# *One touch tracking system with integrated maps*

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***Abstract***

The time is precious for every human being and this project is developed in order to value the time and for security purposes. Now a day, though Internet is being available everywhere, considering rural areas where it is not as like in urban. Using GSM Technology the communication between anywhere in the earth is possible. GSM plays important role here for tracking. In rural, considering a student or vendor who is waiting for bus in order to travel they spent most of the time for waiting. Using GPS Hardware in the vehicle we can instantly track the exact location of vehicle by connecting with GSM and then tracking the exact location using Offline Map technology, just by tapping the message which was sent to the registered mobile. This makes the time to be reduced instead of waiting for bus to be travel. This project also focus on unmanned military vehicles, cab, school bus and delivery services.

**Keywords—GPS, Vehicle Tracking, GSM Technology**

## I. INTRODUCTION

With the advancements in technology, automated vehicle tracking systems (VTS) have become very prominent. In this project, we will send the location coordinates to the Local Server and we just need to open a 'webpage' on our computer or mobile, where we will find a Link to Google Maps with our Vehicles Location Coordinates. When we click on that link, it takes us on Google Maps, showing our vehicles location. In this **Vehicle Tracking System using Google Maps**, **GPS Module** is used for getting the Location Coordinates, **Wi-Fi module** to keep send data to computer or mobile over Wi-Fi and **Arduino** is used to make GPS and Wi-Fi talk to each other. The vehicle position is updated every 60 s as the vehicle is moving. Several authors have reported in literature their work related to vehicle tracking. Aravind et al proposed a low cost VTS which uses wireless sensor technology [1]. The Qualnet network simulator is used to perform simulations for different scenarios. SeokJu Lee et al developed a smart phone application for real time vehicle tracking. Google maps API is used to locate the vehicle in a map using the smart phone application [2]. Hoang Dat Pham et al used GPS and GSM technologies to transmit the vehicle location to user‟s phone [3]. Moloo and Digumber developed a web application using PHP and MySQL for GPS tracking using low-priced mobile phones. Google maps API is used for location visualization [4]. Almomani et al proposed a GPS vehicle tracking system which sets speed and geographical limits [5]. Manoharan proposed a software architecture to locate lost and misplaced devices [6]. Dhiraj sunera proposed Real Time Vehicle Tracking on Google Maps using Raspberry Pi Web Server [7]. Maps are not new at all to geo-information community. Indeed, maps have been regarded as one of the three ancient communication means, the other two being language and music.

The system proposed in this paper helps in monitoring the vehicle location from anywhere in the world through the web server. Displaying the coordinates on Google maps enables the users to understand the location vehicle easily.

## II. LOCATION BASED SERVICES

Location-based services (LBS) applications that provide information to users based on their location are a growing business. From social networking to navigation to banking, consumers are being offered a range of new location-based services. But every time a consumer uses one of these services, there is a risk that the company offering the service may be collecting and retaining detailed records of who she is, where she goes, and what she does. Once collected, outdated privacy laws and varying corporate practices can leave this sensitive information vulnerable to access by the government and third parties.In general GPS works in open space areas only and used for radio navigation purpose through radio signals the GPS is a small device that can be embedded in any devices like mobiles. GPS receiver calculates the exact longitude, latitude and altitude values and those values can be used by LBS for finding the location .GPS also provides information like time for calculating sender and receiver locations based on the information received from the satellites. Using GPS receiver in the mobile device we can even set the navigation path from source to reach a particular destination .Three satellites may be enough for computing the position of mobile devices.


**Figure 1.1: Architecture of Real Time Vehicle Tracking System**

## III. SYSTEM DESIGN AND ARCHITECTURE

### *A. System Architecture*

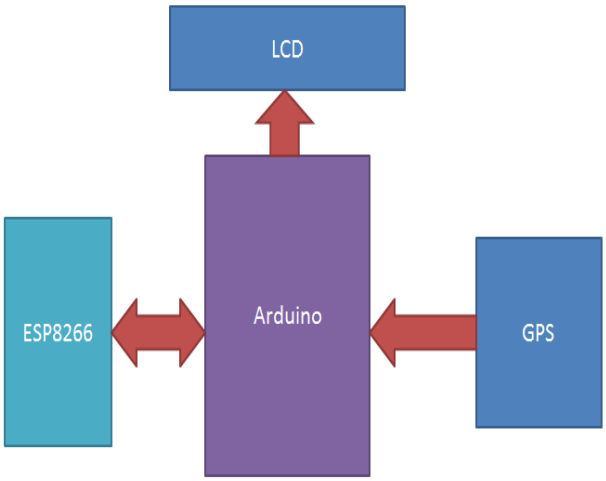


**Figure 1.2: High-level architecture of the system**

**Figure 1.2** illustrates the architecture of the proposed system. The basic function is used to track the location of the vehicle. The parameter information of the location tracking is required to find the Coordinates of Vehicle by using GPS module. GPS module communicates continuously with the satellite for getting coordinates. Then we need to send these coordinates from GPS to our Arduino by using **UART**. And then Arduino extract the required data from received data by GPS.

