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Design of IoT based real time Geofencing Model for the realization of high security system

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Abstract

Using LBS (Position Based Service) and GPS (Global Positioning System) location sensors, which allow the information of the Geofencing region to be properly located, security will be maintained by creating virtual boundaries of a certain zone. In this study, an effort is made to keep track of the items' whereabouts and to be able to sound an alert when they leave the Geofence zone. The true position of the object and its final destination, along with the precise borders it entered or left, were revealed by the results. This method can be used in classrooms to set virtual limits for students and in prisons to implement inmate security proposals.

Keywords: Mobile APP, Raspberry Pi 3, Ublox, IoT, virtual boundaries.

1. INTRODUCTION

A technique called geofencing is primarily used to gather data and disseminate information inside a given geographic area. In mobile APPs, geofencing is a form of GPS tracking mechanism. It is a technique that enables the automatic detection and execution of pre-planned activities when a user device is present in a certain Geofenced region. The Google Android Geofencing platform has always been supported by this technology. This technique combines information from the cellular network, GPS, and IP addresses based. GPS is quite precise and can be used in Geofencing to determine the user's location.

2. LITERATURE SURVEY

Geofencing is the cutting-edge technology present ubiquitously in the world. In the organization employs a large number of people, making it impossible to track everyone's attendance using RFID and thumbprint technology. It will require lots of time., for this a geo-fenced mobile application is develop for the company's staff [1] Application Kit that aids people in preventing the spread of COVID-19 This groundbreaking tool stops the spread of the coronavirus by combining geofencing and machine learning. The second feature is a powerful

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tracking system that monitors everyone who interacts with the user by using Geofencing technology [2-3].

Ankle trackers powered by Arduino that use a GUI-based application to build geofencing and track people inside of quarantined homes. Within a geofence, a virtual boundary that is circular in shape, the ankle tracker serves as the trigger that is being monitored. With the use of Geofencing-based applications, a user in a smart city can discover the best services or shops nearby by using data from the GPS in his mobile service. [4]. The finest example of a geofencing scenario in a dairy farm is receiving feedback from wearable sensors like heat, drinking, and feeding from the cow. Farmers can simply obtain data about each cow from each place using IoT-based SMS technology, such as position, milk production, health, etc. [5].

Geofencing for a certain region is required to approach close to the target in a precise manner for unmanned aerial vehicles utilizing GIS-based technology to locate objects on the side of the road. where Geofencing for a certain area is required to allow an unmanned vehicle to approach an object in close proximity and precisely [6]. Geofencing can be used to alert the naval officer when a ship approaches a specific underwater catastrophe region or to inform drivers on a highway about the construction of the road's operating condition when they enter that Geofencing-based area in their car [7]. Finding a sea border is a challenging undertaking in the water. Using Geofencing technology, it is feasible to send alerts to fishermen when they cross an offensive border into another country [8]. In the event of child safety, wearable sensors such as temperature and pulse can provide information regarding the child's status as well as location, which can also be tracked by GPS, and alerts can be sent using GSM technology [9].

A virtual barrier, such as Geofencing, can be used to regulate access to public spaces where smoking and drinking are prohibited. These sensors can detect intoxicated individuals and provide alert messages about the location [10]. If the peripheral of jail is trotted with a virtual boundary utilizing Geofencing method, without utilizing CCTV camera modules, then if any inmate tries to cross jail boundary, the jailer will receive an escape alert message [11].

If a vehicle is being tracked, the owner must configure the geofencing graphical region in the mobile app so that, should the vehicle depart from the geofencing physical boundary for whatever reason, the owner will receive an SMS alert [12]. By measuring the precise distances between buildings, trees, and other obstacles, a drone would be provided a safe region in which to move [13].

3. GEOFENCING TECHNIQUES

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This method allows for pre-programmed tracking of portable objects entering or leaving a Geofenced area. When distinct mobile devices enter or leave the limit, warnings are generated. The Geofence's shape can either be square or more amorphous, like a complicated polygon. At actuality, the Geofence is shaped like a circle, with the eye point in the centre. Given that it only requires two boundaries—the precise spot and an estimated range—this method is the simplest way to implement geofencing. The computation determines the distance between the circle's perimeter and centre.

4. METHODOLOGY OF THE PROPOSED SYSTEM

A wearable physical sensor for gathering data from school students will transmit data to the next door and then be transferred to a data base station through the internet. The information is sent from the base station to the cloud, where it is analyzed using a variety of methods and strategies. The Google Map API and the Google Places API are two examples of how the Google API is used with mobile clients. Figures 1 and 2 display the proposed system's block diagram and hardware implementation. There are three modules in the complete framework.

