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AUTOMATIC TOLL COLLECTION USING RFID

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Abstract

RFID Toll Street Installment frameworks have truly helped a great deal in decreasing the substantial blockage brought on in the metropolitan urban communities of today. It is one of the most straightforward strategies used to sort out the overwhelming stream of movement. At the point when the car travels through the toll entryway on any street, it is shown on the RFID peruser that it has crossed the clearing. The requirement for manual toll based frameworks is totally lessened in this strategies and the tolling framework works through RFID. The framework therefore introduced is very catalyst decreasing the time and cost of explorers since the tag can be deciphered from a separation .The general population going through this vehicle medium needn't bother with whatever else to get on a thruway, rather the RFID tag conveyed by their vehicle does everything. A worker going through this medium becomes acquainted with how much sum has been paid and how much cash is left in the tag. It doesn't require the individual to convey money with him to pay the toll charge constantly. The long line sitting tight for their turn is decreased, which thusly lessens the utilization of fuel. The RFID toll instalment frameworks are truly utilized as a part of forestalling trespassing on fringes. The product arrangement created can guarantee a smooth running of vehicles with no requirement for further advancement. The product controlling these RFID labels and peruses is anything but difficult to execute.

Index Terms: *RFID Tag, RFID Reade, Microcontroller.*

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1. INTRODUCTION

Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

1.1 What is RFID?

A basic RFID system consists of three components:

a) An antenna or coil

b) A transceiver (with decoder)

c) A transponder (RF tag)

There are many different types of RFID systems available in the market. They are categorized according to their frequency ranges.

1) Low-frequency (30 KHz to 500 KHz)

2) Mid-Frequency (900KHz to 1500MHz)

3) High Frequency (2.4GHz to 2.5GHz).

1.2 Typical Applications of RFID

- Automatic Vehicle identification

- Inventory Management
- Container/ Yard Management
- Document/ Jewellery tracking
- Patient Motorial,

2. COMPONENTS OF RFID

A basic RFID system consists of three components:

- An antenna or coil
- A transceiver (with decoder)
- A transponder (RF tag) electronically programmed with unique information

2.1 Antenna

The antenna emits radio signals to activate the tag and read and write data. They are the medium between the tag and the transceiver; it controls the system's data gain and communication. These types of antennas are available in a variety of shapes and sizes; they can be built on the door frame to receive tag data from sender or things passing through the door, or it can be mounted on an existing tollbooth to monitor traffic passing on road. The antenna produces electromagnetic field which can be constantly present when multiple tags are expected continually. If constant inquiry is not required, a sensor device can activate the field.

All the time antenna is packaged with the transceiver and decoder to become a reader, which can be designed as handheld or a fixed-mounted. The reader emits radio waves in range of one inch to 100 feet or more, depending on its power output and the radio frequency which used. When an RFID tag passes through the electromagnetic area, it will detects the reader's activation signal.

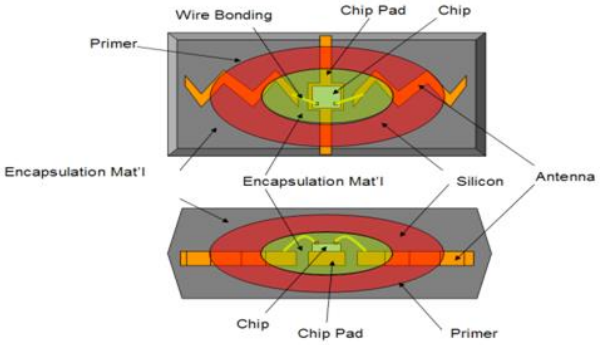

Fig.1 Antenna

2.2 Tags

An RFID tag is consists of a microchip which identifying information and an antenna which transmits this data wirelessly .Basically, the chip will contain a stored identification code, or license plate number, that uniquely identifies that specific item, Similarly the many bar codes are used now a days. A key difference is that RFID tags have a higher data capacity than their bar code. This increases the options for the type of information that can be encoded on the tag, including the manufacturer. In fact, an unlimited list of other types of information can be stored on RFID tags, depending on application needs. An RFID tag can be placed on individual items, cases or pallets for identification purposes, also as well as on fixed assets such as trailers, containers.

The amount of data storage on a tag can vary, ranging from 16 bits on the low end to as much as several thousand bits on the high end. Of course, the greater the storage capacity, the higher the price per tag.

2.3 RF Transceiver

The RF transceiver is the source of the RF energy used to activate and power the passive RFID tags. The RF transceiver may be enclosed in the same cabinet as the reader or it may be a separate piece of equipment. When provided as a separate piece of equipment, the transceiver is commonly referred to as an RF module. The RF transceiver controls and modulates the radio frequencies that the antenna transmits and receives. The transceiver filters and amplifies the backscatter signal from a passive RFID tag.