### *B. Arduino Board:*


**Figure 1.3: Arduino ATMEGA328 microcontroller board.**

The embedded controller is the central controller for the whole unit. Here, ATMEGA328 controller is used, which is an open source electronics prototyping 8 bit micro-controller board running at 16 Mhz.

### *C. Global Positioning System(GPS):*

**Figure 1.4: GPS with Antenna.**

GPS is used to detect the Latitude and Longitude of any location on the Earth, with exact UTC time (Universal Time Coordinated). GPS module is the main component in our vehicle tracking system project. This device receives the coordinates from the satellite for each and every second, with time and date. **GPS module** sends the data related to tracking position in real time, and it sends so many data in NMEA format (see the screenshot below). NMEA format consist several sentences, in which we only need one sentence. This sentence starts from **$GPGGA** and contains the coordinates, time and other useful information. This **GPGGA** is referred to **Global Positioning System Fix Data**. Know more about Reading GPS data and its strings here. We can extract coordinate from $GPGGA string by counting the commas in the string. Suppose you find $GPGGA string and stores it in an array, then Latitude can be found after two commas and Longitude can be found after four commas. Now these latitude and longitude can be put in other arrays.

**$GPGGA,104534.000,7791.0381,N,06727.4434,E,1,08,0.9,510.4,M,43.9,M,,*47**

$GPGGA,HHMMSS.SSS,latitude,N,longitude,E,FQ,NOS,HDP,altitude,M,height,M,,checksum data

| IDENTIFIER | DESCRIPTION |
|---|---|
| $GPGGA | Global Positioning system fix data |
| HHMMSS.SSS | Time in hour minute seconds and milliseconds format. |
| Latitude | Latitude (Coordinate) |
| N | Direction N=North, S=South |
| Longitude | Longitude(Coordinate) |
| E | Direction E= East, W=West |
| FQ | Fix Quality Data |
| NOS | NOS |
| HPD | Horizontal Dilution of Precision |
| Altitude | Altitude from sea level |
| M | Metre |
| H | Height |
| Checksum | Checksum Data |

*Table 1.1: $GPGGA String, along with its description.*

### *D. Wi-Fi Module*

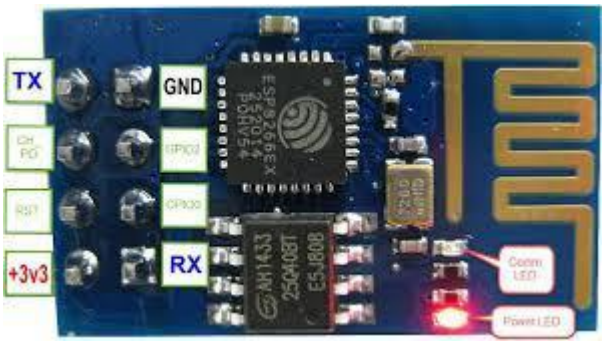


*Figure 1.5: ESP8266 WIFI module.*

ESP8266 has two LEDs, one is Red, for indicating Power and second is Blue that is Data Communication LED. Blue LED blinks when ESP sends some data via its Tx pin. Also, do not connect ESP to +5 volt supply otherwise your device may damage. Here in this project, we have selected 9600 baud rate for all the UART communications. User can also see the communication between Wi-Fi module ESP8266 and Arduino, on the Serial Monitor, at the baud rate of 9600:

| Command | Description | Return |
|---|---|---|
| AT+CNMI | Set the new message remind, for example AT+CNMI=2,1, | +CMTI:"SM",2 |
| AT+CMGF | Set the module message mode, set either at PDU(0) or text mode(1) | OK |
| AT+CSCS | Set TE character set, set AT+CSCS="GSM" for English only message, or set AT+CSCS="UCS2" for other language | ok |

*Table 1.2: AT command format.*

## IV. SOFTWARE AND ENVIRONMENT

### *E. Arduino Software:*

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.


