GPS and GSM Based Vehicle Tracking System

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ABSTRACT
A vehicle tracking system is very useful for tracking the movement of a vehicle from any location at any time. An efficient vehicle tracking system is designed and implemented for tracking the movement of any equipped vehicle from any location at any time. The proposed system made good use of popular technology that combines a smartphone with an Arduino UNO. This easy to make and inexpensive compared to others. The designed in vehicle device works using Global Positioning System (GPS) and Global System for Mobile Communication (GSM) technology that is one of the most common ways for vehicle tracking. The device is embedded inside a vehicle those positions is to be determined and tracked in real time. An Arduino UNO is used to control the GPS receiver and GSM module. The vehicle tracking system uses the GPS module to get geographic coordinates at regular time interval. The GSM module is used to transmit and update the vehicle location to a database. This paper gives minute by minute update about vehicle location by sending SMS through GSM modem. This SMS contain latitude and longitude of the location of vehicle. Arduino UNO gets the coordinates from GPS modem and then it sends this information to user in text SMS. GSM modem is used to send this information via SMS sent to the owner of the vehicle. Location is displayed on LCD. And then Google map displays location and name of the place on cell phone. Thus, user able to continuously monitor a moving vehicle on demand using smartphone and determine the estimated distance and time for the vehicle to arrive at a given destination.

Keywords: Arduino UNO, GSM module, GPS module, mobile, LCD

I. INTRODUCTION
Global System for Mobile Communication (GSM) and Global Positioning System (GPS) based vehicle location and tracking system provided effective, real time vehicle location, mapping and reporting this information value and add by improving this level of service provided. The GPS based vehicle tracking system is designed to find out the exact location of any vehicle and intimate the position to the concerned authority about through an SMS. The system includes a GPS modem that it retrieves the location of a vehicle in terms of its longitude and latitude. The system uses geographic position and time information from the GPS. The system has an onboard module that it resides in the vehicle to be tracked and a based station that monitors data from the various vehicles. The onboard module consists of GPS receiver, a GSM modem.This hardware is fitted on to the vehicle in such a manner that it was not visible to anyone. That system sends the location data to the monitoring unit continuously therefore it is used as a covert unit. The location data from tracking system uses to find the location and to give the information to police when the vehicle is stolen. This gives an edge over other pieces of technology for the same purpose. The system automatically sends a return reply to that particular mobile indicating the position of the vehicle in terms of latitude and longitude when a request by user is sent to the number at the modem. A program has been developed that it is usedto locate the exact position of the vehicle and also to navigated track of the moving vehicle on Google map. The system allows to track the target anytime and anywhere in any weather conditions. This system is user friendly, easily installable, easily accessible and can be used for various other purpose.

II. System Block Diagram
The current design is an embedded application. It is continuously monitor a moving vehicle and report the status of vehicle on demand. For doing an Arduino is interfaced serially to a GSM modem and GPS receiver. A GSM modem is used to send latitude and longitude of the vehicle from a remote place. The GPS modem gives the data i.e., the latitude and longitude indicating the position of the vehicle. The GPS modem gives many parameters as the output, but only the National Marine Electronics Association NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end from the place of the vehicle's position is demanded. An EEPROM is used to store the data received by GPS receiver. That is used for detecting coordinates of the vehicle, GSM module is used for sending the coordinates to user by SMS. And an optional 16x2 LCD is also used for displaying status messages or coordinates. It has used GPS module GY-NEO6MV2 and GSM module SIM 900A.The hardware interfaces to microcontroller are LCD display, GSM modem and GPS receiver. In order to interface GSM modem and GPS receiver to the controller, a MUX is used. The system automatically sends a return reply to that

