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IoT based bus tracking system

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ABSTRACT In the busy metropolitan cities like Mumbai, Delhi, people don't have time to wait for transport. Waiting time for transport in such crowded cities leads to less productivity on a whole. People face this problem in their daily life where they have no idea about the current status of their transport. So, the proposed solution is a web-based application that will help the user to check out the current location of the bus and also will help the user to know how much time the bus will take to reach the current location of the user. The system will use GPS as the basis for the application and basic web application will be interfacing with the updated database to provide the real-time data to the user, hence enhancing the user-experience. There are buses available for passengers travelling to different locations, but not many passengers have complete information about these buses. Complete information namely the number of buses that go to the required destination, bus numbers, bus timings, the routes through which the bus would pass, time taken for the vehicle to reach its destination location would assist the passengers with various routes, track the current location of the bus and give the correct time for the bus to reach its destination. The system deals with overcoming the problems stated above. The system is a web application that gives necessary information about all the buses travelling in destination. The platform chosen for this kind of system is a web application, reason being a web application is because every person nowadays uses World Wide Web irrespective of device and operating system.

KEYWORDS: Sense amplifier, Delay;

I. INTRODUCTION

Now a days one of the popular online taxi booking services like Uber, Taxi for Sure, Zoom Car and many more have opened the world of real time location tracking. GPS plays a vital role both in allowing the user and also the service provider to track the taxi. A vehicle tracking system combines the use of automatic vehicle location in individual vehicles with software that collects these fleet data for a comprehensive picture of vehicle locations. Modern vehicle tracking systems commonly use GPS or GLONASS technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed on electronic maps via the Internet or specialized software. Urban public transit authorities are an increasingly common user of vehicle tracking systems particularly in large cities. Several types of vehicles tracking devices exist. Typically, they are classified as "passive" and "active". "Passive" devices store GPS location, speed, heading and sometimes a trigger event such as key on/off, door open/closed. Once the vehicle returns to a predetermined point, the device is removed and the data downloaded to a computer for evaluation. Passive systems include auto download type that transfer data via wireless download. "Active" devices also collect the same information but usually transmit the data in near real time via cellular or satellite networks to a computer or data center for evaluation. In this project an IoT based GPS Location tracker using NEO-6M GPS Module. This Location Tracker Board consists of a NodeMCU, NEO-6M GPS Module. For user interface a web-based application will be created to display the location details. This web application will contain a link to directly check the bus location in Google Maps.

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II. THE ORETICAL BACKGROUND

The software has been developed to track the vehicle information with the help of the hardware provided. The hardware consists of sensor and emitter. Sensor is used to sense the IR rays. Emitter device emits unique frequency IR rays and is attached with vehicle. Whenever IR ray is in the sensor range, it senses the rays and the signals are manipulated and information of the vehicle is updated. If the vehicle is black listed by any authority, then it will be marked as 'blocked', otherwise it will be marked as 'Clear'. If the Current Status is 'blocked', then the system immediately alerts the concerned authority by sounding a siren and shuts the gate if it is open. If the current status is 'clear', then the system will order the Toll Gate Motor Controller section to open the door. All these interactions are carried out through interface circuit, which sits next to the PC's port. The software has been developed to track the vehicle information with the help of the hardware provided. The hardware consists of sensor and emitter. Sensor is used to sense the IR rays. Emitter device emits unique frequency IR rays and is attached with vehicle. Whenever IR ray is in the sensor range, it senses the rays and the signals are manipulated and information of the vehicle is updated. In this paper an overview of "Automation of Toll Gate and Vehicle Tracking" using microcontroller and IR communication has been presented. By adapting this technology, various applications like Traffic Management Process, Vehicle Movement Tracking and Stolen Vehicle Detection could be implemented. Using model-based approach, this could be implemented and tested using MATLAB and Simulink

This paper proposes and implements a low cost object tracking system using GPS and GPRS. The system allows a user to view the present and the past positions recorded of a target object on Google Map through the internet. The system reads the current position of the object using GPS, the data is sent via GPRS service from the GSM network towards a web server using the POST method of the HTTP protocol. The object's position data is then stored in the database for live and past tracking. A web application is developed using PHP, JavaScript, Ajax and MySQL with the Google Map embedded. The existing live tracking systems that are available now a days use SMS for the communication to the server which turned out to be expensive. In this paper they have used the GPRS service which made their system a low cost tracking solution for localizing an object position and status. This system is very useful for car theft situations (alarm alert, engine starting, localizing), for adolescent drivers being watched and monitored by parents (speed limit exceeding, leaving a specific area), as well as for human and pet tracking.

