medical treatments such as diabetes, blood pressure, heart diseases or pregnancy, etc. Also with the help of a checkbox window denoting the symptoms of COVID-19, he has to mark those which he is suffering from. This information, after clicking on the Submit button, will be collected by the main server which is located near to the doctor. The doctor will go through this information, analyze it, and then make a report of it. This report will consist of the data such as whether the patient is affected by the COVID-19, or have any chances of getting affected in the future. Also, it will include the necessary precautions that should be taken by the patient to avoid further spreading of the virus (Figure 4).

When the doctor will input the name of the quarantined patient to the experimental setup, it will give the exact location of the patient to the doctor. There will be an ESP32 module and that module in connection with the GPS module through the wires which have a GPS antenna with it. The Arduino software will debug the code from the ESP32 module. The module connection will be given to the GPSMOD. When the doctor will ask for the location from ESP32, we will get latitude and longitude of the current location as an output. This output in the form of latitude and longitude should be copied to the available browser which in turn will give the exact location of the patient as an output. If he tries to go out from home, strict action will be taken by the cops.

Another sensor system is implemented with the same GPS module to the quarantined patient. It will sense if another person comes in contact with the quarantine one, and raise a sound alarm so that, another one will get notify not to make any contact with the same person. Our main focus is to detect the location home quarantine person and reduce COVID-19; we apply a GPS module and ESP32 module technology to overcome it. When a home quarantine person will go to the doctor there will be a checkup taken by him and the doctor will note down all the information in the application that we are going to provide. The application will contain the following type of information: Name, Personal Information, Travel history, Symptoms, Start date of quarantine, the End date of quarantine.

After taking the information doctor will fill in the application and at that time. Also, he will provide E SP32 module

with GPS and which will stick to him. He will restrict him to keep it with him so that continuously they will locate. If the doctor wants to see the location of that person he will open the application select name, then there will be an input given and through the GPS module, there will be located on Google Maps. The ESP32 module is debugged code through Arduino and ESP32 and GPS module are connected with the jumpy wires. When he will locate the GPS module with GPS antenna range 1575.42MHz gets connected automatically to the satellite and provides the information to the satellite and in return gives a location to the doctor. The whole setup required for the tracking should be wear by the patient in his hand so that they can be tracked easily. Each quarantine person should be provided with a single setup (Figure 5).

As the person is restricted to stay at home due to a sharp increase in COVID19 patients, in case if he breaks the rule and goes out of the house then the cops will catch the patient and he will be isolated in hospital for 20 days. It will help in breaking the COVID19 chain. So as there will be a decrease in patients, all we can move towards a healthy life.



Figure 5.Application Windows



Figure 6. Latitude and Longitude values as an output from the software

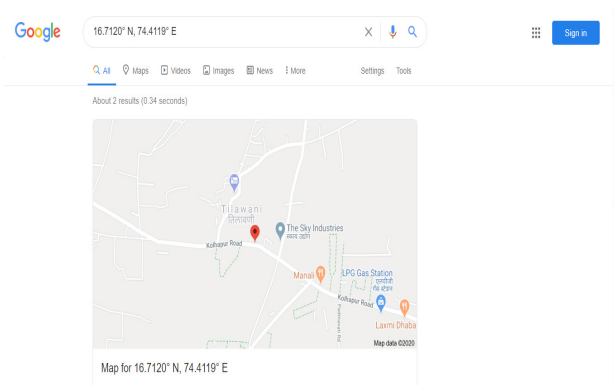


Figure 7. Location of patient as an Output after copying Latitude and Longitude values

Figures 6 and 7, show the output windows of the system. When the doctor will input the name of the patient of which the location is to be found out, the GPS antenna will provide the latitude and longitude values as output after code debugging in the software. These obtained values should be copied to the browser such as Google Chrome, Google Maps, etc. so that it will provide the location of the patient as shown in Figure 7.

Benefits

As far as the benefits are concerned, this system is very useful in the areas where COVID-19 has spread widely due to human interaction through social contacts. Due to the large population of COVID-19 patients, they are facing too many problems for getting tested regularly. Traditional methods of collecting patient data and reporting health officials are costly as well as time-consuming. In this case, the developed application will help us to gather all the information in a single place. So it will reduce the efforts required to collect the data. Also, the IoT based system will give the exact location of the quarantined patient. It will help doctors and cops to check whether the patient is following the rules strictly or not so that necessary actions can be taken immediately. The sensor system will sense and raise a sound alarm whether the quarantined patient comes in contact with any other person or not. So that the further spreading of the virus.

Conclusion

This paper represents a live tracking system for COVID19 suspects. The combination of IoT and GPS helps to provide continuous and real-time tracking of a person. The IoT and GPS combination is one of the important systems to track and locate a person in real-time. In the end, the authorities can track every detail of the person. In this paper, the solution is given to find the live location or travel history of the COVID19 suspect while the person is home quarantined by the authorities and to look if the person obeys the rules of home quarantined suspect patient. This paper concludes with the solution of tracking COVID19 suspects in a very effective way and without consuming much time and manual work. Finally, this solution or idea can be used in many other fields.

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