*Figure 1.6: Arduino logo open source.*

### *F. Arduino Environment:*

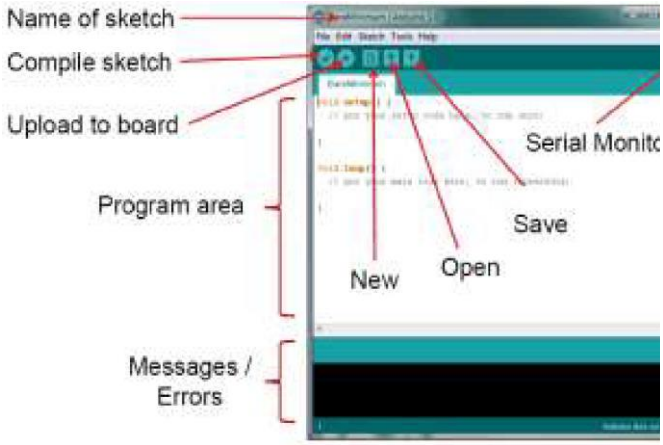


***Figure 1.7 Arduino Program Developing Environment.***

**Figure 1.7** Shown Is The Arduino Is Connected To The Computer Using USB. The Community Calls A Program . Arduino IDE Contains A Text Editor Used To Write The Program In C/C++, And After Compilation, The Program Is Dumped In To The Board. Arduino IDE Tool Sketch

