

Vehicle Tracking System

REAL TIME VEHICLE TRACKING USING GPS AND GSM WITH ARM LPC2148

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Abstract- As we all know the fact that the population increase in the last decade has given rise to the increased automobile usage. Along with this the society is facing unhealthy actions such as robbery, accidents etc. which effect the smooth going of the society. However, accidents directly happen due to the sheer ignorance of the drivers which have to be given attention, whereas the theft issue is one which we can completely avoid by making use of the advanced technology which helps us in many ways to avoid these activities. Our project is one which proposes a method to avoid these actions by making use of smart technology components which are economical as well as efficient such as GSM, GPS and LPC2148 ARM CONTROLLER.

I. INTRODUCTION

In the last 10 years there has been a constant increase in terms of population, advancement in technology, rate of growth of transportation means, which directly has an impact on the nation progress in many aspects. Many companies have announced themselves as strong force in improving the technical areas which help the common people to get many benefits at a affordable rate. When it comes to transportation means considering our vast geographical area the number of automobiles being brought into the act have constantly raised over the years. Electronics domain have hugely had their say in the design and development of the automobiles. In the present real world, we all are aware of the misfortunes that happens regarding our mode of transport such as accidents, burglary etc., out of which burglary is an important issue in the present society which needs immediate attention. The improvement in the technology of satellite communication is used to identify the vehicle location. Vehicle tracking system has brought the technology(Real time monitoring) to the day to day life of a common person. In this project we demonstrate one such grouped technology to avoid vehicle theft using ARM7 microcontroller, GPS, GSM modules.

II. PROJECT OVERVIEW

The project mainly deals with the intention of vehicle tracking and vehicle security. This system provides the features of Real time tracking using SMS and information is

transmitted to remote server or to a particular domain using GSM.

A. ARM PROCESSOR

ARM, previously Advanced RISC Machine, is a part of Reduced Instruction Set Computing architectures for computer processors, organized for various environment. ARM7 is one which is widely used micro-controller family in the embedded system . LPC2148 is the IC used from ARM7 family. It is manufactured by the company named Philips and it is pre-loaded with many inbuilt peripherals (Libraries) making it more efficient and a effective option for the Starters as well as high end application developers.



Fig 1. LPC 2148 ARM MICROCONTROLLER

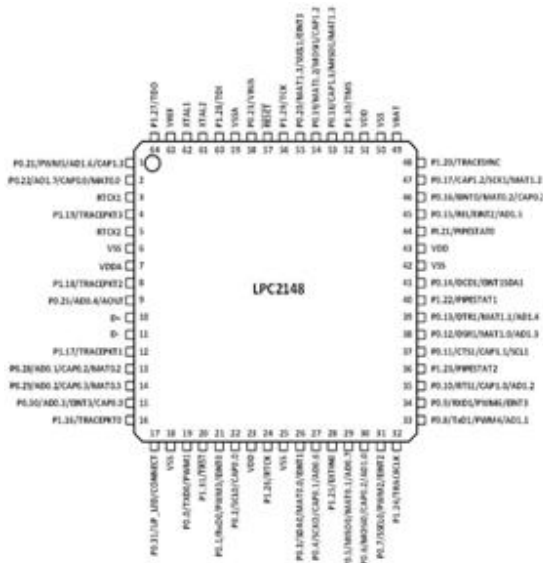


Fig 2. ARCHITECTURE OF LPC 2148

B. GPS

Global Positioning System is a global navigation system which provides the location and information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. GPS is a network of 30 satellites. Once it has the information on how far away at least 3 satellites are, The GPS receiver can pinpoint your location by a process called trilateration.



WORKING: The GPS working consists of three segments namely

- 1) SPACE SEGMENT
- 2) CONTROL SEGMENT
- 3) USER SEGMENT

GPS MODULE

SPACE SEGMENT: The function of the space segment is used to route(navigate) signals and to store them and

retransmit the same(route/navigate) message sent by the control segment. These transmissions are monitored and controlled by a highly stable atomic clocks on the satellites. The GPS Space Segment is formed by a satellite constellation, which we had studied in the physics that it has enough satellites to ensure that the users will have at least 4 simultaneous satellites in sight from any point on the Earth surface at any point of time.

