International Journal of Engineering Inventions
e-ISSN: 2278-7461, p-ISSN: 2319-6491
Volume 1, Issue 12 [December. 2012] PP: 98-101

Vehicle Tracking and Prevention of Road Accidents by using RFID Technology

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Abstract: Radio Frequency Identification(RFID) emerges as one of the converging technologies and transportation plays an important role in urbanization, RFID is one of the key catalyst playing a significant role in it. RFID plays major role in auto ID applications like RFID contact less smart cards used by bus riders, in Super market, Library systems, Attendance Tracking, Textiles and logistics chain management. This paper aims to understand the benefits of RFID technology possibilities to reduce the accidents on Indian roads.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) is one of the major evolutionary steps to serve real time high speed data services. Population explosion is the source of so many issues, one among them is transport. In this paper, we propose a novel method to tackle trasport related issues. Applications such as vehicle tracking, accident alert are explained in this paper.

Keywords: GSM, Microcontroller, RFID, RFID Reader, SMS (Short Message Service)

I. INTRODUCTION

This fast paced World is with 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, environment alert, traffic rule violation control, vehicle theft identification and traffic signal management. RFID tags are placed on the road giving area information and environment alerts (such as school zone, industry, market, bridge etc.). One RFID 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 in vehicle, Toll Gates, Parking areas and also in traffic signal areas. We used GSM module with embedded unit in the moving vehicle to transmit accident information to different points. Whenever vehicle meets with an accident, the system reads area information from RFID tags placed on the road and transfers this information to embedded module. The details are transmitted to the specific numbers stored in database (Police station, Owner and Hospital). Additionally, vibration sensor activates air bags such that severe accident to the driver driving the vehicle can be avoided and transmits this emergency situation to owner, police control office and hospital through SMS. Whenever the vehicle crosses the particular road area, the data from Vehicle tag is read and based on the location, an SMS regarding location of the vehicle will be sent to the owner. Vibration/Impact sensors are added to trigger our system, when the vehicle is met with accident. Special zone information can be programmed in active tag and this information is transmitted to RFID reader connected with vehicle embedded kit, it alarms driver about the zone.

II. DESIGN AND IMPLEMENTATION

In the current work we have designed following operating points. One is on road unit, the second is vehicle unit, the third is traffic signal controller unit, the fourth is parking slot controller unit, and the fifth is tollgate unit and sixth is alert receiver unit.

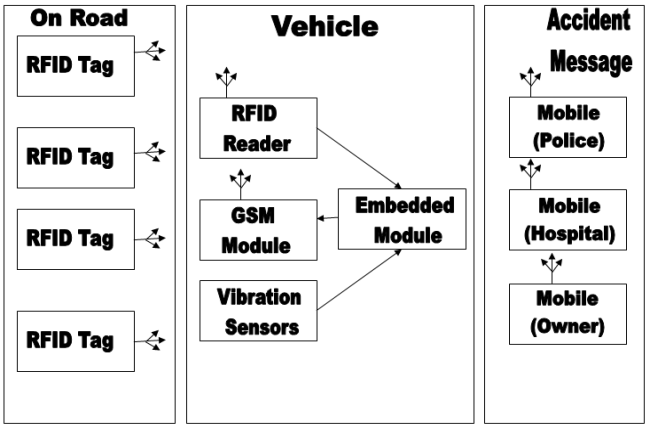


Figure 2. Vehicle tracking and Accident alert system

2.1. Section 1 - On road unit

In this unit we can have „N" number of RFID tags to transmit general area information and alert on special zones like school, hospital, weak bridges and zigzag bends etc., UHF Semi passive tag is used in our application. Its coverage is a maximum of 50 Meters with 64 Kbits of memory operating at 902 MHz range. The location information and driver alert information are stored in this tag. 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.