An RFID reader is used in the Bus to get the address of the location if any tag is present in the vicinity of it. The decoder then responds to the microcontroller about the address. At mega 328 processor has internal SPI module which directly support the ESP8266 Wi-Fi module serial communication. This system utilizes a stand-alone Wi-Fi controller IC which handles most of the network protocol requirements. The IC communicates directly to the Arduino using a standard serial interface using the Arduino IDE software-platform.We have developed a very basic implementation of the proposed concept using Thing Speak web service. We have used Virtuino android app version 2.8.2 tested on an Android Phone supporting minimum API 14 (Ice-cream Sandwich). With the help of API 14 and above ensures that the application will run on approximately above 90percent of the devices that are active on the Google Play Store. The Arduino IDE is a software for Arduino microcontroller and which provides environment to code the Arduino devices to interface the different kinds of sensors and other type of devices and perform the operation on both global and local domain by using library functions. This prototype system at present developed for tracking buses travelling in one route, it can be implemented for all the routes. This system contains low covering frequency RFID reader; it can be implemented by using high covering frequency RFID reader.

This paper presents a novel idea of vehicle tracking system based on the existing GSM cellular networks. A software based system is proposed that sends specialized request to the GSM cellular networks to call any particular vehicle ID. The vehicle ID is actually a particular SIM kept in a special kit inside the vehicle that is capable of receiving a phone call automatically. As soon as the call is established, the particular cell information is available to the BSC which is then passed to the software. Based on the information collected, the software will initiate a forced handover of the call to another suitable cell and then receive the information of that cell too. Upon completion of two consecutive forced handovers, i.e., receiving cell information of the vehicle ID from three different cells and sending them to the software, it will automatically disconnect the call.The software will analyze the cell info and extract three timing advances (TA) data along with the GPS locations of the individual cells. An algorithm has been developed for this system, which then calculates the exact location of the vehicle.

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III. DESIGN AND IMPLEMENTATION

3.1 DesignforImplementationofBus Tracking System

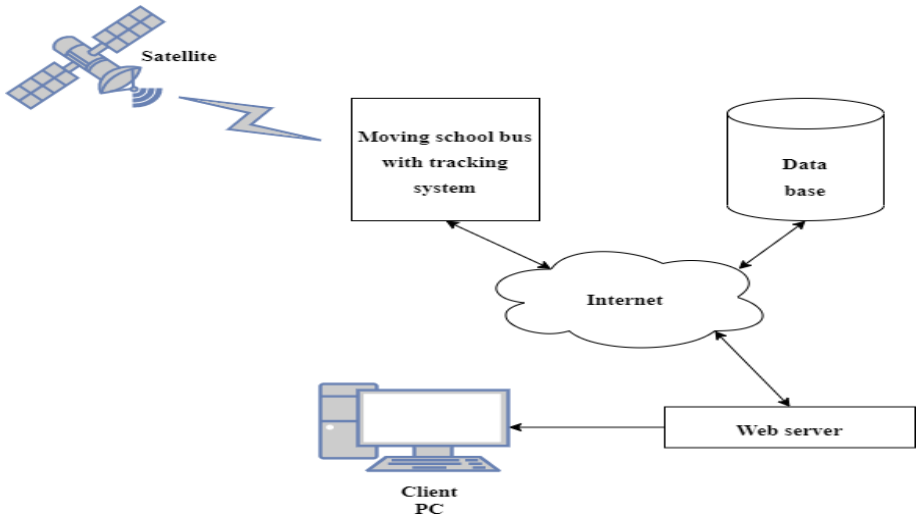

Figure3.1:Blockdiagramof Bus Tracking System

The application provides the live location of the bus to the user. By using the application commuters can not only fetch the bus location but also can calculate the estimate time taken by bus to reach its destination The Location information is fetched from the online database which receives the data regarding the location from a hardware device placed inside the bus. This helps in maintaining the uniqueness of the bus.While displaying its location on the map. The request made by the client for the bus information will be fetched from the database and delivered to client through server. The bus tracker will send its coordinates continuously to the server where it will be stored in the database. When the user selects that particular Bus ID, its location will be retrieved from the server and shown on the map. Since the coordinates will be changing, the point on the map will keep on moving, hence the user can actually see the live location of the selected bus. Also, we can use Google's distance matrix algorithm to show the user the approximate time taken by bus to reach the user. The web application will be developed using HTML, CSS, JAVASCRIPT, PHP, XAMPP. It will make tracking the bus very easy for the user. The hardware part of the project will be developed using NodeMCU and Neo 6M GPS module. The GPS module will collect the latitude and longitude data from the satellite and send it to the NodeMCU. Then the NodeMCU with the help of internet will send the data to the database. Then the data is fetched from the database tshrough server and location will be shown to the user on the map when the link is opened.