## V. EXPERIMENTAL RESULTS

### *G. Experimental Setup:*

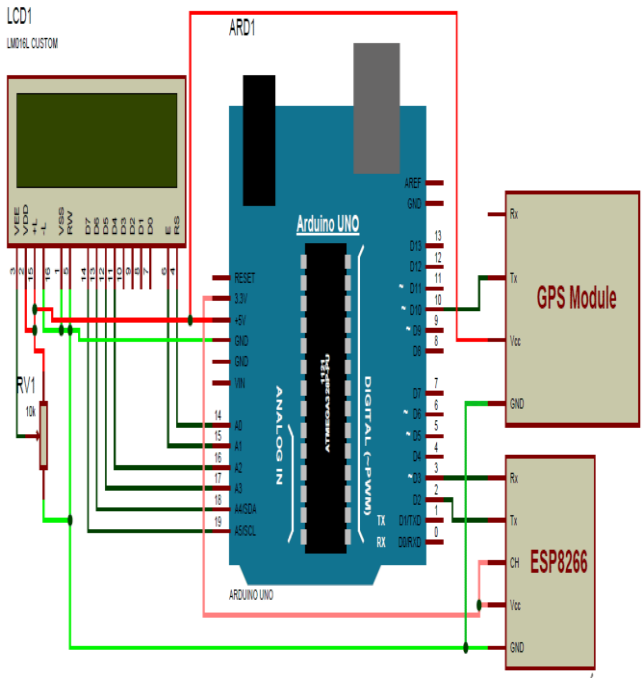


***Figure 1.8: Circuit Connection Of Experiment.***

### *H. Experimental Results:*

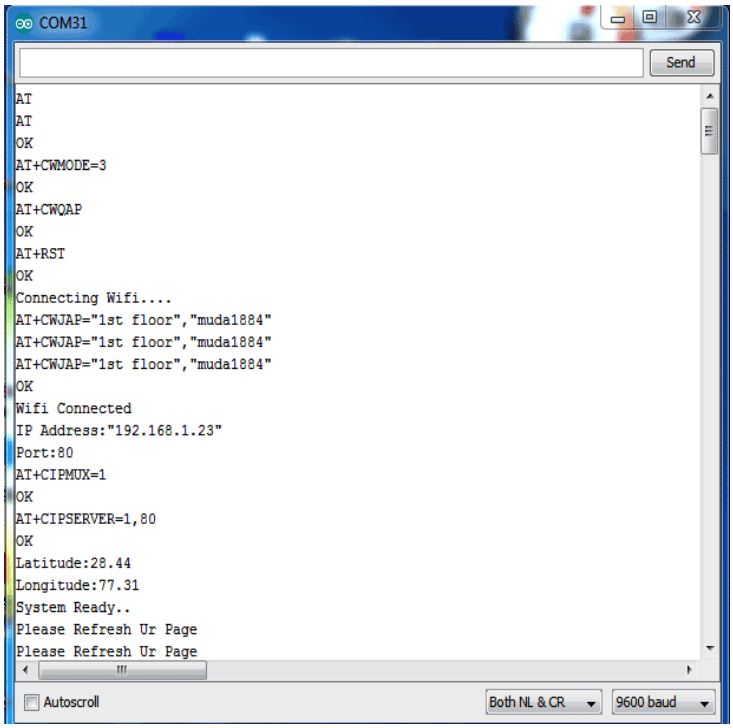


***Figure 1.8: Serial monitor Showing communication between arduino and WIFI module.***

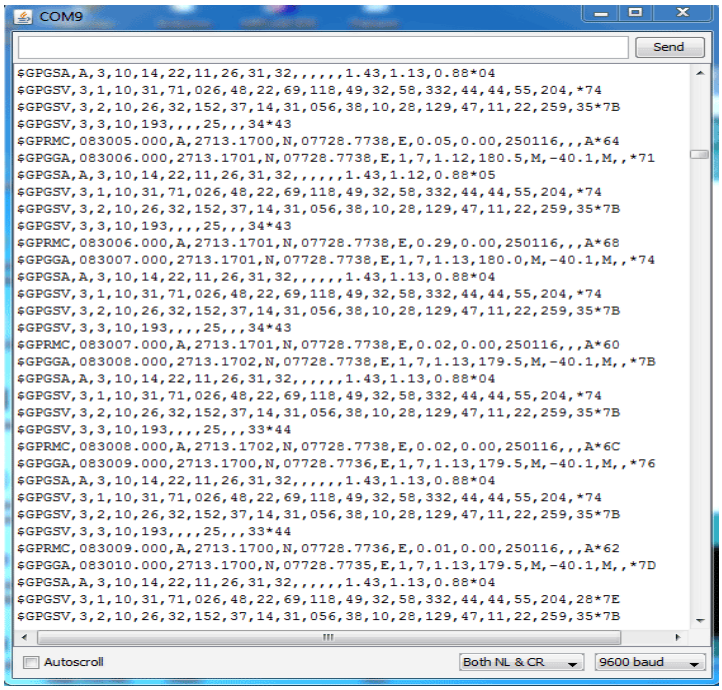


***Figure 1.10: Serial monitor showing GPS receiving data from the satellite through antenna.***

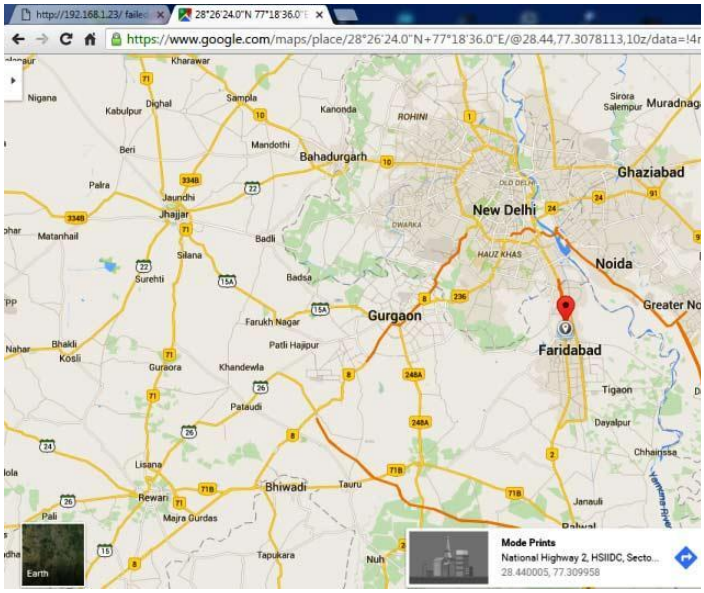


***Figure 1.11: web server showing Google maps***

## VI. CONCLUSION AND FUTURE SCOPE

The implementation and experiment details of a vehicle tracking system on Google maps using Arduino and WIFI module are presented. Arduino microcontroller is used in the VTD and transmits the GPS coordinates to a remote web server. The program to receive GPS coordinates and send these values to the web server by establishing TCP/IP communication is written in Embedded C in Arduino IDE. The vehicles GPS coordinates are updated for every 60 seconds in the server and the corresponding location is shown on Google maps. Prototype of the VTS is implemented using low-cost electronics and tested for satisfactory operation.

***Future Development:***

This implementation can be extended

- For tracking of multiple vehicles at the same time.
- An android application could be developed to show the vehicle location in a smart phone. Also, a subscription system could be developed to send alerts to subscribers, when vehicle is at a certain distance or time from the user location.
- can monitor some parameters of vehicle like overheat or LPG gas leakage and also give an emergency call if the vehicle goes out of a certain / pre-decided track
- This system can be further enhanced by the use of camera and by developing a mobile based application to get the real-time view of the vehicle instead to check it on PC, which would be more convenient for the user to track the target

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