CONTROL SEGMENT: The Control Segment consists of master control station and five monitor stations provided with atomic clocks that are scatter around the globe. The five monitor stations monitor the Signals from Satellite and send the authorized data to master control station where the errors are corrected and returned back to GPS satellites through ground antennas.

USER SEGMENT: This is the area which actually collects the GPS signal from the GPS satellites and discover how far it is from each satellite. Most of the public, uses this from survey for transportation to natural resources.

C. GSM

Global System for Mobile communication is the most widely used cellular technology in the real world presently. It operates at 850MHz, 900MHz, 1800MHz, 1900MHz frequency bands.

WORKING: GSM is a compound of TDMA (Time Division Multiple Access), FDMA (Frequency Division Multiple Access) and Frequency Hopping. Initially, GSM use two frequency bands of 25 MHz width: 890-915 MHz frequency band for up-link and 935-960 MHz frequency for down-link. Later on, two 75 MHz band were added. 1710-1785 MHz for up-link and 1805-1880 MHz for down-link. up-link is the link from ground station to a satellite and down-link is the link from a satellite down to one or more ground stations or receivers. GSM divides the 25 MHz band into 124 channels each having 200 KHz width and remaining 200KHz is left unused as a guard band to avoid interference.

10. Hit the Start Button to flash the hex file.
11. Once the hex file is flashed, reset the board. Now the controller should run your application code.



GSM (GLOBAL SYSTEM for MOBILE COMMUNICATION)



USB TO UART SERIAL CONVERTER MODULE

PROJECT OBJECTIVES:

- The main objective is to develop an ON-BOARD MODULE which lie in the vehicle that transfer information about the location of the vehicle.
- To control the illegal activities like burglary.
- To reduce the cost of the vehicle tracking system using advanced technology and making it available for common people.

D. FLASH MAGIC BURNER SOFTWARE

We use Flash Magic Software to run the application code for the ARM processor. This is done with the help of USB to UART converter module. The following steps are followed to create a Hex file that has to be done in the flash magic burner software to run the code in the ARM processor:

1. Select the IC from Select Menu.
2. Select the COM Port. Check the device manager to check the COM port.
3. Select Baud rate from 9600-115200
4. Select None ISP Option.
5. Oscillator Freq 12.000000(12 MHz).
6. Check the Erase blocks used by Hex file option
7. Browse and Select the hex file.
8. Check the Verify After Programming Option.
9. If DTR and RTS are used then go to Options->Advanced Options-> Hardware Config and select the Use DTR and RTS Option.

E. ULTRASONIC SENSOR

The main reason to use ultrasonic sensor in our project is to solve a test case in the real time application of our project which gives us a situation where our vehicle has not been illegally authenticated, but it has been towed away by the Traffic Control Department. So, at this point we will not be able to know the whereabouts of our vehicle. This is where the ultrasonic sensor comes into act which tells us that the vehicle is towed and robbed. As we know how the sensor determines the distance by sending sound waves at a specific frequency and wait for the waves to bounce back. So, in our project we place the ultrasonic in front of the vehicle at a sensible height and give a level of acceptance height for reference and if the height crosses this we will get a alert that the vehicle is picked up. So, we can eliminate the issue of towing other than burglary.



ULTRASONIC SENSOR

III. IMPLEMENTATION METHOD

The project deals with the global positioning system (GPS) and global system for mobile (GSM) interfacing with the LPC2148 of ARM family. This board consists of two UART ports, which can be used for both GSM and GPS to work simultaneously. An antenna can be used for GPS for better capturing of signal, if the receiver is placed inside a room or a remote area. GPS is connected to the pins of the LPC2148 and the GSM is connected to the pins of the board. LCD is used (to monitor the happenings) and is connected to pins. This deals with the one phase of the project and the other phase is regarding implementing it to the vehicle.

As this is a real time project, it seems difficult to install it to the gearless motor bikes so it is worthy and easy to install it to a gear motor bike. So, this project is implemented on a gear vehicle. There may be many chances that a vehicle can be theft. The source code consists a logic in a form that whenever the bike gets on it will send an alert message to the specified number in the source code, if it is not the owner one who is using the bike that time, can send an SMS (for ex: off) then the bike will be turned off and cannot be able to turn on by the other person until the owner sends another command (for ex: on) to turn on the vehicle.



So, whenever our neighbour, friend or any other known person takes our bike for his/her necessity and you need to know where exactly the person is going, this can be done by sending a command (trace vehicle) and the GPS which is interfaced to GSM through ARM board sends the current location of the vehicle in the form of coordinates to the mentioned in the code.