3.2 Circuit Diagram

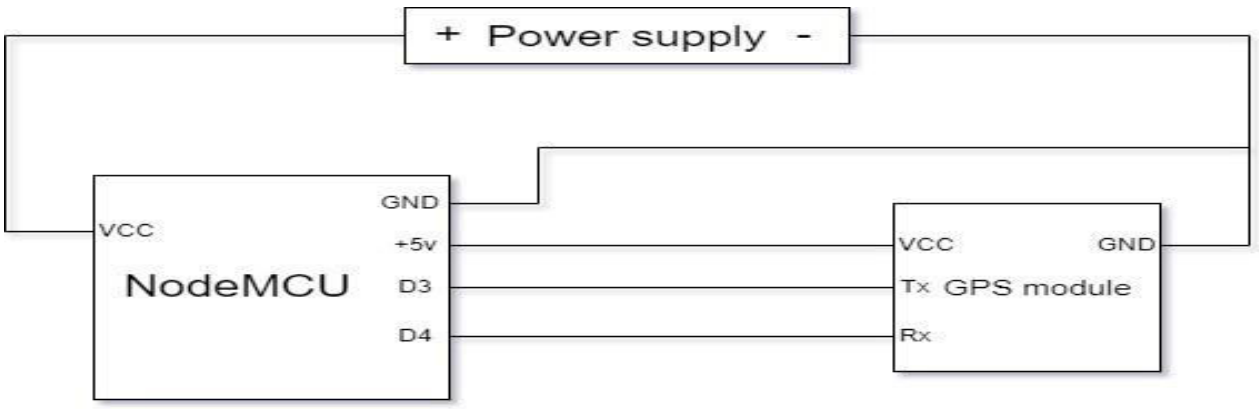

Figure 3.2Circuit diagram of GPS tracking hardware

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In this circuit diagram we use the NodeMCU and Neo6MGPS module. In this we connect The Positive of the Power supply is connectingVCC of The NodeMCU and VCC of The GPS Module and Negative of the power supply is connecting to the ground of the NodeMCU and GPS Module. The Tx and Rx are the transmitting and receiving signal of the GPS Module. In NodeMCU act as the Wi-Fi module. It share theInformation to the client.

IV. RESULT AND DISCUSSION

The proposed project has a very simple User Interface to use it. Google maps API is the core component that can be used in it, which is very easy to use and explore maps with simple gestures such as pinch to zoom tap to point etc. It will make tracking the bus very easy for the user. The system allows a user to track their bus from the web application. With the help of bus tracking user can see how far the bus is located, this allows user to plan their route and travel plan accordingly. The web application will also give number of buses arriving at the particular location with the arrival time. This will reduce the wait time and improves the customer satisfaction. This web application will make bus transportation more productive.

