



Internet of Things (IoT) Based Vehicle Tracking System using SIM7600EI and Arduino UNO

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Abstract— The rising cases of vehicle theft, vehicle hijack, kidnapping, diversion of crude oil and petrol, change of route by drivers of transport companies and theft of valuable containers and items in seaports have necessitated the use of a more reliable security system in vehicles and storage facilities for valuable items. Security systems that can track, monitor, and give feedback of the location of the vehicle or container. Several technologies have been developed to provide reliable security for vehicles and valuable goods. Some of the technologies are locking systems such as the steering wheel lock, central locking systems, theft detection systems, fuel and ignition disabling system, etc. all these can reduce the possibility of vehicle been stolen but can easily be manipulated by the thief and does not give a trace or location of the vehicle or goods if the vehicle is eventually stolen. Several researchers and companies have designed and constructed vehicle monitoring and tracking device. Many of them are microcontroller-based system.

Keywords: *Android Application ,Global Positioning System, Global System for Mobiles IoT, SIM 7600EI.*

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I. INTRODUCTION

The rising cases of vehicle theft, vehicle hijack, kidnapping, diversion of crude oil and petrol, change of route by drivers of transport companies and theft of valuable containers and items in seaports have necessitated the use of a more reliable security system in vehicles and storage facilities for valuable items. A security system that can track, monitor and give feedback of the location of the vehicle or container. Several technologies have been developed to provide reliable security for vehicles and valuable goods. Some of the technologies are locking systems such as the steering wheel lock, central locking systems, theft detection systems, fuel and ignition disabling system, etc. all these can reduce the possibility of vehicle been stolen but can easily be manipulated by the thief and does not give a trace or location of the vehicle or goods if the vehicle is eventually stolen. Several researchers and companies have designed and constructed vehicle monitoring and tracking device. Many of them are microcontroller-based system.

The vehicle tracking system presented here is a vehicle theft or location change monitoring and tracking system that gives information on demand of the new location of vehicle. This system is suitable for vehicle owners, school buses, transport business companies, fleet management, crude oil, and petrol tankers owners etc. It consists of small electronic unit which is fixed in a hidden place in the vehicle to monitor the location of the vehicle. It is fixed in the vehicle in such a manner that it is not visible to anyone who is inside or outside

the vehicle except the owner of the vehicle or the company that installed it. After installation, the system will locate target using an android application (Java based application) in the app's own map system. When the vehicle changes location or is stolen, the GPS module (receiver) in the device receives information about the location (coordinates) from the GPS satellites and transmits data to the microcontroller.

The GSM modem provided with a registered SIM card receives the GPS parameters of latitude, longitude and time from the microcontroller. The Exact location of the vehicle is indicated in the form of latitude and longitude along with the exact navigated track on map. The arrived data, in the form of latitude and longitude is used to locate the vehicle on maps, the output is then displayed on the LCD and transmits to the vehicle owner mobile phone in the form of SMS when request is made. This system is user friendly, easily installable, easily accessible and can be used for various other purposes. The system is not limited to find the location of the target but also calculates the distance travelled between two stations. The app also provides the ability to get the history of previously various locations. Also, the process to change the number of the SIM present in the tracker is also streamlined.

II. EASE OF USE

Our project is easy to use, as the whole system is controlled by the app we developed as the main source of system control

for the project. This user must download the app and then with the press of a single button the vehicle is tracked.

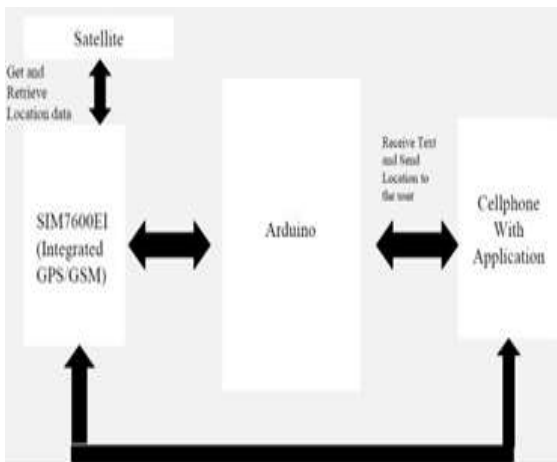


Figure 1: Tracker Block Diagram

We make use of an Arduino Uno board as the central system for the project. In our project we are using an Integrated GPS and GSM. The GPS allows us to gather the location data in the form of Longitudinal and Latitudinal coordinates. The GSM module is the one that is required to carry out the task of communication between the user and system. When the user wants to know the location of his/her Vehicle He/ She All he must do is use the app provided with the module and the further communication is received by GSM in SIM7600ei module interfaced with the Arduino. Then the Arduino sends signal to the GPS in the same SIM7600ei to get the live location. Then the GPS module communicates with the satellite it is locked to and receives the location in the form of coordinates. These coordinates sent to the user via GSM and then are received by the app and the real-time tracked location is loaded in the app.

III. TESTING & TROUBLESHOOTING

In testing, we fixed the completed vehicle tracking device in a car and allow the car to be driven away to a different location. We then send an SMS with a registered mobile phone to the GSM modem with a registered SIM card through the app and received the correct and accurate results in the app.

