

## Real Time Vehicle Tracking and Control System Using GPS & GSM Technology on ARM7TDMI Embedded Development Board and Google Map



**Ainakanti Gopal**  
M.Tech Scholar,  
VJIT-Hyderabad.



**G.Sreenivasa Rao**  
Associate Professor,  
VJIT-Hyderabad.



**Y.Kiran**  
Application Engineer,  
Unistring Technology Solutions.

### Abstract:

Implementation of an efficient and advanced real time vehicle tracking system based on ARM7 Embedded Development Board and Google Map application for tracking the movement (course) of any equipped vehicle from any location at any time using GPS & GSM/GPRS Technology. The proposed system made good use of a popular technology that combines the embedded system with Smartphone application. This will be easy to implement and inexpensive compared to others. The designed in-vehicle device works will send the tracking information of the vehicle like vehicle number (Unique ID), location (Latitude, Longitude), Date and Time, then mapped into Google Maps application.

### Keywords:

GPS, GSM, Real-time Tracking & Navigation and Google Maps.

### 1. Introduction:

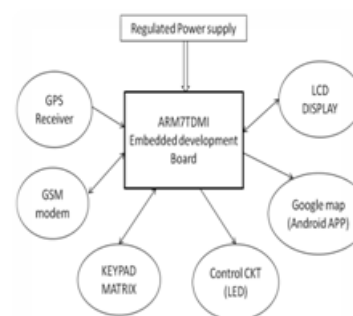
Real time navigation & Tracking System is the technology used to determine the location of a vehicle using different methods like GPS and other radio navigation systems operating through satellites and ground based stations by triangulation method. Vehicle information like location details, speed, distance traveled etc. can be viewed on a digital mapping with the help of Google map via Internet. This system is very efficient for outdoor application purpose. This kind of Vehicle Tracking System Project is widely in tracking Cabs/Taxis, stolen vehicles, school/colleges buses etc.

### 2. Proposed system:

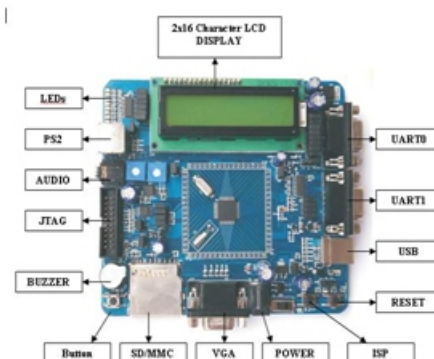
The device is embedded inside a vehicle whose position is to be determined and tracked in real-time.

A microcontroller is used to control the GPS and GSM/GPRS modules. The vehicle tracking system uses the GPS module to get geographic coordinates at regular time intervals. The GSM/GPRS module is used to transmit and update the vehicle location to a database. The Google Maps API is used to display the vehicle's location on the map in the Smartphone application. Thus, users will be able to continuously monitor a moving vehicle on demand using the Smartphone application and determine the estimated distance and time for the vehicle to arrive at a given destination.

### 3. Block diagram:



**Fig.2 Block diagram of Real time tracking system**



**Fig.3 ARM7TDMI Development Board**

## 4. Hardware modules

### i.LPC2148 Features

- o32-bit ARM7TDMI-S microcontroller Architecture
- o40 KB of on-chip static RAM and 32 KB to 512 KB of on-chip flash memory
- oIn-System Programming/In-Application Programming (ISP/IAP)
- o8 KB of on-chip RAM accessible to USB by DMA
- oTwo 10-bit ADCs provide a total of 14 analog inputs
- o10-bit DAC provides variable analog output
- oTwo 32-bit timers/external event counters
- oPWM unit (six outputs)
- owatchdog timer
- oReal-Time Clock (RTC) with independent power
- oMultiple serial interfaces including
  - \* two UARTs,
  - \* Two Fast I2C-bus (400 Kbit/s)
  - \* SPI and SSP with buffering and variable data length capabilities
- oVectored Interrupt Controller (VIC) with configurable priorities and vector addresses
- o45 general purpose I/O pins
- o21 external interrupt pins available
- oOn-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz

### ii.GPS Receiver:

GPS stands for Global Positioning System and 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.



**Fig.4 GPS Receiver**

GPS module sends the data related to tracking position in real time, and it sends so many data in NMEA format. 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. We can extract (parse) coordinate and time from the \$GPGGA string.