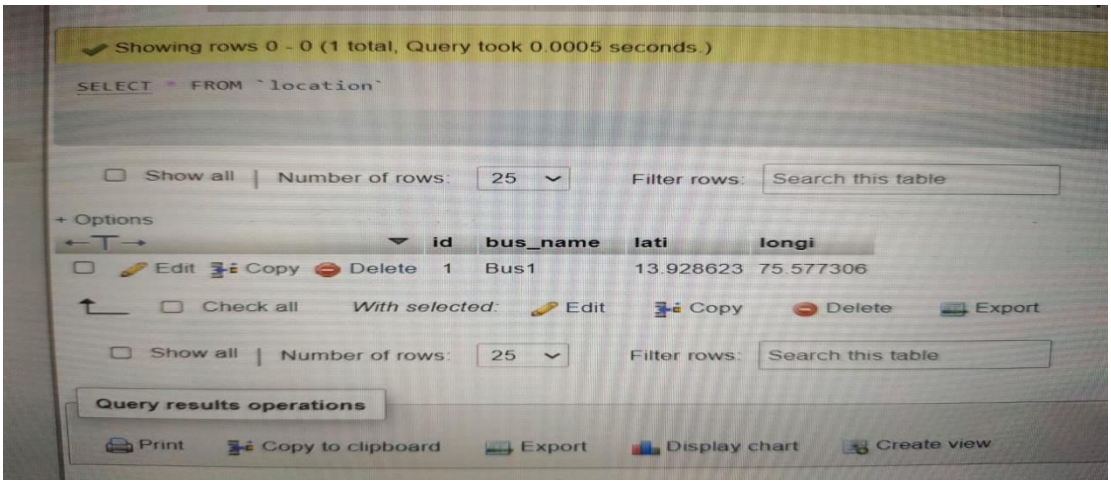

Figure4.1:latitude and longitude on serial monitor

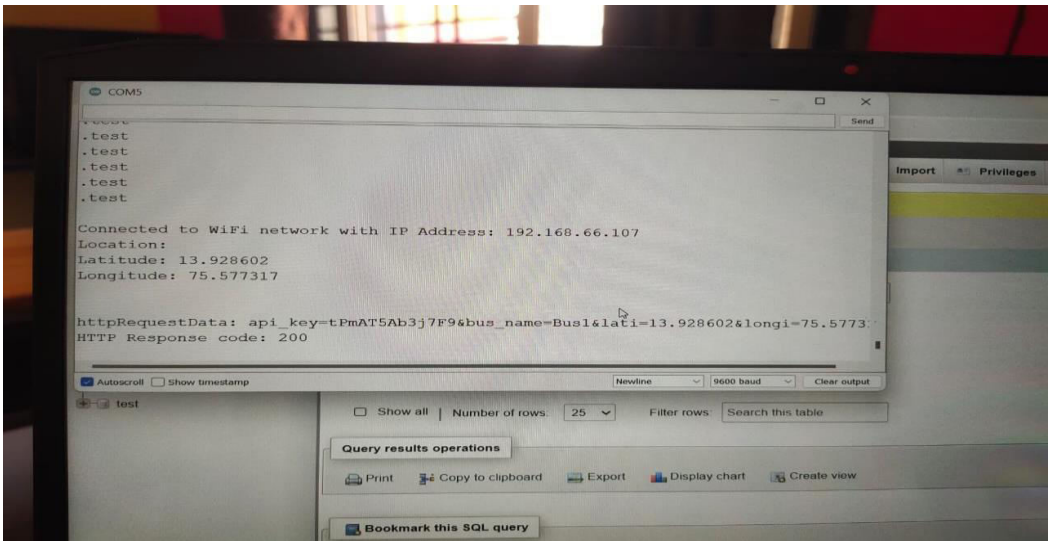

Figure4.2:Connecting toWI-FI

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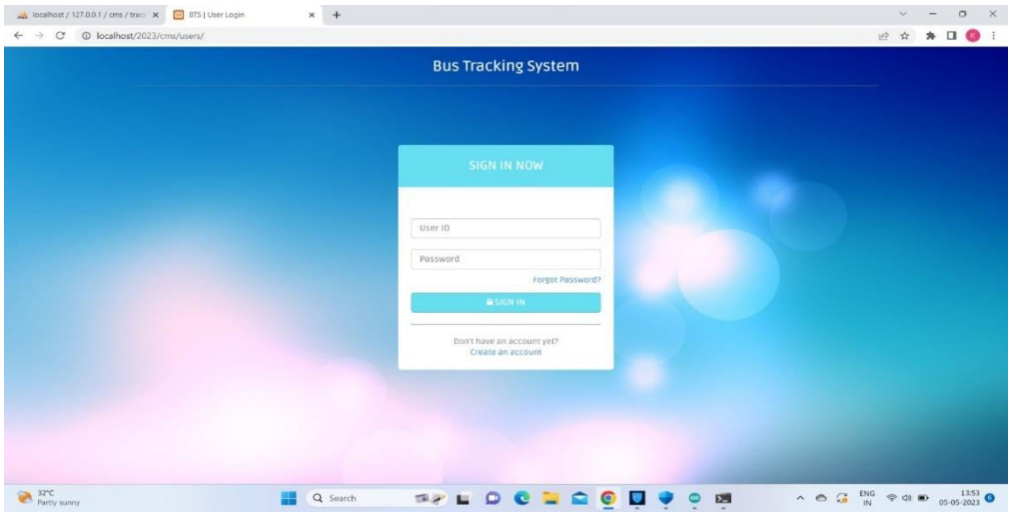

