

Arm 7 Based Semi Autonomous Vehicle

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Abstract- In every day there are millions of vehicles are passing on the roads due to urbanization. Transportation Department plays an important role in the features like Time, safety and efficiency but due to the lack of awareness Accidents occurs as usual and the consecutive things will be delayed then it gives the lose of the life also. Here the proposed paper describes the process for avoiding the above mentioned issues. It is ARM7 based system the core hardware has modules such as RFID READER, GPS, GSM wireless transmission will try to compensate the new transport related issues. Applications such as accident alert, traffic rule violation control and special zone are explained in this paper. An efficient utilization of communication link between RF Modems over a wireless channel to provides the information regarding vehicle monitoring, vehicle authentication. The implemented system is a more convenient to automatically sending information to above such applications.

Keywords- Gps, Gsm, Acclerometer, rfid tag, rfid reader

I. INTRODUCTION

The advanced in the technologies related to wireless communication has led to the emergence of several engineering designs to aid the human requirements. In this fast paced modern world we are facing a number of transport related problems. RFID technology can be effectively used to solve some of them. some of the problems that require immediate attention are accident risk management[1], environment alert, traffic rule violation control[7], parking slot arrangement, tollgate management, vehicle theft identification and traffic signal management. GPS technology provides the on road area information and environment alerts (such as school zone, industry, market, bridge etc.).One RFID[2] is placed in vehicle with owner info, RC book, insurance details, service details etc. to send vehicle identification to traffic information database. RFID reader will be placed with embedded controller Toll Gates, Parking areas and also in traffic signal areas. Figures 1 and 2show on traffic light controls, and accident alert system. Whenever vehicle meets with an accident, at that time MMA7600FC device activates on the GPS using on board ARM7. We arranged one GPS and one GSM combine embedded system board is arranged in vehicle, the accident location will be traced with GPS receiver. The GPS receiver continuously[4][5] tracks the information of geographical earth and data will be send to mobile number from which number we willm receive the message. We placed

GSM module with embedded unit in the moving vehicle to transmit accident information to different points. The system reads area information and then the details are transmitted to the specific numbers stored in database (Police station, Owner and Hospital)[1]. Whenever the vehicle crosses the traffic signal area, the data from Vehicle tag is read and based on the traffic density[7], traffic signal is enabled. By this traffic problem is managed intelligently. If vehicle insurance is not renewed in time, the traffic police will be alerted. Special zone information is transmitted to GPS receiver connected with vehicle embedded kit, it alarms driver about the zone.

II. TECHNICAL OVERVIEW

1. RFID:

Today on one side the importance for secured access is growing in several fields and on other side with technology advancements the RFID cards and readers are becoming low cost. Both these aspects are the primary reasons for rapidly growing RFID based authentication system. RFID[6] is an auto ID device like Barcode, Smart cards, Biometric technologies (Retinal scans) and optical character recognition etc. Special feature of this technology is that there is no need of line of sight reception as required in some other technologies. In RFID systems the items are marked with tags. attached to a person, product or animal. The operating frequency range is 125 – 134 KHz. In this work we are using Active RFID tags because of its low power consumption and have greater range up to 100m. In RFID systems the items are marked with tags. These tags contain transponders that emit messages readable by specialized RFID readers. Most RFID tags store some sort of identification number; for example a customer number or product code. A reader retrieves information about the ID number from a database, and acts upon it accordingly. RFID tags can also contain writable memory, which can store information for transfer to various RFID readers in different locations. This information can track the movement of the tagged item, making than information available to each reader. RFID[10] tags fall into two general categories, active and passive, depending on their source of electrical power. Active RFID tags contain their own power source, usually an on-board battery. Passive tags obtain power from the signal of an external reader. RFID readers also come in active and passive varieties, depending on the type of tag they read. Then based on their frequency range of transmission it is classified as LF, HF, VHF and UHF tags.

2. GPS:

The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to Civilian users on a continuous worldwide basis freely available to all. For anyone with a GPS receiver, the system will provide location and time[6][8]. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world. It is the only fully functional global navigation satellite system that uses a constellation of at least 24 medium earth orbit satellite that transmit precise microwave signals, direction, and time.

3. GSM:

The Global System for Mobile Communications(GSM) has been a great success in providing both voice and low speed data services. The Enhanced Circuit Switched Data on GSM (ECSD)[3] is one of the major evolutionary steps to serve real time high speed data services. GSM is a common European mobile telephone standard for a mobile cellular radio system operating at 900MHz. Throughout the evolution of cellular telecommunications, various systems have been developed without the standardized specifications resulting in many problems directly related to compatibility. The GSM[5] standard is intended to address these problems. In the current work, SIM300 GSM module is used The mobile communications has become one of the driving forces of the digital revolution. Everyday, millions of people are making phone calls by pressing a few buttons. Little is known about how one person's voice reaches the other person's phone that is thousands of miles away. Even less is known about the security measures and protection behind the system. The complexity of the cell phone is increasing as people begin sending text messages and digital pictures to their friends and family.