2.2. Sections 2 - Vehicle nit

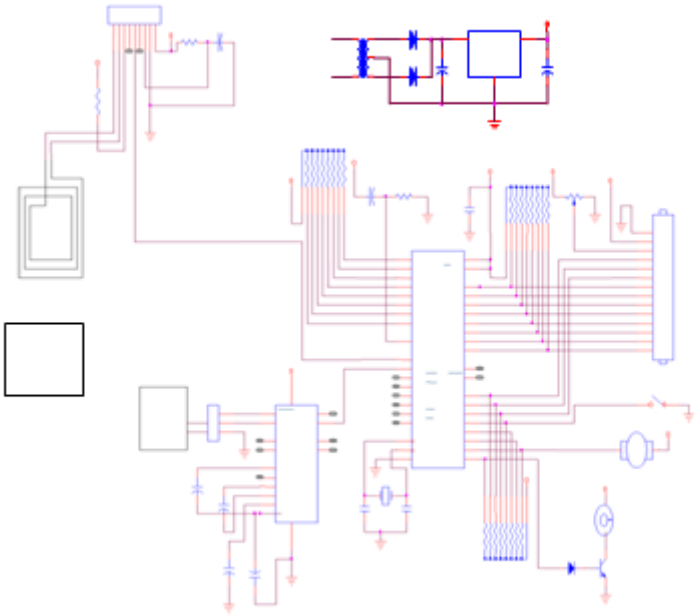
These units consist of RFID reader, vehicle information RFID Tag, 8051 embedded module and GSM module. Here we have used SIM 300 GSM module to transmit alert data to the mobile receivers already configured. RFID reader and GSM are connected to the embedded module.

2.3. Section 3-Alert Receiver Unit

This unit is nothing but alert receiving mobile phones programmed in the embedded module. It may be owner of the vehicle, the hospital emergency care and the police station information number. Short script message or voice message will be sent to the receivers.

III. IMPLEMENTATION

3.1 Schematic diagram



3.2 Introduction

We have used Atmel C 52 microcontroller as a base device. GSM module and RFID reader is connected with serial port of the controller also vibration sensors and camera is connected. Whenever vehicle meets with an accident the vibration sensor triggers the embedded module for rescue operation. Embedded module gets area information from RFID reader module and the alert information is sent through the GSM module. RFID reader gets area information from RFID tags on the road unit.

RFID reader is connected to Receiver (Rx) of the serial port and GSM Module is connected to transmitter (Tx) of the serial port. The digital camera is which is connected with the system will act as black box and it will be triggered on during the accident. Special zones like School, Hospital, Zigzag bends and weak bridge etc., are programmed in the RFID tag and whenever vehicles crossing that area, embedded module will alert the driver to reduce acceleration. This will 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.

3.3. Micro Controller (AT89C52)

The AT89C52 is 80C51 microcontrollers with 128kB Flash and 1024 bytes of data RAM.A key feature of the AT89C52 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI.

The Flash program memory supports both parallel programming and in serial In-System Programming (ISP). Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The AT89C52 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running.

3.4. Functional description

Power-On reset code execution the Following reset, the AT89C52 will either enter the Soft ICE mode (if previously enabled via ISP command) or attempt to auto baud to the ISP boot loader. If this auto baud is not successful within about 400 ms, the device will begin execution of the user code.

3.5. In-System Programming (ISP)

In-System Programming is performed without removing the microcontroller from the system. The In System Programming facility consists of a series of internal hardware resources coupled with internal firmware to facilitate remote programming of the AT89C52 through the serial port. This firmware is provided by Atmel and embedded within each AT89C52 device. The Atmel in-System Programming facility has made in-circuit programming in an embedded application possible with a minimum of additional expense in components and circuit board area. The ISP function uses five pins (VDD, VSS, TxD, RxD, and RST). Only a small connector needs to be available to interface your application to an external circuit in order to use this feature.