particular mobile indicating the position of the vehicle in terms of latitude and longitude when a request by user is sent to the number at the modem. A program has been developed that it is used to locate the exact position of the vehicle and also true navigated track of the moving vehicle on Google map.
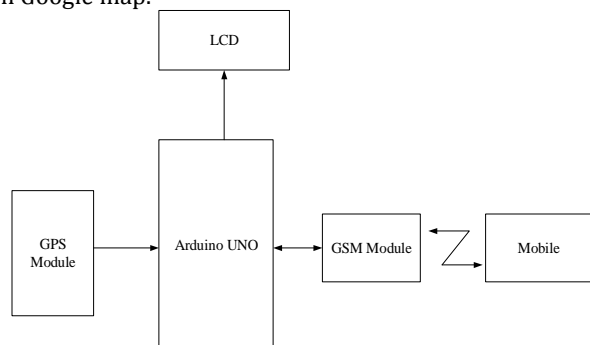

Fig1: Block Diagram of GPS and GSM Based Vehicle Tracking System

The flowchart shown in Fig.2 is for the operation of the system. In this system, Arduino UNO is used as the main of control system. LCD is displaying "HI" when the system is started. After initialize message track was sent from user to GSM module in this system, Arduino find track and LCD was displayed tracking. And then, software serial was printed vehicle location of user latitude and longitude. At the time, LCD was displayed vehicle location latitude and longitude and message send. If GPS module was not received the signal, GSM module send the message to the owner as the owner's car location is latitude 00.00 and longitude 00.00. Therefore, the users have to wait received signal from GPS satellite.
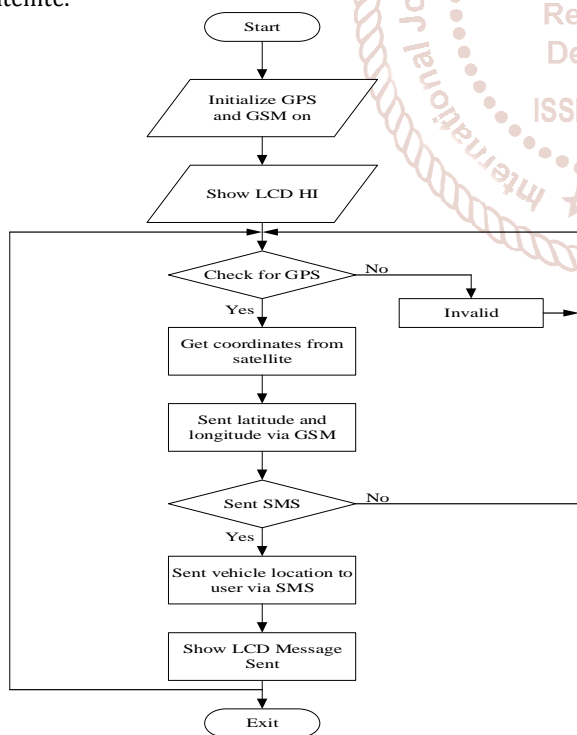

Fig 2: Flowchart of Vehicle Tracking System

III. Implementation
A. Software Implementation for GSM Module
In programming for GSM module include libraries and define software serial communication. Software serial library is used to allow serial communication on pin 10 and 9. In the next line, they create a constructor of softwareserial with

name myserial and pass the digital pin numbers as parameters. The actual format is like softwareserial myserial (Rx, Tx). It gets to the configuration part of program inside setup. The first task is to set baud rates of softwareserial library to communicate with GSM module. This by invoking myserial.begin function. The second task is to set the baud rate of Arduino IDE's serial monitor. It makes this by invoking Serial.begin function. Both have to set at the same baud rate and the user use 9600 bits/second in this operation. Configuration part is over with setting baud rates and it good to give a small delay of 100 milli seconds. It get to the actual program inside loop(). To make things simpler, It have developed a user input based program. The program seeks user input via serial monitor of Arduino. If the input is "s" the program invoked function to send an SMS from GSM module. If the user input is "r", the program invoked the function to receive a live SMS from GSM module and display it on serial monitor of Arduino. The whole program is as simple.
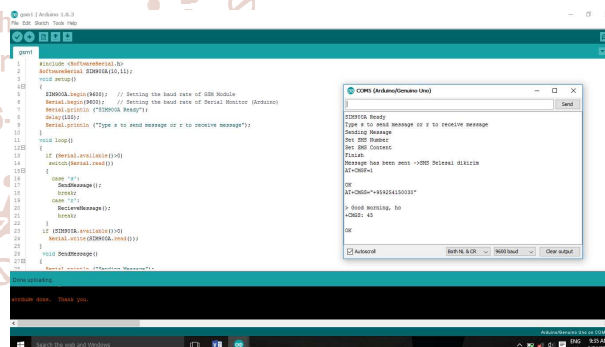