4. Accelerometer Adxl335:

The adxl335 is a ± 1.5 g 3Axis Accelerometer with Digital Output(I2C). It is a very low power, low profile capacitive MEMS sensor featuring a low pass filter, compensation for 0g offset and gain errors, and conversion to 6-bit digital values at a user configurable samples per second. The device can be used for sensor data changes, product orientation, and gesture detection through an interrupt pin (INT). The device is housed in a small 3mm x 3mm x 0.9mm DFN package. 5 ARM7 ARM7TDMI based LPC 2148 micro controller is a 32-bit microcontroller .Which contains an on chip static RAM of 8 kB to 40 kB and on-chip flash memory of 32 kB to 512 kB ,and abundant internal and external

resources The ARM7[4] is the highest performance and most power efficient processor currently in production today. it is a 32-bit RISC architecture with 16 registers and a Harvard memory architecture. It can run at speeds between 600MHz to over 1 GHz while averaging as little as 300mW of power. The ARMv7 architecture includes two pipelines: a 13-stage integer pipeline and a 10- stage NEON pipeline (useful for accelerating multimedia and signal processing applications). In addition, the ARMv7 architecture includes the Jazelle-RCT technology that allows for just-in-time compilation of byte code languages (such as Java), and Thumb-2 technology that reduces code size while maintaining equivalent performance by allowing 16- bit instructions to coexist with 32-bit instructions.

III. HARDWARE BASED SYSTEM DESCRIPTION

In the current work we have designed following hardware systems are

- 1) ARM7 board vehicle system.
- 2) Special zone alerting facility.
- 3) Traffic control system.
- 4) alariting receiver unit.

1. ARM 7 board Vehicle system :

These system consist of GPS,GSM module, vehicle information RFID Tag and ARM7 embedded module. Here we have used SIM 300 GSM module to transmit alert data to the mobile receivers already configured. GPS, GSM and MMA7660FC are connected to receive and transmit of the serial port in embedded module. The total controller program is developed in embedded C language and is downloaded into the memory for operation. Here we use semi passive tag to transmit vehicle database like insurance details (renewal date and expiry date), RC book and license etc., to traffic organizers. This data is collected in the RFID reader enabled traffic signal areas. This controls traffic issues like insurance non payment and also used to manage traffic signal in intelligent way.

2. Special zone alerting facility :

In this unit we have used GPS receiver identify the general area information and alert on special zones like school, hospital, weak bridges and zigzag bends etc. At the time ARM7 produces message which will be displayed on LCD and automatically buzzer beeps. The alert information can be dynamically changed like damage in bridge, condition of road and new changes in road (one way or two ways and other diversion indications) etc.

3. Traffic control system :

The conventional traffic signal controller works on the principle of Time division. It is rigid method and does not consider traffic density in a particular direction. Here we are proposing a low cost modified adaptive architecture with RFID enabled system. In this module we are using Atmel S52 microcontroller as a base unit and RFID reader is connected with serial port of the system. We use external antenna based readers. Instead of using single antenna, array of antennas used here to give better results. The general time division based traffic signal management will create massive traffic problems in peak hours. But our system is adaptive system based on vehicle density calculation. It will give perfect solution for the traffics problem faced by previous one.

4. Alert receiver unit :

This unit is nothing but alert receiving “mobile phone” programmed in the embedded module. It may be owner of the vehicle, the hospital emergency care and the police station information number.

IV. WORKING PRINCIPLE

We have used ARM7 as a base device. GPS,GSM module, Adxl 335 and RFID is connected with serial port of the controller. Whenever vehicle meets with an accident the MMA7660FC triggers the embedded module for rescue operation. Embedded module gets area information from GPS receiver module and the alert information is sent through the GSM module. GPS receiver gets an area information on the road unit. Special zones like School, Hospital, Zig Zag bends and weak bridge etc., whenever vehicle crossing that area, embedded module will alert the driver to reduce acceleration. This will as control accident ratio. In addition to embedded module one special RFID Tag is placed inside vehicle to transmit vehicle information. In the traffic signal management system RFID reader and display informer unit are connected with serial port of the microcontroller. If vehicle insurance, pollution test, FC is not proper, the alert system will produce beep sound and vehicle number is displayed. Then the traffic police can easily alert the driver / owner. Traffic signal is managed by counting the number of vehicles crossing the reader area in a particular time interval. Here the data collected by the antennas are given to the reader via multiplexer switch. This method will save RFID reader usage and money. By this we can manage the traffic intelligently.