It can be seen in Google maps through the link provided in the SMS. The SMS will be received every short interval of time as it provides latest location of the vehicle to the owner. The project can also be able to detect any kind of theft using the sensors and alert the owner about the happenings. The relay circuit acts as a switch to control the vehicle, it monitors and controls the activity that owners send through the key. The gets off if the command is off and turns on if the command is on. The power supply to this arrangement is given by a 12v battery and a heat sink is provided to absorb the heat. It consists of a resistor, diode,

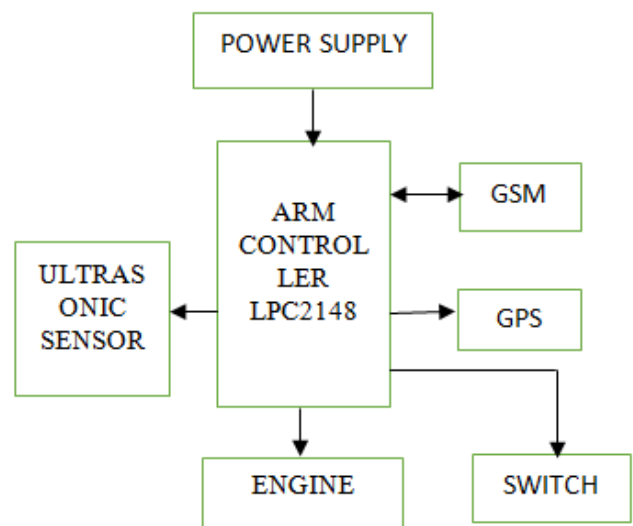
coil, and transistor. It is connected to the pins of the board and an external can used as an alternate if the vehicle battery is weak or discharged.

IV. INTERFACING GSM AND GPS WITH ARM PROCESSOR

Important part of the project deals with the GSM and GPS interaction with the ARM processor so interfacing them with each other is the first part of the whole project. As we interface GPS with the ARM processor its job is to detect the exact location and send the co-ordinates to the controller. Next comes the interfacing the GSM module with the ARM board for the communication purpose between the owner and the vehicle and to send the commands respectively.



GPS AND GSM INTERFACED WITH THE ARM PROCESSOR



BLOCK DIAGRAM

V. RESULTS

We have successfully interfaced GSM and GPS module with the ARM processor and real time application is done. Communication between the owner and the module is done and the GPS is productively giving the location of the vehicle. The whole system is placed in the vehicle.



FINAL ASSEMBLY

VI. CONCLUSION

Vehicle security system becomes very important aspect in the large cities amidst the thick population. The type of security system proposed in our project is more secured than any other security system. As we all are aware of the illegal activities of vehicle thefts, this is a nice way to have control in such actions. With the integration of the smart technology at a cost-efficient rate with worthy outcome, we can improve the current standards of transportation system. This can also be used by many organizations like ambulance organizations, Cab services for improved public service and security purpose. The system can also be helpful for safe-keeping of kids while travelling in school transportation vehicles. Many advantages are gained out of this system such as low cost, real time capability, application in wide areas, easy to operate etc.

REFERENCES

- [1] Daniel. W. Lewis, “Fundamental of embedded software”, prestige hall of India, 2004.
- [2] William Stalling, “Wireless Communication and Networks”, 3rd edition, prestige hall of India, 2005.
- [3] Chen, H., Chiang, Y. Chang, F. H. Wang, Toward Real-Time accurate positioning of location: Differential GPS Based on ICS super rapid product, SICE Annual Conference, The TAJ Hotel, Managua, Taiwan August 14-17, (2012).
- [4] Asaad M. J. Al-Hindawi, Ibraheem Talib, “Exploratory Estimation of GPS/GSM Based System Design and Development”, Journal of Electronic Systems, Volume 2 dated 2 June, 2012.
- [5] Kunal Maurya , Mandeep Singh, Neelu Jain, “Real Time Vehicle Security System based on GSM and GPS Technology. An Anti-theft vehicle Monitoring System”, International Journal of Electronics and Communication Engineering, ISSN 2277-1756/V2N3-3103-1207.
- [6] http://www.academia.edu/12434275/A_Project_Report_On_VEHICLE_THEFT_SYSTEM_USING_GPS_AND_GSM.