

The Global Toll Booth System

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Abstract- The global toll booth system is been stimulated here. That means that the user can pay the prepaid toll using the RF card. The money is automatically paid from the user's bank as soon as the vehicle approaches the toll. For this the user bank PC is been connected with toll booth server via local area network(LAN).The main concept of the project is to enable the toll booth user to pay his prepaid either from the users bank or the toll booth.

Keywords: - RF card, global, LAN, PC.

I. INTRODUCTION

Thousands of vehicles pass through toll booths paying toll tax. In past toll payment system was manual and drivers used manual system i.e. payed cash by hand to cross the toll plaza gate. Manual process is very time consuming and drivers have to wait for long time for crossing the toll plaza. This ultimately leads to useless wastage of time as well as fuel .hence this manual toll deduction system is changed to automated system, where driver doesn't need to wait or get token to cross the toll plaza. This automated system uses the technology of RFID. Being an automated system, it works faster with best results. The global toll booth system is been stimulated here. That means that the user can pay the prepaid toll using the RF card. The money is automatically paid from the users bank as soon as the vehicle approaches the toll. For this the user bank PC is been connected with the toll booth server via local area network (LAN). The main concept of the project is to enable the toll booth user to pay his prepaid either from the users bank or the toll booth. LAN based toll booth systems rely on four major components:

- Automated vehicle identification
- Automated vehicle classification
- Transaction processing
- Violation enforcement

Main features of electronic toll collection system:

- It is easy to operate and maintain.
- It helps speed up activities.
- It provides automatic verification and consolidation of data.
- It helps for fraud detection.
- It has multiple toll collection modes.
- Easy issuance of cards is possible in this system.
- The efficiency in system helps to prevent any failures.

II. SPECIFICATIONS

A. Radio Frequency Identification (RFID)

It is the use of a wireless non contact system that uses radio frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking.

B. Weigand Protocol

It is a simplex protocol. It comprises two signals data0 and data1.The logical zeroes are negative impulses on data0 signal, and the logical ones are negative impulses on data1 signal. Both outputs are held normally high (+5 volt reference to supply negative) and are pulled low (0.7 volt) for the duration of the pulse.

C. Microcontroller PIC 16F877

It is used because it is cheap, easily available and high level of computing is possible.

D. DC Motor Driver I293d

It is a dual H-bridge motor driver, so with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction.

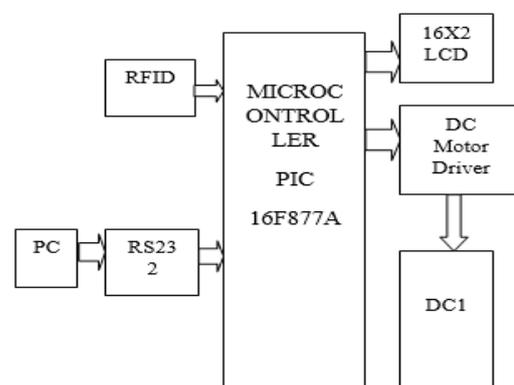
E. RS232 Protocol

It is used for serial communication between micro-controller and PC. In telecommunications, RS232 is the traditional name for a series of standards for serial binary single-ended data and control signals connecting between a DTE (data terminal equipment) and a DCE (data circuit terminating equipment). It is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pin out of connectors.

F. LCD 16*2 (Liquid Crystal Display)

LCD is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals (LCs).

III. BLOCK DIAGRAM



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IV. BLOCK DIAGRAM DESCRIPTION

A. Radio Frequency Identification (RFID)

The use of a wireless non contact system that uses radio frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking.