3. BLOCK DIAGRAM

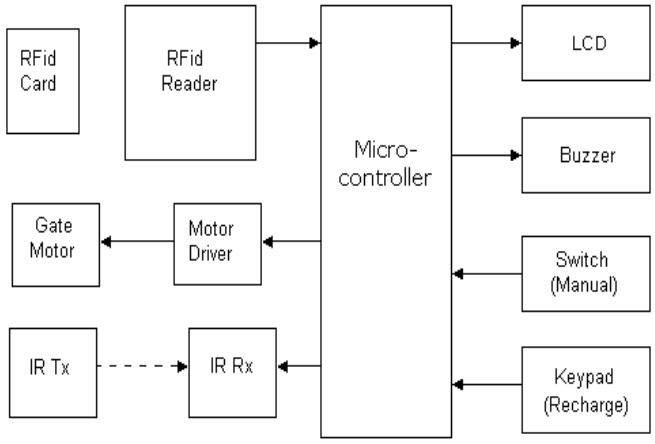

Fig.2 Block diagram of ACT

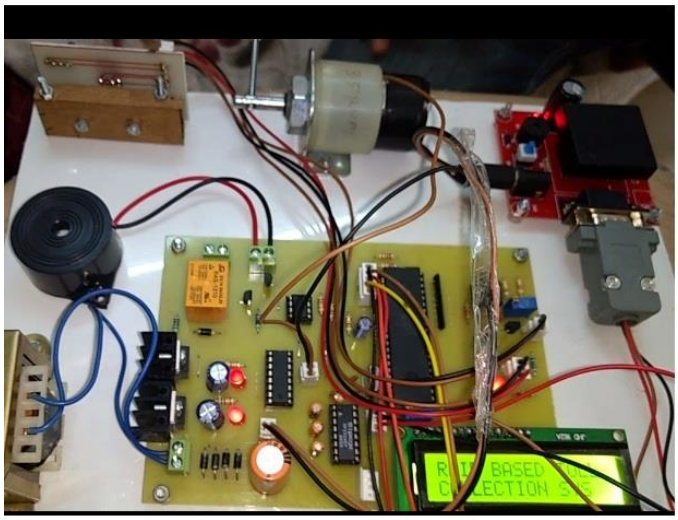

Fig.3 Actual model of ATC

3.1 Microcontroller

This is the most important part of the project, which is microcontroller. This is responsible for detection and polling of the peripherals status. Making decisions for the connected devices is done by microcontroller. It is responsible for prioritizing all the devices attached to it. We have used the ATxmega16 microcontroller. The AVR is a modified Harvard architecture machine where program and data is stored in separate physical memory systems that appear in different address spaces, but having the ability to read data items from program memory using special instructions.32-bit microcontrollers deliver a unique combination of performance, power efficiency, and design flexibility. Optimized to speed time to market, they are based on the industry's most code-efficient architecture for C and assembly programming. No other microcontrollers deliver more computing performance with better power efficiency. Industry-leading development tools and design support let you get to market faster. Once there, the large AVR family lets you reuse your knowledge when improving your products and expanding to new markets easily and cost effectively

3.2 Liquid Crystal Display (LCD):

Liquid Crystal Display which is generally known as Alphanumeric Display .It can display Alphabets, Numbers as well as special symbols. Graphic display. It has embedded controller for controlling different modes. This Controller accepts commands and data bytes from micro controller. LCD display has total 16 pins for interface with processor. RS is instruction or data select line. Special feature of this LCD module is it allows reading of data bytes stored in RAM. Pin no. 5 i.e. R/W is used for deciding read operation or write operation. Graphic display has RAM memory for storing characters codes to be displayed on LCD. We have used 16 x 2 Alphanumeric Display which means on this display we can display two lines with maximum of 16 characters in one line.

3.2 RFID Card Reader

It reads the RFID card shown in front of it and then sends out the code of the respective card. For this purpose the code is sent through serial communication.

3.3 Keypad

Here keypad is used for doing recharge the RFID cards. We have to enter the recharge amount via Keypad. For this, we have used a 4x1 keypad. Keypad is used to set the time. It contains mainly four keys which are following Enter, Increment, Decrement and Escape.

3.4 IR Receiver

It receives the IR rays transmitted or emitted from IR Transmitter. In this we have used 38 kHz infrared IR receiver for detecting .If a vehicle has passed the toll collection booth. These detector modules need to have infrared rays of 38 kHz which we have given through the IR LEDs via a 555 timer. The other alternative for infrared trans-receiver is optical sensor i.e. IR but the disadvantage is that it can be affected easily by the sun light or other lights. So there is possibility of false triggering. Also the disadvantage of using special color sensors like LASER beam is that it is visible to normal human eyes. To overcome all these points we have used infra-red sensor for the purpose of vehicle detection module.

This receiver requires a square wave of frequency 38 KHz at the input. It is an active low device i.e. it gives low output when it receives IR rays at the input.

3.5 IR Transmitter

It transmits the IR rays to the IR receiver. IR Transmitter is transmitting the rays at 38 KHz frequency. IR LED (Transmitter) Light Emitting Diode which is commonly known as LED is used as IR transmitter. We have used TIL.

4. APPLICATIONs

- This circuit can be used at Toll collection booths on highways.
- With little bit modifications, this project can be used for pay and park systems.

5. CONCLUSION

System developed for automatic toll collection works as we expected. At the point when a vehicle passes the tolling plaza, the proper amount of toll of the vehicle is deducted from the vehicle owner's account**.**

Also using this method we can conclude that time required for tolling process during manual mode is reduced in mode of automatic toll collection using RFID

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