Microcontroller based vehicle alert system using RFID and GSM technology for RTO application

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ABSTRACT

Now a days, parking vehicle in proper place is a major problem. One can unknowingly or by mistake park his/her vehicle in no parking area. If RTO officer (authorized person by RTO to seize the vehicle in no parking area) find your vehicle in no parking area, it is seized by them. To find out where your vehicle is actually bought after the seizing procedure is very difficult and time consuming task.

To avoid such inconvenience an alert system is designed. If RTO officer finds a vehicle in no parking area, RTO officer will show identity with the help of RFID card; and the text message being generated by GSM to inform vehicle owner about the seize and station information where vehicle is to be placed after the whole procedure.

Key Words: GSM, RFID Reader, Accelerometer sensor, buzzer alert.

1. INTRODUCTION

Vehicles are most essential part of our lives. Though they help us alot, parking them in right place getting more hectic issue now a days. One can place his/her vehicle in no parking area, these vehicles are being seized by RTO officer. After the vehicle seize the number code is being place instead of vehicle to get information about the seize to owner when he/she backed to place where they have parked the vehicle. To get back vehicle he/she has to find out first where the vehicle is being bought after the seize. They have to inquiry about who has taken his/her vehicle to which station. Finding out this information is very time consuming task. To easier our lives this vehicle alert system is introduced. Where information of seize is just a one step ahead to you; in the form of text message on your mobile phones. The system is advantageous in form of providing text message on phone as well as buzzer indication on vehicle when unauthorized person trying to uplift the vehicle.

System is introduced to obtain alert message on mobile phone. This system is based on microcontroller, vibration sensor Accelerometer responsible for sensing vibration in x and y position , Global System for Mobile communication i.e. GSM sends text message to vehicle owner, RFID(Radio-Frequency Identification) technology to scan information of officer. Every RTO officer provided with a card consisting of RFID-TAG on it. Before the seize, card identity showed to the reader attached to vehicle. The owner of vehicle get information about the RTO officer, police station (where the vehicle will be place after the seize) , etc.

2. LITERATURE SURVEY

- K. Vidyasagar et.al.[1] described the safety mechanism to the transportation of bus and to the children travelling from home to school and resume back to home is a stand alone component to the parents and to the school component management. Range and obstacle detection as well as accident detection sensors are implemented on the front surface of the bus for avoidance of collision with another vehicle on the road. Each student is tagged with a special unique code. Two counters are provided at the entrance as well as on exit location of the bus. Information of the status of the bus to the school principal via wireless communication technology. The absentee record of the student will be send to concerned parents before leaving the children entry point. The return information is also informed to the parent with the help of GSM technology. The return record of the results are accurably good to meet the challenges of the security issues.

- Akriti Pawar et.al.[2] described concept about several GSM applications in various fields like in medical field for detecting body temperature, heart beat rate as well as the wireless ECG using Bluetooth helps to make the patients monitoring devices to make them more mobile. Several GSM based microcontrollers are being used for antitheft security system not only with text message as feedback but also raise an alarm. Another advantage is GSM based city area monitoring system.

- Agoston Katalin investigate the use and function of vibration and acceleration sensors. The ADXL202 sensor is a duel axis accelerometer on a single IC chip, with the capability of measuring dynamic and static accelerations, has a faster response time than electrolytic or mercury or tilt

sensors (thermal). It can be used in computer peripherals, internal navigation, seismic monitoring, vehicle security systems and battery powered motion sensing .The separate representation of static and dynamic accelerations are permitted by designed software[3].

- Sencun Zhu et.al.[4] have described the design, implementation and evaluation os a Sensor Networked Based Vehicle Anti-theft System named as SVATS to address these limitations. System included the vehicles with sensors, that are parked within the same parking area of sensor network, monitoring and identification of vehicle theft by detecting unauthorized vehicle movement. When such movement is detected, an alert will be reported to base station in parking area and warning message being sent to the security office. The system focuses on technical issues specific to topology management, theft detection, and intra-vehicle networking.

3. SYSTEM OVERVIEW

- Different HARDWARE COMPONENTS of the system are as follows :

3.1   MICROCONTROLLER

The system uses ARM 7 : LPC2148 Microcontroller. ARM 7 is popular and successful used processor family in embedded system applications. LPC2148 IC is the IC which is widely used IC from ARM-7 family. It is manufactured by Philips. It has many inbuilt peripherals pre-loaded making it more efficient and a reliable option for the beginners and also for high end application developer. Figure 1 shows ARM-7 LPC2148 IC.

Figure 1 : Microcontroller LPC2148

3.2   RFID TECHNOLOGY

Radio Frequency Identification technology i.e. RFID is a non-contact, automatic identification technology which uses radio signals to identify, detect variety of objects including people, vehicle, goods and assets without the need for direct contact as in magnetic stripe technology or line of sight contact such as in bar code technology.

RFID technology is divided into two parts ; RFID TAG, RFID READER. Figure. 2 describes the RFID technology.

RFID TAG :

RFID tag is an object that can be applied to or inserted or attached to the product, an animal or a person for the purpose of identification as well as tracking by the radio waves. Some tags can be read from several meters away and beyond the line sight of the RFID reader. Most of the tags carries a plain text encryption and a bar code as complements for direct reading as well as for cases of any failure of radio frequency electronics.

Generally RFID tag consists of at least two parts; one is an integrated circuit to accomplish the purpose of storing and processing information, another is modulating and de-modulating radio-frequency i.e. RF signal and other specialized functions. An antenna is being used for receiving and transmitting the signal.