Fig 3: GSM Module Send SMS

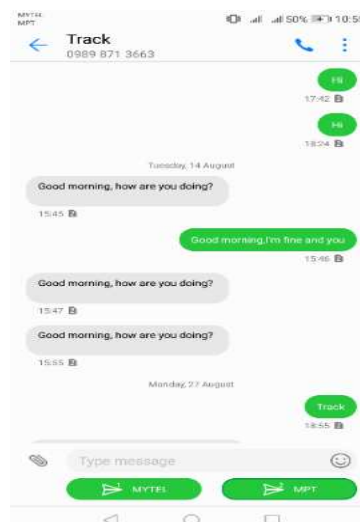Fig 4: Serial Monitor for GSM Module Send SMS

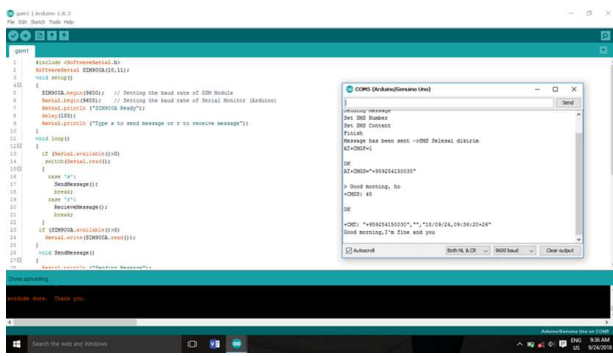Fig 5: Send and Receive SMS of GSM Module

Fig 6: Serial Monitor for GSM Module Receive SMS

B. Software Implementation for GPS Module

The programming language is written as the simplest form so that it is nothing to have any problem to understand. In programming for GPS module include libraries and define software serial communication. Software Serial Library (SSL) is used to allow serial communication on pin 3 and 4. The setup function for the GPS module is declared the Tx and Rx pin of the GPS module is input by using serial.begin and also declared ss.begin to show the result on the serial monitor. Serial.begin(9600); ss.begin(9600); The loop function for the GPS module includes reading the input pin and triggering the output by using ss.available. While compare by using ss.available() greater than 0, gps.encode read software serial by using ss.read(). If GPS module reached a new place, the new location is updated by using "gps.location.isUpdated()".
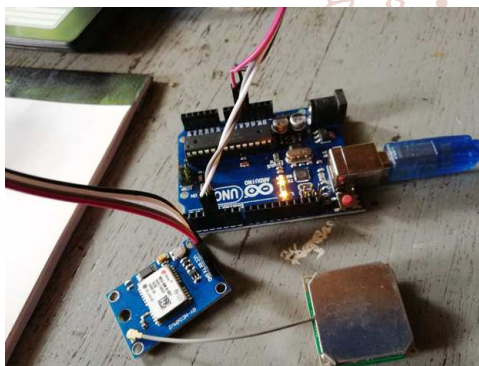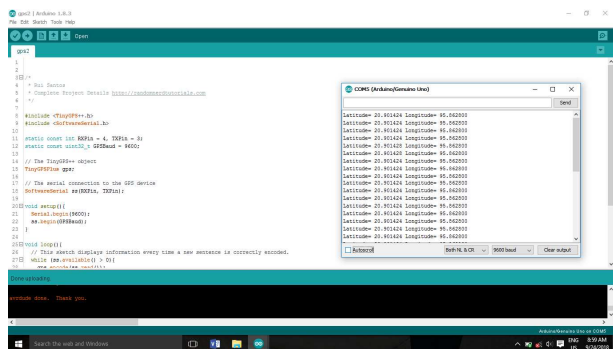