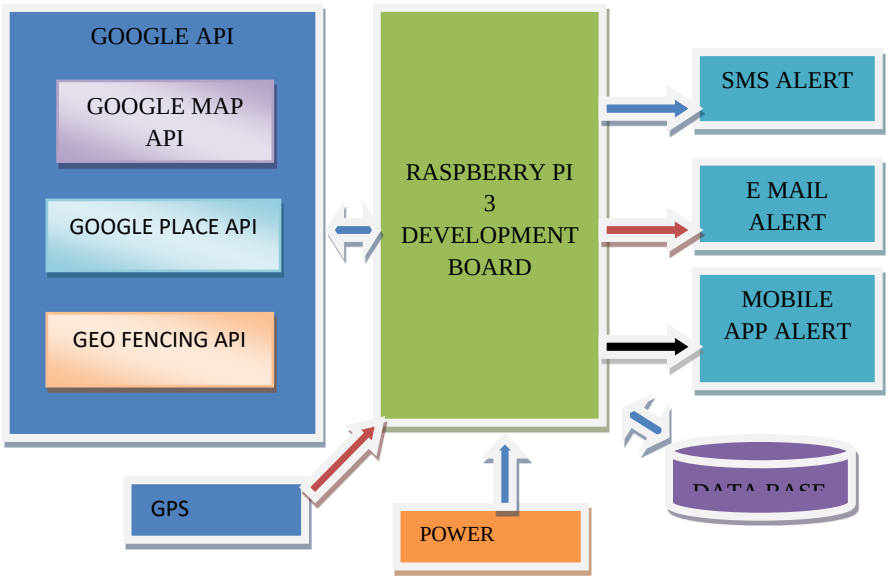

Fig. 1 Block Diagram Geofencing System using IoT

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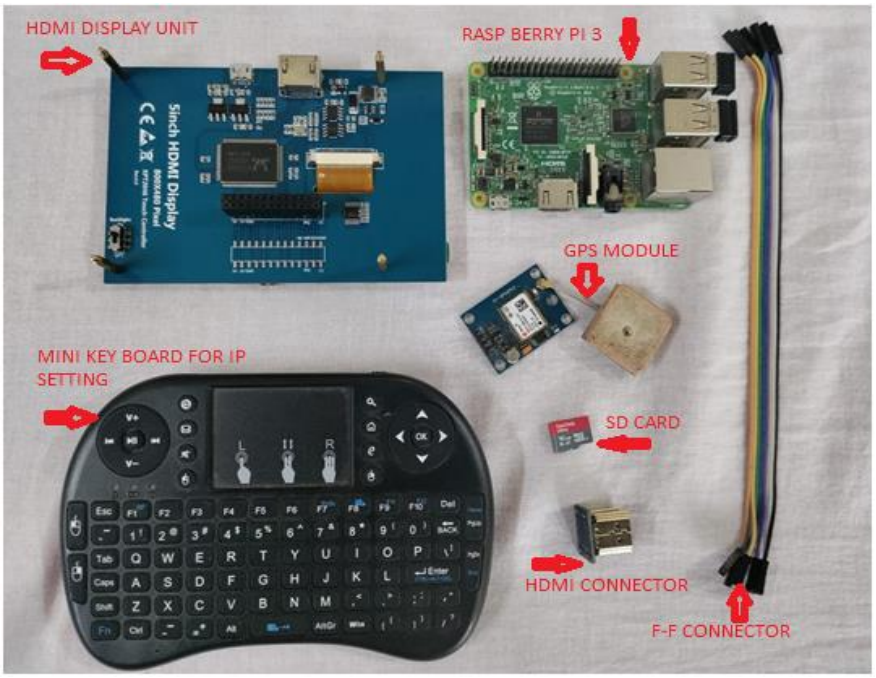

Fig. 2 Hardware Implementation of IoT Based Geo-Fencing System

5. GEOFENCE NODE SETTINGS IN NODE RED

Geofence app must be successfully installed on a phone so that it may operate server-side. It comprises both mobile and labtop operations, such as continuous tracking of when a device enters or exits a geofence, such as a school fence. Node RED collects the data when we leave the location, translates it into human language, and then sends the SMS alert. It will only need to be set up once for every OS-operated device.

Every position reported into mosquito protocol for NodeRED includes a coordinate like longitude and latitude along with the device's tracker id thanks to a Geofence put up on the server side. This process offers pre-programmed inspection of mobile objects travelling through or inside a Geofenced area. The Raspberry Pi, GPS, micro-SD card and U BLOX and make up the module.

The proposed system is being developed using a number of different pieces of software, including NOOBS OS, mobile applications, PHP, the MQTT Protocol, Python language, and Node RED technologies. The flowchart in Figure 3 provides an explanation of the Geofencing system's architecture.