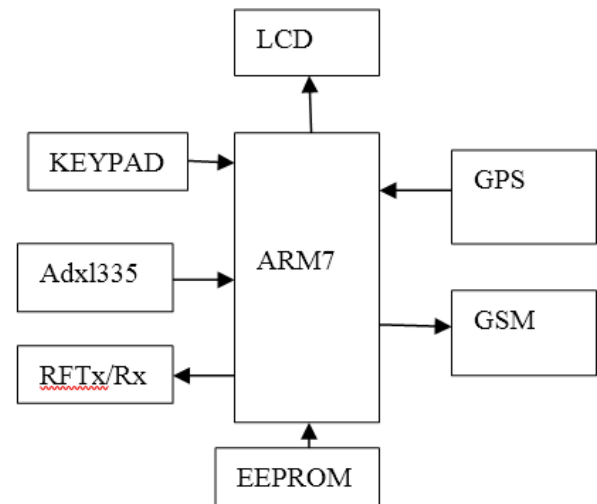


Figure 1. On Board Vehicle System

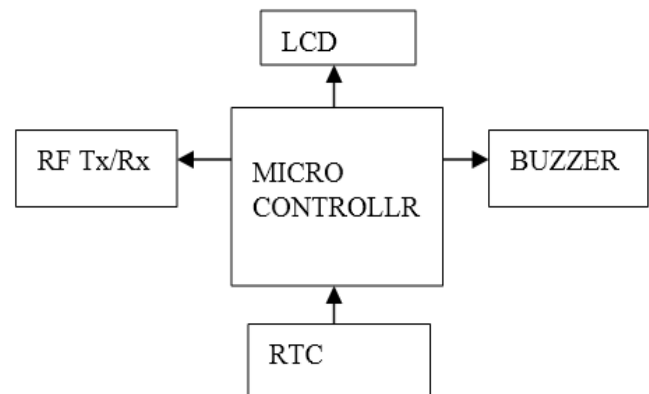


Figure 2. Traffic Control Unit

1. Implementation of autonomous vehicle on ARM-7

This autonomous vehicle utilizes an ARM7 microcontroller , GSM, GPS and Adxl335 device for the develop of an accident alert, traffic rule violation control and special zones. For software developing in the module Keil's - uVision3 development environment along with ARM-GCC compiler used. Keil's uVision3 development environment along with ARM-GCC compiler. For flash programming the LPC2000 Flash Utility V2.2.1 has been used.

V. CONCLUSION

This paper mainly reviewed the research and development Work for traffic and transport related problems such as accident alert, traffic signal control, traffic rules violation control, and special zone alert using the latest GPS, GSM, RFID technology. In this project we have designed a system to give complete solution. It is proposed as a low cost

optimized solution using RFID and GSM mobile technology. This is in line with the developed countries like USA, England, German and Japan, where RFID, ZIGBEE, GPS and GSM technologies are widely used for traffic management. But in India we have not implemented any automated system for transport management due to prohibitive cost. Keeping this in mind we have proposed this system at low cost.

Middleware System for Automatic Identification", IEEE International Conference on Service Operations and Logistics, and Information,

REFERENCES

- [1] Victor Olugbemiga MATTHEWS (Ph.D), Emmanuel ADETIBA (M.Eng., R.Eng.) Vehicle Accident Alert and Locator (VAAL) 116102-2929 IJECS-IJENS © April 2011.
- [2] Pawel Rotter, "A Framework for Assessing RFID System Security and Privacy Risks," IEEE Pervasive Computing, vol. 7, no. 2, pp. 70-77, Apr.-June 2008, doi:10.1109/MPRV.2008.22
- [3] Martin Backstrom, Andreas Hardrup, Tomas Nylander, Jari Vikberg and Peter Ohman, "Mobile @ Home-GSM Services over Wireless LAN", Ericsson Review, No.2, 2005.
- [4] Lihe, Ivfang., design of intelligent mobile vehicle checking system based on arm7, IEEE-2010,978-1- 4244-5848-6.
- [5] Muzahid Hussian, Abhishek tayal, Sarabjot singh(2011). Position Matching Based Autonomous Speed Regulation Syste for Vehicles. Thapar University, Patiala,india.
- [6] Manish Bauhptani, Shahram Moradpour, "RFID Field Guide-Developing Radio Frequency Identification Systems", Prentice Hall,2005, pp 7-9, 16-225, 160, 231.
- [7] InigoR.H., Application of machine vision traffic monitoring and control,IEEE transaction on vehicular technology,1989,3813
- [8] Greenfield,J.S(2002) matching GPS observation to locations on a digital map. in preceeding of the 81th annual meeting of the transportation research board, Washing ton dc.
- [9] Bemstein,D.kornhauser,A.(1996).An interdiction to map matching for personal navigation assistants. Technical report, New jersesy TIDE center, Princeton University,USA
- [10] Sewon Oh, Joosang Park, Yongioon Lee, "RFID-based