Automatic Toll Gate Management and Vehicle Access Intelligent Control System Based on ARM7 Microcontroller

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Abstract

There are millions of drivers passing through Toll Gate Stations every day. The conventional or the traditional way of collecting the toll from the vehicle owners or the drivers is to stop the car by the Toll Gate Stations and then pay the amount to the toll collector standing (or perhaps sitting!) by the side of the toll booth, after which the gate is opened either mechanically or electronically for the driver to get through the toll station. An efficient utilization of communication link between RF Modems over a wireless channel to facilitate vehicle monitoring, vehicle authentication and automated toll collection on the highways is proposed. The system is implemented to automatically a more convenient way of collecting the toll and traffic management. It's called Electronic Toll Gate Stations using RFID and ZigBee Technologies. The implementation is divided into the design of three modules, Vehicle Module (Active Tag) and the Central Database Module, Tollgate station. The three modules communicate via GSM modem connected to each module..The special feature of RFID tags it provides Security through PASSWORD

Keywords— Radio Frequency Identification (RFID), ARE Frequency, Active Tag, RF Module, Shielding, Full Duplex, Frequency Hopping Spread Spectrum.

I. INTRODUCTION

The advances in the technologies related to wireless communication has led to the emergence of several engineering designs to aid the human requirements. 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. Today several wireless technologies are used for building wireless networks. Among them the 2.4GHz wireless network

is most widely deployed and used. The wide usage of 2.4 GHz wireless communication indicates that this infrastructure can give near real time responses and makes suitable for crucial industrial systems. Global system for mobile communication is that it is an international standard. If you travel in parts of world, GSM is only type of cellular service available. Implementing mobile communication based health monitoring via short message service (sms). simple wireless control device to achieve the targets, or use the GSM network technology to achieve. Nevertheless, the functions of these devices are too simple to prevent the vehicle theft crimes from happening, furthermore, their burglarproof methods are not only character.There are millions of drivers passing through Toll Gate Stations every day. The conventional or the traditional way of collecting the toll from the vehicle owners or the drivers is to stop the car by the Toll Gate Stations and then pay the amount to the toll collector standing (or perhaps sitting!) by the side of the toll booth, after which the gate is opened either mechanically or electronically for the driver to get through the toll station. So in order to stop all these problems and inconvenience, we introduce an automated or a more convenient way of collecting the toll and traffic management. It's called Electronic Toll Gate Stations using RFID Technology.

II. BASIC PRINCIPLE

Automatic Toll Collection System perfom information exchange by the device RFID fixed in the vehicle and road head device IR SENSOR which is fixed in the toll station's roadway.It consists of Central Database,Vehicle Unit ,Tollgate Station unit.The RFID tag send s the signals from 100-200mts to the tollgate station,then IR SENSOR detects the signal and the information to Centarl database,if information is matched an acknowledgment send to Tollgate station ,amount

will be detected.then automatically gate will be opened.

III. SYSTEM HARDWARE DESIGN

In This project we are implementing automatic *toll gate* management and vehicle access control system *using* ARM based LPC2148, PIC18F452 and *wireless technologies such as RFID , zigbee and GSM. In this system three sub-systems are present those are central database system , tollgate unit and vehicle unit.* The vehicle unit consists of a active rfid tag ,GSM modem, keypad and ignition control unit. The Active RFID tag send the necessary vehicle identification information to tollgate unit based on user request. GSM send the vehicle starting intimation to user and also receive the necessary command from user for stop the vehicle. Keypad is used for authentication password to access to start the vehicle. The tollgate unit contains the Active RFID reader to the necessary vehicle identification information When a vehicle comes in the vicinity of the toll gate the tag attached to the vehicle is communicates with the reader attached to Toll gate station and the information of tag is sent through Central data base station using Zigbee wireless communication protocol. At the other side the central data base system receives this information compares the database for the sufficient details and amount. If the details are matched and sufficient amount is found then the successful information is sent to the corresponding toll gate station via Zigbee. At the toll gate if the received information is about success then the toll gate will be opened after vehicle passed away it will be closed automatically based on IR sensor interfaced at toll gate.
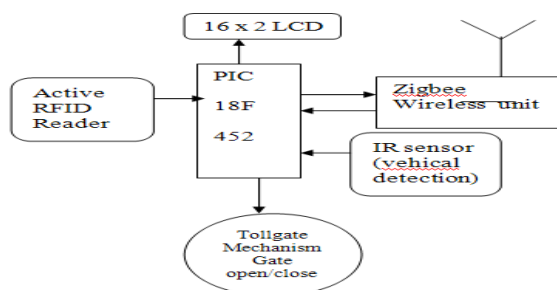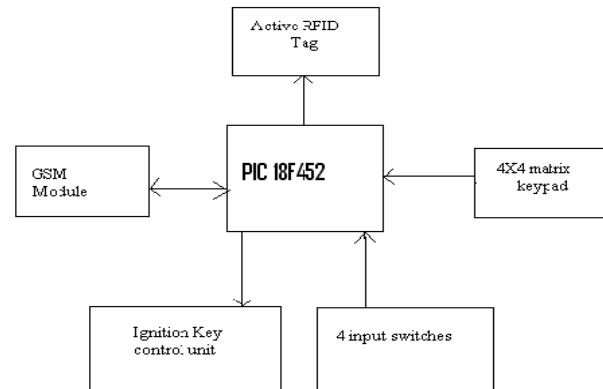