RFID READER ;

It uses electromagnetic fields to identify and track tag attached to objects automatically. The RFID tags contains electronically stored information. RFID reader is a network connected device with an antenna that sends power and data as well as commands to the tags. The RFID reader acts as a access point for RFID tagged items so that the tags' data can be made available to business applications. Collection of energy for passive tags gain from the nearby RFID reader interrogating radio waves. Active tags have local power source similar as battery and may operate at hundreds of the meters from the RFID reader. RFID is one of the methods for that automatic identification and data capture i.e. AIDC
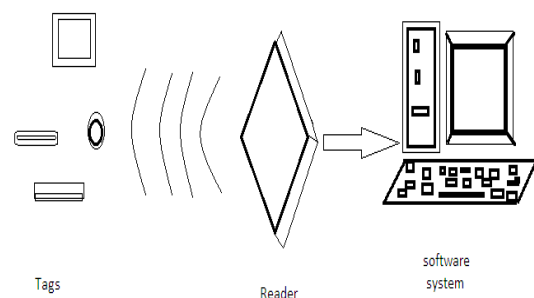

Figure 2 : RFID Tag and Reader

3.3 GSM TECHNOLOGY

GSM can be expanded as Global System for Mobile communication is a standard introduced by the European telecommunications standard institute i.e. ETSI to describe the protocols used for 2G digital cellular networks used by the mobile phones, first deployed in Finland in July 1991.

GSM provide data transmission speed around 9.6 Kbit/s. It allows transmission of basic data services like SMS (Short Message Service). Another advantage is its international roaming capacity, allowing the users to access the same services even when travelling aboard. GSM satellite roaming has also widened its service access to areas where the terrestrial coverage is not available. GSM-1800, information is being sent from the mobile station to the base transceiver station as well as 1805-1880 Mhz for the other direction. It provides 374 channels and duplex spacing as 95 Mhz GSM gives worldwide connectivity. GSM module is shown in figure 3.
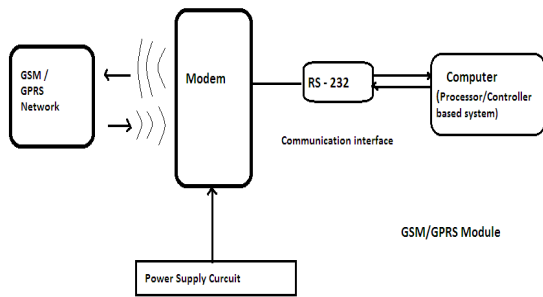

Figure 3 : GSM module

3.4 MAX232

The MAX232 is an integrated circuit created in 1987 by Maxim Integrated Products. MAX232 converts signals from TIA-232 i.e. RS-232 serial port into the signals suitable for TTL-compatible digital logic circuits. The MAX232 is duel transmitter/ duel receiver that convert the RX, TX, CTS, RTS signals typically. The drivers provide TIA-232 voltage level output from a single 5 V supply by on-chip charge pumps and external capacitors. Figure. 4 represents the MAX232
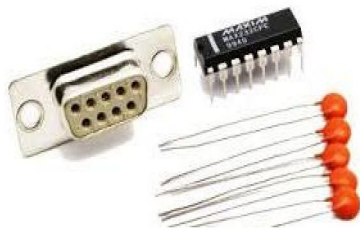

Figure 4 : MAX232 IC

3.5 VIBRATION SENSOR

One of the most common vibration sensors is the accelerometer, a dynamic sensor which is capable of a vast range of sensing. Accelerometers are able to measure acceleration in one, two or three orthogonal axes. Accelerometers are used generally for following modes :

- As an inertial measurement of the velocity as well as position.
- As a sensor of inclination or tilt or orientation in two or three dimensions, referenced from acceleration of gravity (1g=98m/s^2)
- As a shock (impact) or vibration sensor.

There are considerable advantages to use an analog accelerometer as a liquid tilt sensor – inclinometer gives output binary information(which indicates a status on/off), thus it is only possible to detect the inclination/tilt has exceeded some thresholding angle. Generally now a days most accelerometers are micro mechanical sensors (MEMS). A small proof mass is being displaced and etched into the silicon surface of the integrated circuit and which is suspended by the small beams by these accelerometers. Accelerometer is very cost effective and user friendly solution or almost any application. Figure. 5 represents accelerometer sensor.
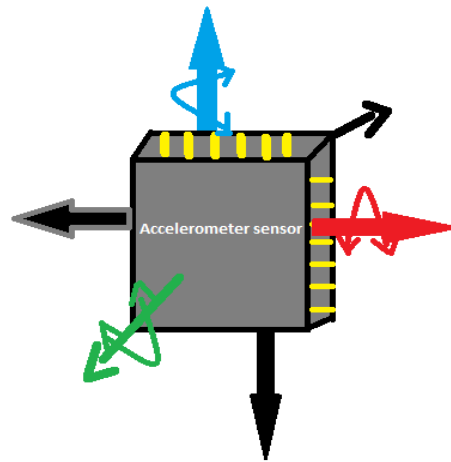

Figure 5 : Vibration Sensor – Accelerometers

4. ADVANTAGES

- Alert message to mobile phone for remote information.
- Automated system.
- Time reduction as details notified by SMS to owner.
- Sophesticated security.

5. CONCLUSION

Designing alert system for vehicle seize via text message as notification for vehicle owner. System uses microcontroller ARM7 LPC2148 controller, vibration sensor accelerometer, RFID tag - reader and GSM technology combinedly. The system will able to convey remote information i.e. from the place where the vehicle being parked, to mobile phone as notification via GSM technology. System helps to reduce inconvenience after the seize to find out the vehicle.

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