RFID can be used in a variety of application, such as:

- a) Access management
- b) Tracking of goods
- c) Tracking of persons and animals
- d) Toll collection and contactless payment
- e) Machine readable travel documents
- f) Airport baggage tracking logistics

B. Weigand Protocol

It is a simplex protocol. It comprises two signals data0 and data1. The logical zeroes is negative impulses on data0 signal, and the logical ones are negative impulses on data1 signal. Both outputs are held normally high (+5 volt reference to supply negative) and are pulled low(0.7 volt) for the duration of the pulse. Data format of the weigand protocol is as follows:

For a digital '0' – a low edge pulse on INT 0 pin of microcontroller

For a digital '1' – a low edge pulse on INT 1 pin of microcontroller

So when the data comes in this manner the microcontroller converts the interrupts into corresponding 1's and 0's and stores the card ID in the HEX format and stores it in the internal memory.

C. Microcontroller PIC 16f877

The PIC 16F877 has 8K words or program memory. Since each word in the midrange family is 14 bits long, the program memory can else be expressed as 14Kbytes. The unit has 368 bytes of data RAM and 256 bytes of EEPROM. It has 8 channels of A/D with 10 bit resolution. The unit has two 8 timer/counters and a 16 bit timer/counter. In addition to this it has several different types of serial communication functions such as SPI, I2C and normal PC type serial communication functions. Up to 33 lines can be used for parallel input or output lines. It has a built in clock circuit that can be used in a variety of configurations using crystals, ceramic resonator and RC timer circuitry. The availability of these resources makes the development of complete embedded systems possible with very few components in addition to the PIC microcontroller.

D. DC Motor Driver L293d

It is a dual H-bridge motor driver, so with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction. There are three types of connections used for DC electric motors: series, shunt and compound. These types of connections configure how the motors field and armature windings are connected together. The type of connection is significant because it determines the characteristics of the motor and is selected for speed/torque requirements of the load.

Series connection: a series dc motor connects the armature and field windings in series with a common D.C. power source. This motor has poor speed regulation since its speed varies approximately inversely to load.

Shunt connection: a shunt D.C. motor connects the armature and field windings in parallel or shunt with a common D.C. power source. This type of motor has good speed regulation even as the load varies, but does not have as high of starting torque as a series DC motor. It is typically used for industrial, adjustable speed applications, such as machine tools, winding/unwinding machines and tensioners.

Compound connection: a compound DC motor connects the armature and fields windings in a shunt and a series combination to give it characteristics of both a shunt and a series DC motor. This motor is used when both high starting torque and good speed regulation is needed. The motor can be connected in two arrangements:

- a) Cumulatively
- b) Differentially

Cumulative compound motors connect the series field to aid the shunt field, which provides higher starting torque but less speed regulation. Differential compound DC motors have good speed regulation and are typically operated at constant speed. They are commonly used in elevators, air compressors, conveyors and punch presses.

E. RS 232 Protocol

This protocol is used for serial communication between micro-controller and PC. In telecommunications, RS232 is the traditional name for a series of standards for serial binary single-ended data and control signals connecting between a DTE (data terminal equipment) and a DCE (data circuit terminating equipment). It is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pin out of connectors. Many modern personal computers have no RS232 ports and must use an external converter to connect to older peripherals. Some RS232 devices are still found especially in industrial machines or scientific instruments.

F. LCD 16*2 (Liquid Crystal Display)

LCDs are used in wide range of applications, including computer monitors, televisions, instrument panels, aircraft cockpit displays, signage etc. they are common in consumer devices such as video players, gaming devices, clocks, watches, calculators and telephones. Each pixel of an LCD typically consists of layer of molecules aligned between two transparent electrodes, and two polarizing filters, the axes of transmission of which are (in most of the cases) perpendicular to each other. With actual liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer.

G. Personal Computer

PC is used for storing the database of various nodes located on different positions in the green house. It is also used for displaying the various parameters on screen in the form of graphics or numerical values.

V. RESULT AND ANALYSIS

We observed the following features:-

- a) It is easy to maintain and operate.
- b) It helps speed up activities.
- c) It provides automatic verification and consolidation of data.
- d) It helps for fraud detection.
- e) It has multiple toll collection modes.
- f) Easy issuance of cards is possible in this system.
- g) The efficiency in system helps to prevent any failures.