3.6. Input/Output ports

Input/output (I/O) ports 32 of the pins are arranged as four 8-bit I/O ports P0–P3. Twenty-four of these pins are dual purpose with each capable of operating as a control line or part of the data/address bus in addition to the I/O functions. Details are as follows:

Port 0: This is a dual-purpose port occupying pins 32 to 39 of the device. The port is an open-drain bidirectional I/O port with Schmitt trigger inputs. Pins that have 1s written to them float and can be used as high-impedance inputs. The port may be used with external memory to provide a multiplexed address and data bus. In this application internal pull-ups are used when emitting 1s. The port also outputs the code bytes during EPROM programming. External pull-ups are necessary during program verification.

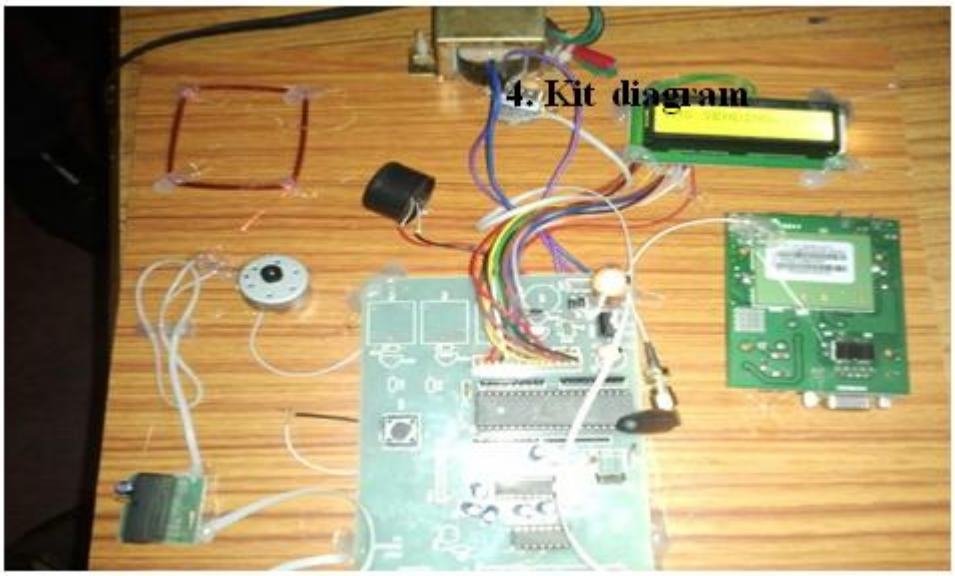
Port 1: This is a dedicated I/O port occupying pins 1 to 8 of the device. The pins are connected via internal pull-ups and Schmitt trigger input. Pins that have 1s written to them are pulled high by the internal pull-ups and can be used as inputs; as inputs, pins that are externally pulled low will source current via the internal

pull-ups. The port also receives the low-order address byte during program memory verification. Pins P1.0 and P1.1 could also function as external inputs for the third timer/counter i.e.:(P1.0) T2 Timer/counter 2 external count input/clock out (P1.1) T2EX Timer/counter 2 reload/capture/direction control

Port 2: This is a dual-purpose port occupying pins 21 to 28 of the device. The specification is similar to that of port 1. The port may be used to provide the high-order byte of the address bus for external program memory or external data memory that uses 16-bit addresses. When accessing external data memory that uses 8-bit addresses, the port emits the contents of the P2 register. Some port 2 pins receive the high- order address bits during EPROM programming and verification.

Port 3: This is a dual-purpose port occupying pins 10 to 17 of the device. The specification is similar to that of port 1. These pins, in addition to the I/O role, serve the special features of the 80C51 family *B.*

IV. KIT DIAGRAM



V. CONCLUSION

This project is designed as a system to give complete solution for transport related problems such as accident alert, Vehicle surveillance. This project can also extended with small changes for Toll gate control, traffic signal control, traffic rules violation control, parking management, vehicle theft and special zone alert using the latest RFID technology. 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, 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 I have proposed this system at low cost

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