Fig 7: Software Implement for GPS Module

Fig 8: Serial Monitor for GPS Module

C. Software Implementation for Vehicle Tracking System

In programming include libraries and define pins for LCD and software serial communication. Also define some variable with arrays for storing data. Software serial library is used to allow serial communication on pin 4 and 3. TinyGPS" gps is used for storing received message from GSM module and float latt, lonn is used for storing GPS string. After it have initialized serial communication, LCD, GSM and

GPS module in setup function and showed a welcome message on LCD. In loop function the system receives message and GPS string.Initialization function is used for initializing and configuring the GSM Module, GSM module is checked whether it is connected or not by sending AT command to GSM module. If response OK is received, means it is ready. System keeps checking for the module until it becomes ready or until OK is received. Then echo is turned OFF by sending the "ATE0" command, otherwise GSM module will echo all the commands. Then finally Network availability is checked through the AT+CPIN? command, if inserted card is SIM card and PIN is present, it gives the response +CPIN: READY. This is also check repeatedly until the network is found
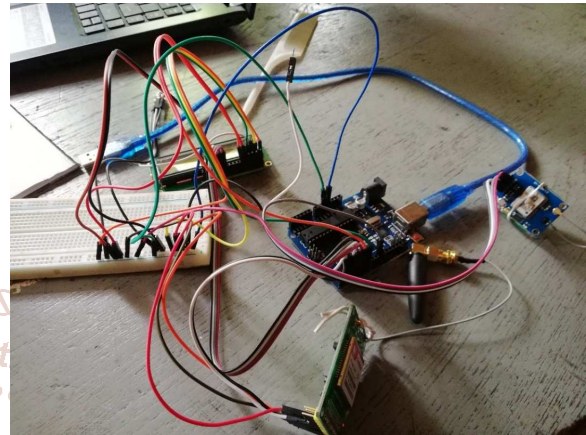

Fig 9: Software Implement for GPS and GSM Based Vehicle Tracking System
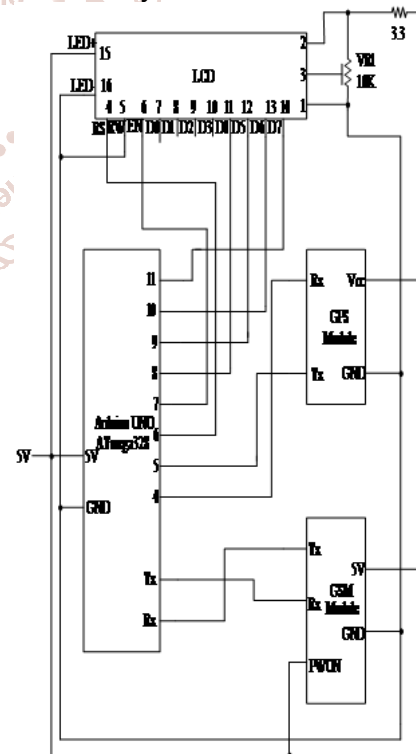
D. Implementation by Hardware