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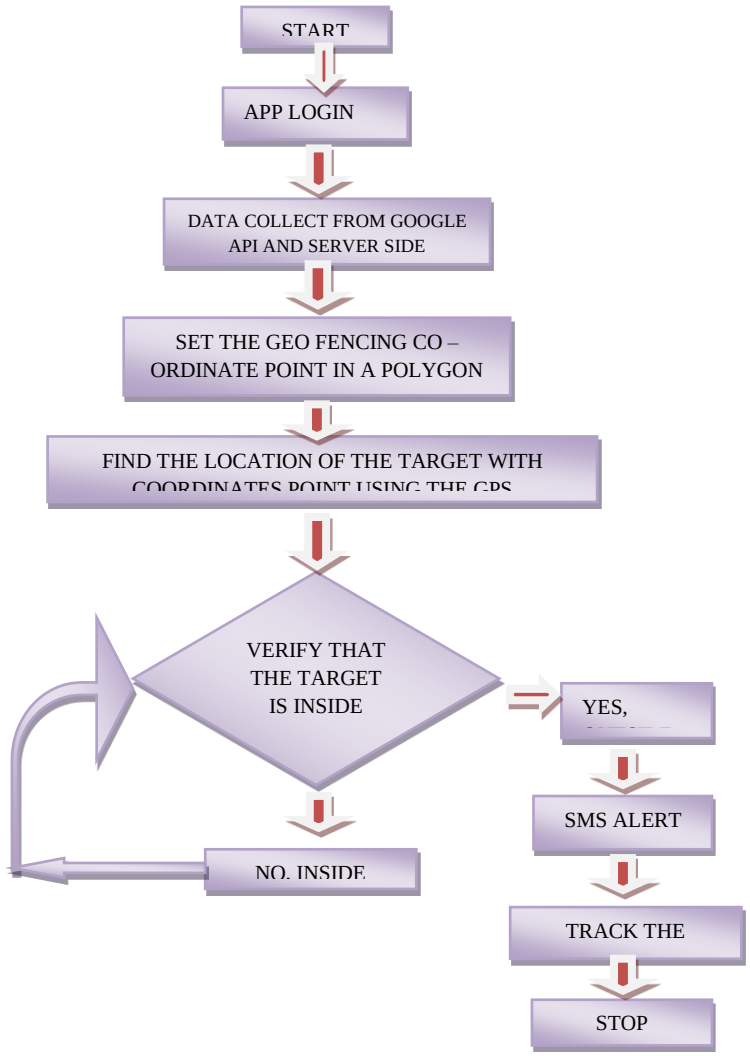

Fig. 3 Flow Chart of Geo-fencing System

6. RESULTS AND DISCUSSION

Any youngster, student, or anybody else can use this concept to check entering or exiting through Geofence borders for security reasons. It can be used in many different places, such as parking lots, jails for criminals, animal habitats, etc. A user can examine and monitor the person by connecting the IP address 192.168.201.34 with the port number 1880 in the Geofencing track in system. By supplying the specific latitude and longitude of that Geofencing position, which are given in IP (192.168.201.34), based on a user's Geofencing tracking in the Google

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Map VNC viewer, they can also receive a message alert if that person is beyond the virtual Geofence the user has set up.

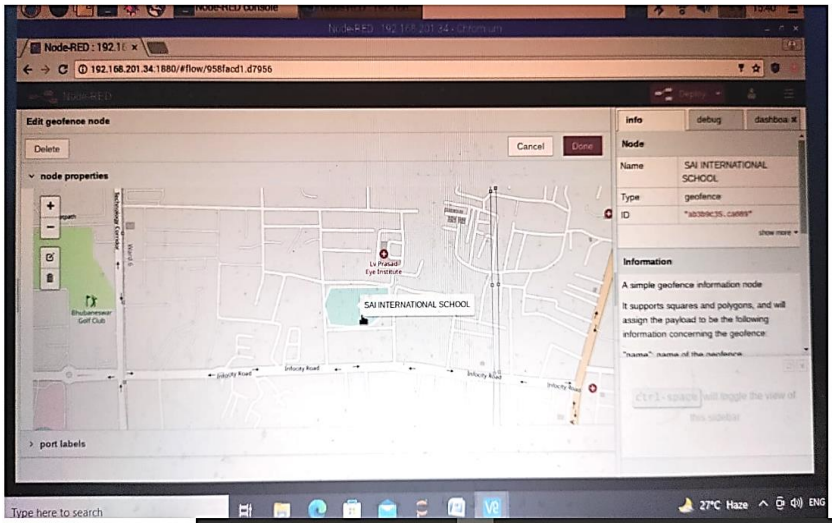

Fig. 4 The user using the remote sharing viewer in Google Maps displayed a geofencing map around a SAI INTERNATIONAL SCHOOL at IP (192.168.201.34)

7. CONCLUSION

In this paper, an appropriate model is put forth that can be used to control Geofencing at schools. This model demonstrated the best results of maximum security by limiting student movement when they entered or left the virtual boundary area that was created by the user, in this case the user's parents. It can safeguard the criminal screen next to the school.

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