Figure4.3:Creationofdatabase

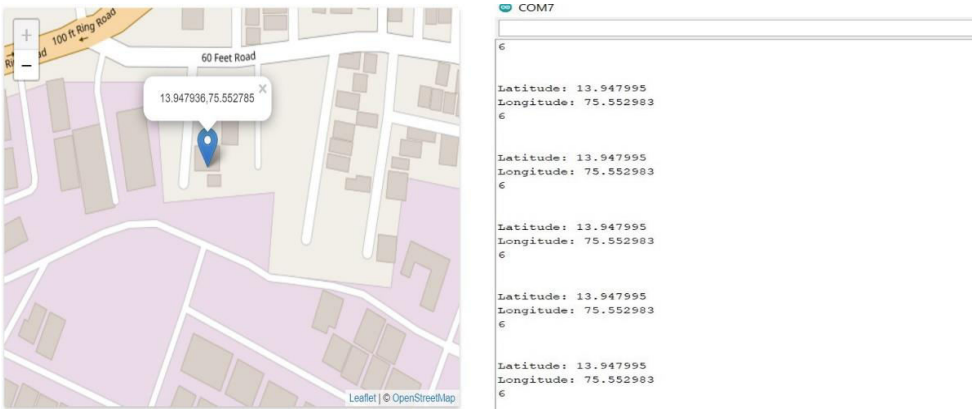

Figure4.4:Verifyingtheoutput.

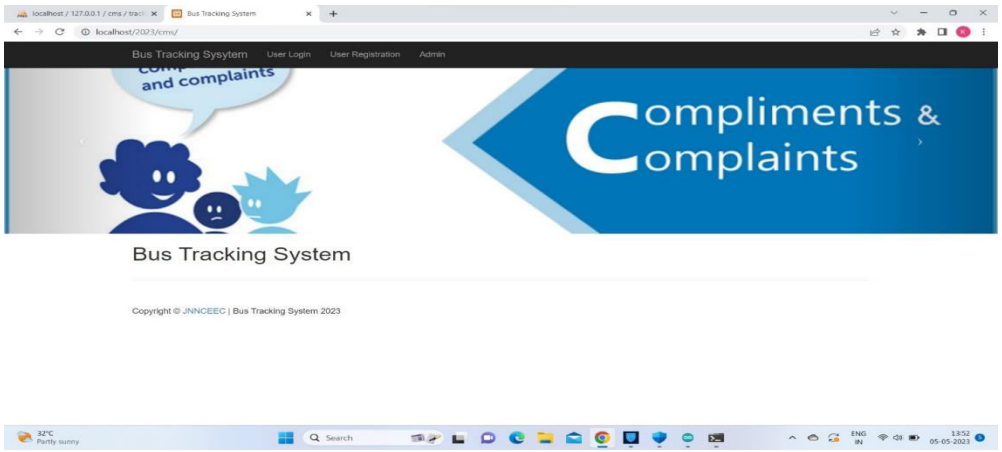

Figure4.5:Loginpage

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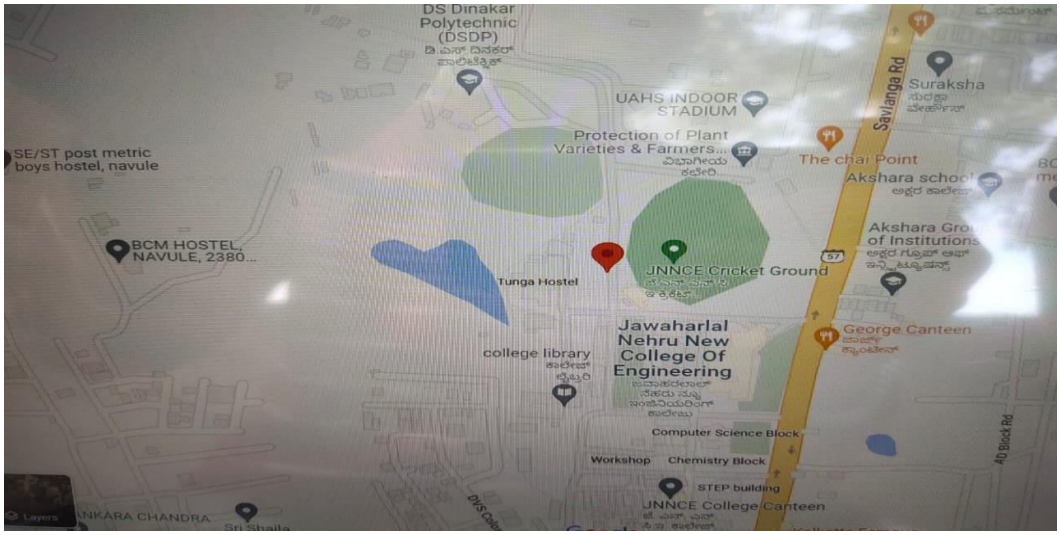