### GPS - NMEA data frame information:

```
$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,No S,HDP,altitude,M,Altitude,M,,checksum data
```

### iii.GSM Module



**Fig.5 GSM module**

GSM stands for Global System for Mobile Communication. It is a digital cellular technology used for transmitting mobile voice and data services. GSM is the most widely accepted standard in telecommunications and it is implemented globally and it is the most widely used cellular technology in worldwide today. It has been a particularly successful cellular phone technology for a variety of reasons including the ability to roam worldwide with good Quality of Services and Security.

GSM 900 Cellular System Specification	
Multiple access technology	FDMA / TDMA
Duplex technique	FDD
Uplink frequency band	890 - 915 MHz (basic 900 MHz band only)
Downlink frequency band	933 - 960 MHz (basic 900 MHz band only)
Channel spacing	200 kHz
Modulation	GMSK
Speech channels per RF Channel	8
Channel data rate	270.833 kbps
Frame duration	4.615 ms
Bandwidth	2*25MHz



**Fig.6 Google Map**

AT commands:

AT-----Attention command

OK-----reply from GSM modem

AT+CMGF=1-----Message format "TEXT" command

OK

AT+CMGR-----read message command

Displays last message along with sender number

AT+CMGD=1-----delete all messages

OK

AT+CMGS="<MOBILE NUMBER>"----- message send command

Type message &<enter>.....crl+Z

OK

## 5. Project Results

GPS Receiver is used for detecting coordinates of the vehicle; GSM module is used for sending the coordinates to user by SMS and located in Google map. And an optional 16x2 LCD is also used for displaying status messages or coordinates. Instantaneously gives you accurate position and time anywhere in the planet.

## 6. Conclusion:

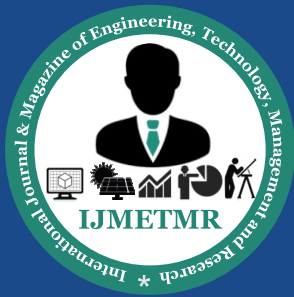
The main objective of the system is to provide Reliable Position, Navigation and Timing services. The system also can be extended to advanced complex applications using Temperature, Pressure and humidity sensors to monitor environmental conditions and make control and alert the intelligent embedded systems accordingly. Vehicle Tracking System is widely in tracking Cabs/Taxis, stolen vehicles, school/colleges buses etc. It has significant role in military and civilian applications.

## 7. References:

[1]International Journal of Research in Computer and Communication Technology, Vol 3, Issue10,October-2014.

[2]IEEE Base paper on "Design and Implementation of Vehicle Tracking System Using GPS/GSM/GPRS Technology and Smartphone Application"

[3]International Journal of Electronics and Computer Science Engineering "Real Time Vehicle Tracking System using GSM and GPS Technology- An Anti-theft Tracking System"



[4]Albert Alexe, R.Ezhilarasie, “Cloud Computing Based Vehicle Tracking Information Systems”, ISSN: 2229 - 4333 ( Print) | ISSN: 0976 - 8491 (Online ) IJCST Vol. 2, Issue 1, March 2011

[5]Hu Jian-ming; Li Jie; Li Guang-Hui, “Automobile Anti-theft System Based on GSM and GPS Module,” Intelligent Networks and Intelligent Systems (ICINIS), 2012 Fifth International Conference on , vol., no., pp.199,201, 1-3 Nov. 2012

### Author Profile:

**Ainakanti Gopal**, presently pursuing M. Tech in Embedded Systems at Vidya Jyothi Institute of Technology (VJIT), Hyderabad, Telangana, India. He Received B. Tech in Electronics and Communication Engineering from Sri Krishna Devaraya Engineering College-Gooty, Anantapur(Dist). He has one year Industrial experience in SDSC-SHAR(ISRO)-Sriharikota under Apprentship.

**Gadela Sreenivasa Rao**, Associate Professor in Vidya Jyothi Institute of Technology (VJIT), Hyderabad. He received M.Tech in Embedded Systems from JNTU Hyderabad and B. Tech in Electronics and Communication Engineering from JNTUCEA, Anantapur. He is having 12 years teaching experience in Electronics & communication and interest in Embedded Systems field.

**Y. Kiran** is currently working as Application Engineer in Unistring Tech Solutions Pvt Ltd, Hyderabad, and Telangana, India. He has 2 years of experience in embedded hardware and software.