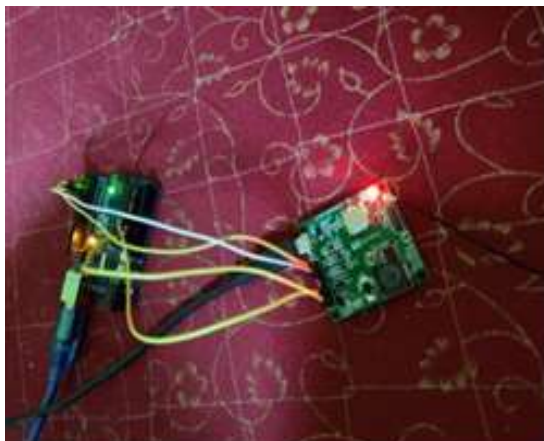


Figure 2: Raw Testing

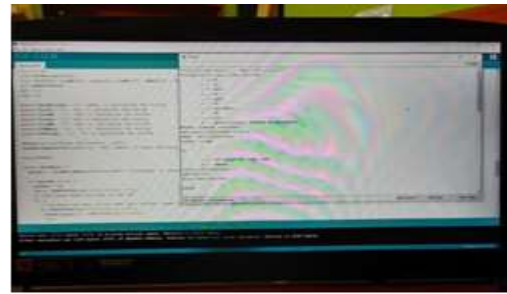


Figure 3: Code Dry Run



Figure 4: Location traced view

As shown in the Figure 2, it is quite clear with setup that 7600 ei module is interfaced with the Arduino UNO for testing. In this arrangement it is to be noted that this module interfacing is totally new and innovative since here we have compressed the space and code. The program testing can also be checked in the Figure 3, where dry run for the code is shown. In Figure 4, the traced location is shown as a result.



Figure 5: Location tracking started

In the Figure 5, it is showing the data displayed by the application. It can be observed here that the how the location tracking is initiated and can be seen with the status as per in the figure. In the Figure 6, the location history can be observed with the details such as date, time and speed. This is essential information regarding the vehicle to be tracked.

As we can see from Figure 2 to Figure 5 are providing good guidelines to make sure the operation of the module and the application too. The vehicle tracking system works mainly by receiving messages from a mobile phone. The user is supposed to use the track button in the app provided. This button initiates the GPS modem and receives the latitude and longitude position and this information will then be sent as SMS to the mobile device. Whenever theft occurs or on demand request of the vehicles location, the device sends a message to the vehicle owner's and the location is loaded in the app.



Figure 6: Location history

IV. ALGORITHM FOR THE MODULE

1. START
2. Check if the module is ready.
3. Check if the user has sent the message to track.
4. If yes, send the signal to satellite to fetch the coordinates.
5. Then send the coordinates to the user's registered mobile number.
6. If the module is not ready retry to connect to the serial ports.
7. If there is no message received then wait for the message to be received and stay in the power saving mode.
8. Once the message is received by the user then check if the sender of the coordinates is a registered and valid mobile number to render the coordinates on the map in the app.
9. If the sender is not a valid number then ignore.
10. Once the message is sent by the module goto step 2.
11. END.

V. FLOW CHART OF THE SYSTEM/MODULE

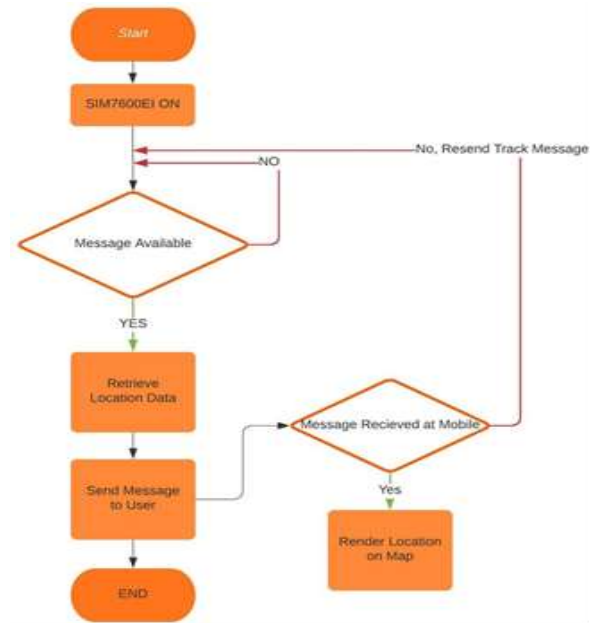


Figure 7: Flow Chart of the system

VI. ADVANTAGES OF THE SYSTEM

This module can be installed in any vehicle with small space requirements. One can monitor a fleet of vehicles by installing the system in his/her vehicles. The amount of fuel used by the vehicles based on the location history available. We can keep history of 100 locations tracked by the user, to track the vehicle if ever stolen. It can be used to aid during accident events.

VII. DISADVANTAGES OF SYSTEM

If the SIM is found in a NO SERVICE zone then the module is not functional for that specific period. System won't work in signal jammer's region.

VIII. CONCLUSION

We have successfully developed and implemented a vehicle tracking system that gives feedback information of the location of stolen vehicle using GPS-GSM technology. It is user friendly, easily installable, easily accessible and can be used for various other purposes. It can also be applied for better management of fleet with a return of large profit, better scheduling, or route planning to enable large job schedule. If this project is properly implemented it will improve safety, reduce vehicle loss due to theft, increase productivity, reduce diversion of routes by transport company's drivers.

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