Figure 3.Toll Gate Section
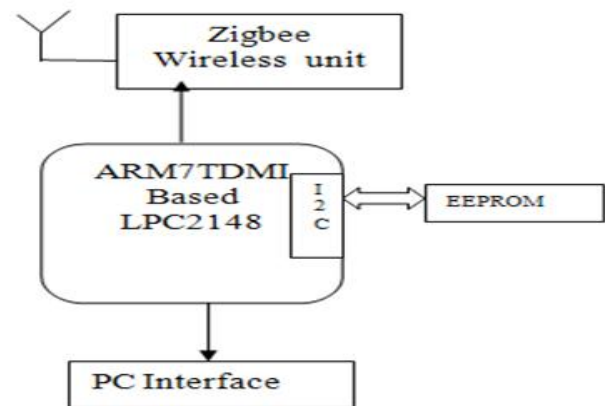

Figure 1.Vehicle section

Figure 2.Central database Section

A. ZIGBEE MODULE:

Zigbee is a Low data rate,Low power consumption system ,which Operates in Unlicensed Bands .Zigbee ISM 2.4 GHz Global Band operates at 250kbps.This is Designed for wireless controls and sensors.

B. ARM7:

ARM7TDMI based LPC 2148 micro controller is a 16-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.

C. PIC18F452:

PIC 18F is a 16 bit micro controller which contains a program memory of 32KB, data memory of 4kB.

D. RFID:

Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. RFID is also called *dedicated short range communication (DSRC)*.This RFID tags can be 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.

Figure 4.RFID Tag

E.LCD:

This module used for display the present status of the system..This is interface to 4 bit mode with LPC2148 microcontroller LCD screen consists of two lines with 16 characters each.

F. 4X4 KEYPAD:

Keypads are a part of HMI or Human Machine Interface and play really important role in a small embedded system where human interaction or human input is needed.Keapads are a part of HMI or human machine interfaceand play really important role.
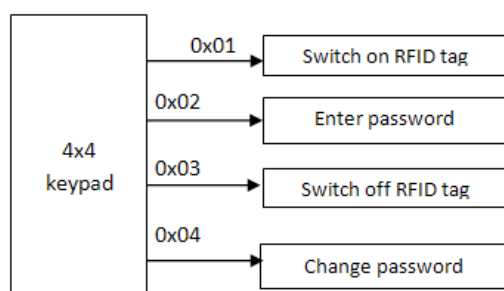

Figure 5.Selection menu

G. GSM:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem send sand receives data through radio waves.

H.IR SENSOR:

An infrared sensor is an electronic device that emits and/or detects infrared radiation in order to sense some aspect of its surroundings. Infrared sensors can detect motion.

IV. SOFTWARE MODULE

Embedded C: The C programming language is a general purpose programming language that provides code efficiency, elements of structured programming, and a rich set of operators. Its generality combined with its absence of restrictions, makes C a convenient and effective programming solution for a wide variety of software tasks. Many applications can be solved more easily and efficiently with C than with other more specialized languages. Cx51 is not a universal C compiler adapted for the 8951 target.
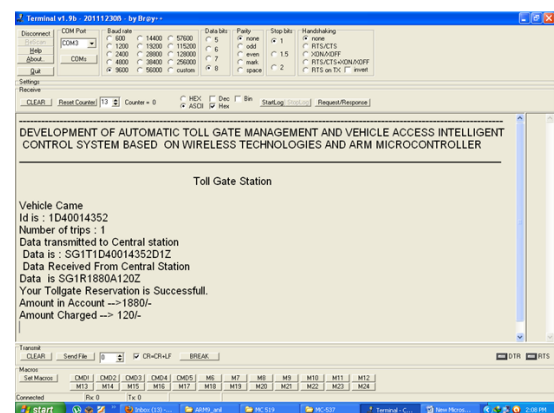
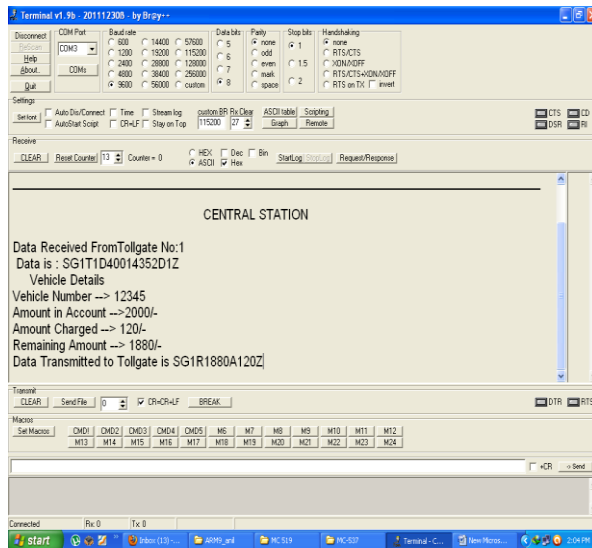## V.RESULT

Figure 6.Toll Gate Station

Figure 7.Central Station

VI.CONCLUSION:

This paper mainly reviewed the research and development Work on the highway parking system. Using RFID wireless communication realized the core technology of ETC; from theoretical and experimental analysis, designed and realize outdoor prototype system for short-range wireless infrared communication, and through software simulated the vehicle terminals' integrate highway parking process. And it also realized the data exchange between terminal software and system control center; completed the business functions and system requirements of logical desi phase; achieved the desired objectives. The amount will be automatically debited from the user account. By using this traffic at the tollgates can be avoided and the users can pass the toll gates without stopping.

VII.REFERENCES

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