VI. FUTURE SCOPE

RFID systems are part of a bigger picture and are potentially a key stepping stone in the development towards the vision of ubiquitous computing. In the ubiquitous computing. In the ubiquitous or pervasive computer vision there will be a multitude of computationally capable, small sometimes invisible to the human eyes devices that will be scattered throughout our environments, operating silently and largely unseen as they go about their individual tasks to support our daily activities. In a step change that will be orders of magnitude greater when compared to today's computing power a bewildering population of heterogeneous sensors, computers and actuators will be operating. Often, these devices will operate with self awareness and be widely networked together. In order to realize this vision a comprehensive jigsaw of technological 'pieces' needs to come together and converge as technology develops over the next few years. The RFID piece of the jigsaw is the ability for individual items to be able to identify themselves to the network. A key concept in this development trajectory is the internet of thing. A term first coined by the RFID development in the auto-ID center in the late 1990s, it is also sometimes referred to as the product internet, T2T (thing to thing) network, or the M2M (machine to machine) network. In this vision, increasingly large numbers of our everyday objects and gadgets will have some kind of simple communication technology embedded into them, allowing them to be connected to each other within local area networks and ultimately to wide area networks of network-the internet. In a sense this is a process of extending the internet beyond computational devices and each of these items must be able to identify itself to other items and to the network in general. Secondly, these items should include some element of individual computational power in order to act with some level of intelligence. Thirdly, they will need to have some sense of their physical environment and geographical location. The basic RFID system of transponder and interrogator is an important starting point in the access.

- a) Hex keypad can be interfaced to microcontroller board by which the user can enter his password then only the lock can be opened. This ensures even if someone has card then also without the password he can't get access.
- b) Connection to PC and development of PC side software to read from microcontroller.
- c) Implementing the security systems with different levels by using different types of mifare cards.
- d) Cryptanalysis of the link between the card and reader.

- e) Study of other RFID techniques for better service and security.
- f) Interfacing the system with a GSM so that data can be transmitted through messages.

VII. CONCLUSION

This development of RFID based toll deduction system has proved that RFID technology has good results in different applications but the standard company has developed the framework of applications. In this toll deduction system, RFID use permitted frequency bands by using high power levels. For the future work RFID speed controlled system will save vehicles from the accidents due to high speed. Auto steering system where vehicle can be controlled by using RFID technology installed on the complete track. This will be beneficial if bus driver has some serious problems of heart or other diseases suddenly; the control will be transferred to automatic RFID communication system. RFID communication range between the reader/antenna and tag is limited to few meters, in future it can be extended to a longer range. As a fledging technology RFID is starting to make an impact on the core business of F&HE. Libraries are likely to initiate most of the activity over the next five years or so, but applications within administration and research are likely to increase but it is unclear to what extent RFID will have impact on teaching and learning other than written specialist projects and it is probably more likely that these applications will develop alongside more general ubicomp developments. RFID has the potential to be a hugely significant technology within the ubicomp vision. However, the benefits of a pervasive computing environment are unlikely to be realized unless the technology can be trusted. Where that trust does not yet exist, or is likely to be undetermined by problems that may arise as a consequence of ill considered or malicious implementations of parts of the technological 'jigsaw', the ubicomp vision will also be negatively affected. The F & HE community cannot rely on the relative ease with which RFID has so far being implemented. It is widely acknowledged that there are genuine concerns around the implementation of the technology and it would be wise to make good use of its position to initiate a proactive approach to developments in F&HE.

REFERENCES

- [1] "RFID technology and applications", B Nath, F Reynold-Pervasive Computing IEEE, 2006.
- [2] "Radio frequency identification", CM Roberts-Computers & Security, 2006-Elsevier.
- [3] "Automatic toll collection system", CS Bower - US Patent 2, 769, 165, 1956.