Figure4.6:Dashboard

III. LIMITATIONS

- GPSreceiversrelyonsignalsfromatleastfoursatellites.Iftheyonlyconnectwith three, the positioning is not entirely accurate.When obstacles such as walls, buildings, skyscrapers,andtreesobstructasignal,problemscanarise.
- Geomagneticstormsandotherextremeatmosphericconditionscanalsocauseprob- lems.Furthermore, the mapping technology used in conjunction with the GPS may be inaccurate or out of date, resulting in navigational errors.
- RelyingsolelyonGPScanbeproblematicifthereisasignalfailureoryouareusing a battery-powered device that runs out of power (GPS devices are almost always power-hungry).Unlessyouhaveabackupplan,suchashardcopymaps,youcouldeasilyget lost andhave no idea which way togo.
- Anotherissueisthatthepositioncanbesignificantlyoffattimes,especiallywhen thenumberofsatellitesislimited.Satellitesuseatomicclocks,whichareveryprecise, buttherearesometimesdiscrepanciesandthustimemeasurementerrors.
- The satellite mustpreservetheirpredefinedorbitalpositions,butgravitationalpulls(fromtheearth, moon, and sun) do occur without their knowledge, GPS devices can be used to track people.
- A device, for example, can be installed in a car to track the victim's location at all times.Thismethodcanalsobeusedtoaidinnefariousandcriminalactivitiessuch as stalking, breaking and entering kidnapping, and even murder. When travelling, local knowledge is extremely valuable.
- If you rely solely on GPS technology, you may miss out on information that could be useful for your journey.For example, whether a stretch of road is prone to flooding orother hazards at certain times of day, whether there are any scenic views, or whether the

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roadisclosedforanyreason,suchasdrawingbridgesorrailwaycrossings.

IV. APPLICATION

A bus tracking system is a technology-based solution that allows passengers to track the location and movement of buses in real-time. This system is useful for passengers as well as bus operators. Here are some of the applications of the bus tracking system:

1. Real-time bus tracking: The main application of the bus tracking system is to provide real-time information about the location of the bus. Passengers can use this information to plan their journey and avoid long wait times at bus stops. Bus operators can use this information to optimize their routes and schedules.
2. Improved passenger experience: With the bus tracking system, passengers can plan their journey better and avoid waiting at bus stops. They can also track the arrival time of the bus, which can help them plan their day better and avoid unnecessary delays.
3. Enhanced safety: The bus tracking system can also be used to improve safety on the buses. The system can be integrated with CCTV cameras to monitor the behavior of passengers and detect any potential security threats.
4. Better maintenance: The bus tracking system can also help with the maintenance of buses. By monitoring the performance of the buses in real-time, operators can detect any potential problems and schedule maintenance before they become major issues.
5. Reduced carbon footprint: By optimizing routes and schedules, the bus tracking system can help reduce the carbon footprint of the buses. This can help reduce the environmental impact of public transportation.

Overall, the bus tracking system is a useful technology that can help improve the efficiency, safety, and sustainability of public transportation systems.

V. CONCLUSION

This project presents a low cost tracking system using GPS technology, suitable for wide range of applications all over the world. The combination of the GPS provides continuous and real time tracking. The cost is much lower compared to SMS based tracking systems. Free Google map and the use of HTTP protocol as data sending method reduces the monthly bundle cost for the individual user and also for the small business owner. The first objective of hardware circuit to obtain the location of the required object has been completed. The hardware circuit will collect the latitude and longitude from the satellite and send it to the data base via internet. The second objective of collecting and updating of location data in real time has been completed. The data base will be refreshed every 30seconds if new data comes from hardware device then only that data is stored. The 3rd objective has been completed. The user can view the location of the bus on website, new data from the database gets fetched every 30seconds through server, up on refreshing the change of location can be seen on the map.

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