Fig 9: Overall Circuit Diagram of the system

This paper consists of GPS receiver and GSM modem with an Arduino UNO. Tx pin of GPS receiver is directly connected to digital pin 5 of Arduino and Rx pin of GPS receiver is also directly connected to digital pin 4 of Arduino. By using software serial library, that has allowed serial

communication on pin 5 and pin 4, and made them Rx and Tx respectively. By default pin 0 and pin 1 of Arduino are used for serial communication but by using software serial library, it allows serial communication on other digital pins of the Arduino. GPS module is powered by 5V. GSM module of Tx pin is directly connected to Rx pin of Arduino and Rx pin of is also directly connected to Tx pin of Arduino. GSM module is also powered by 5V. An optional data pin of LCD D4, D5, D6 and D7 are connected to pin number 8, 9, 10, and 11 of Arduino. Command pin RS and EN of LCD are connected with pin number 6 and 7 of Arduino and RW pin is directly connected with ground. A potentiometer is also used for setting contrast or brightness of LCD. Arduino is used for controlling whole the process with a GPS receiver and GSM module. GPS receiver is used for detecting coordinates of the vehicle, GSM module is used for sending the coordinates to user by SMS. And optional 16x2 LCD is also used for displaying status messages or coordinates. When the hardware design ready with programming, it installs in vehicle and power it up. Then user just needs to send a SMS, track, to the system that is placed in user's vehicle. Send message is received by GSM module which is connected to the system and sends message data to Arduino. Arduino reads it and extract main message from the whole message. And then compare it with predefined message in Arduino. If any match occurs then Arduino reads coordinates by extracting $GPGGA string from GPS module data and send it to user by using GSM module. This message contains the coordinates of vehicle location latitude and longitude. LCD is displaying "HI" when the system is started. After initialize message track was sent from user to GSM module in this system, Arduino find track and LCD was displayed tracking. And then, software serial was printed vehicle location of user latitude and longitude. At the time, LCD was displayed vehicle location latitude and longitude and message send. If GPS module was not received the signal, GSM module send the message to the owner as the owner's car location is latitude 00.00 and longitude 00.00. Therefore, the users have to wait received signal from GPS satellite.

IV. Results

In this paper, GSM module used to send and receive message from another GSM number. If the owner of the vehicle wants to know their vehicle location, they have to send find message firstly. At that time, GSM module was working to send back to the owner mobile phone number. In this thesis, GPS module also contains so that message contains the location of their vehicle latitude and longitude. If the owner wants to see on Google map, it shows the location of their vehicle. Therefore, the user easily knows their vehicle location when the vehicle was stolen. If the nothing message is sending the owner, the operation is performed according to the code so LCD was displaying "HI". Firstly, this system had to wait a little second to active GSM module and GPS module. After active system, it had to show the result on serial monitor.
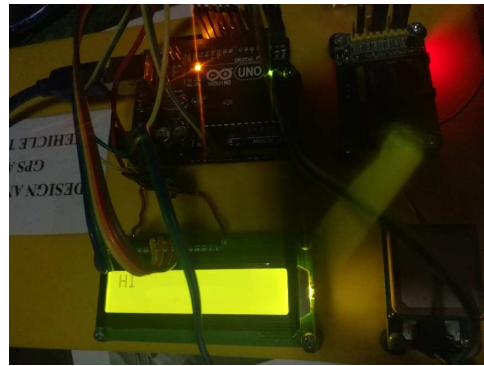

Fig 10: Result for the Active System

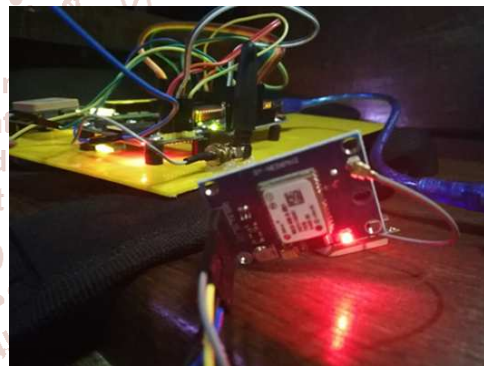Fig 11: Result for Find Location

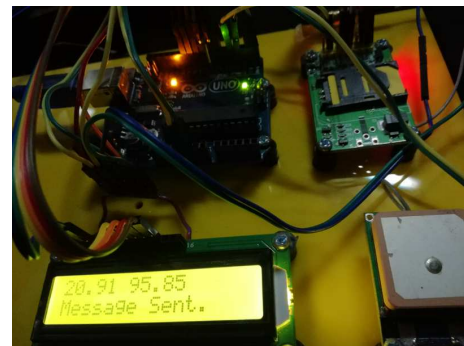Fig 12: Result for GPS and GSM Based Vehicle Tracking System

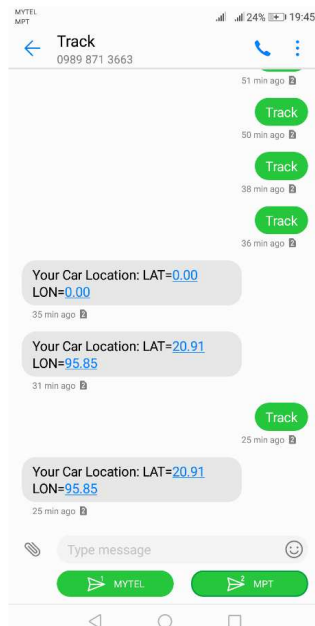Fig 13: Result for Showing Location of Vehicle on LCD

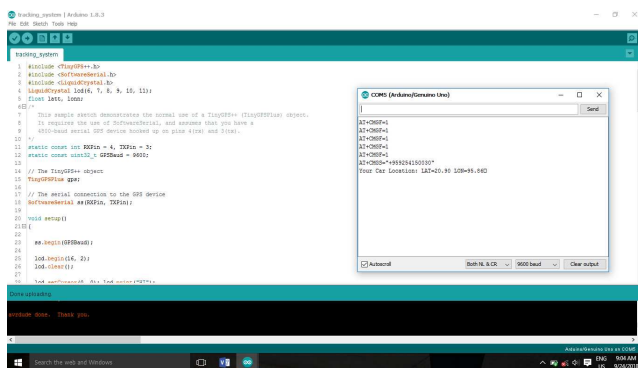Fig 14: Result for the GSM Module Send SMS to the Owner
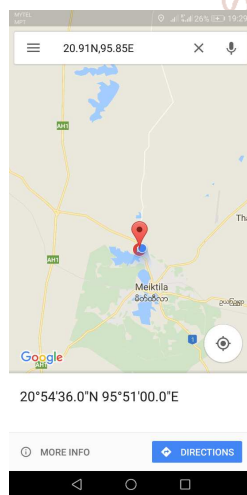

Fig 15: Result for the Vehicle Tracking System

Fig 16: Result for the Vehicle Location on Google Map

V. Conclusion

Tracking system is nowadays the most important system for the person, they want their car security in efficient hands this is the main reason. So the vehicle tracking system are getting popular day by day not only in metropolitan areas but also in small cities. This system is completely integrated and it becomes possible to the user to track their car very easily at any time and from anywhere. As the vehicle theft is increasing day by day but due to this people wasn't avoid uying vehicles but they found an efficient way to keep an eye on their vehicle without being very close to them. These systems keep a good control on the thefts and help avoiding them to some extent. Basically in all these systems the GPS and GSM are used to track the vehicle. Using this system the user determine the position of the vehicle, and the distance completed by it. The user is able to access the position of their vehicle at any instant of time. This system is reliable any very secure. Upgrading this setup is very easy which makes it open to future requirements without the need of rebuilding everything from scratch, which also makes it more efficient.GSM module used in this paper to send and receive SMS. GSM module can supported 2G, 3G and 4G but only 2G can supported in this country. Because each country used different frequencies bands for GSM sim 900A. So, MPT and telenor were used and ooredoo and mytel were not used in this thesis. And then GSM module can also interfaced with Arduino when using AT command. Adding that, GPS module was not get the signal from GPS Satellite easily.

VI. REFERENCES

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