SMART TOLL PLAZA SYSYTEM USING IOT

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Abstract- As we all know, transportation is the strength of our country's economy. Smart Toll Plaza System Using IOTemerges as a converging technology where time and efficiency are the matter of priority in toll collection systems of present day. This paper shows, for the first time, that Toll booth can be completely managed using the 'Internet of Things' concept based on the RFID technology. Thus the reader reads the information in the tag and the transaction takes place through a centralized data base and the aftermath details of the transaction is intimated to the user's mobile and also to the website through GSM technology in a matter of few seconds without halt.

I.INTRODUCTION

Nowadays in this world all are very busy with their tight schedules. People have no time to spare. The collection of toll tax on toll plaza is a time consuming process due to traffic congestion and it causes inconvenience to the public. Thus we have thought of Smart Toll Plaza collection system. Here the priority is for time and efficiency. The need for manual toll based system is completely reduced in this method and the tolling system works through RFID technology and IOT. Here the vehicle need not to be stop on the toll gate, the amount is collected from the users account from a tag in the vehicle using RFID technology and the transaction details will be send to the users mobile and also to website through GSM and GPRS technology.

II. EXISTING SYSTEM

From the very past, the construction, extension, maintenance and operating costs of highways, roads, bridges and tunnels were collected directly or indirectly. In the old indirect method the expenses are compensated either by tax payment for fuel of vehicles or by budget allocation of the national income.

This method is that a number of tax payers, who do not use any of the roads and carriageways, have to pay extra money. However, in other system, called direct method, the tolls are taken directly from the drivers passing that road or street. The other three main reasons why tolling, or road pricing, is implemented are listed below.

Fig 1.Present Toll Gate

Demand management: To moderate the growth in demand on the transportation and car pooling.

Fig 2. Traffic Congestion

III. PROPOSED SYSTEM

The user places the RFID tag within relatively short range so that the radio freq. signals can be detected. Once this tag enters the required range, it can be detected by the reader module and it receives the signal of activation. Once the RFID tag has been identified by the reader then the tag can read and write information to the reader. Then the tag can transmit the information to the RFID reader and then it can be sent to the microcontroller. This corresponding data can be then transmitted via the Wi-Fi module to the online cloud database. For the prototype system, a dummy Government registration database is utilized for the verification purpose. If user is identified, process goes to next level. Corresponding amount is deducted (A reference amount is taken for demonstration purpose) and the operation of the toll booth is complete. On completion of operation, the microcontroller then drives the motor to operate the toll gate. IR sensor is employed to detect when the car has passed and correspondingly the motor is signaled to close the gate. Display Unit is used to display the transaction amount message. For implementation purpose, switches are made available at the toll booth for performing top-up operation

for topping up money in the account. Entire operation is performed using the microcontroller. IoT has been implemented for online application of the system. It has been connected to the cloud server and entire data of the transaction and remaining balance amount in the account is available online for users. As a result entire operation is recorded on the server and information can be accessed remotely. Hence entire operation can be made devoid of human intervention.

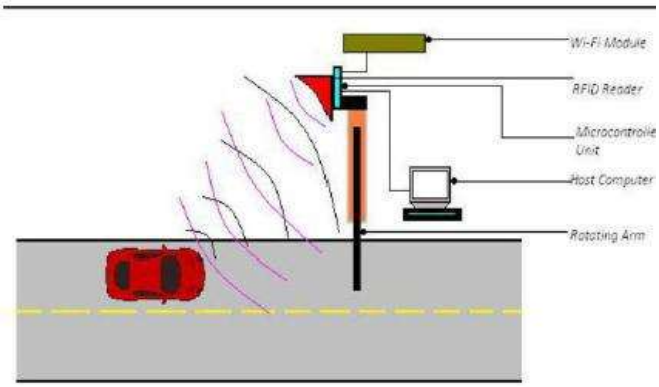


Fig.3: proposed system

IV. BLOCK DIAGRAM

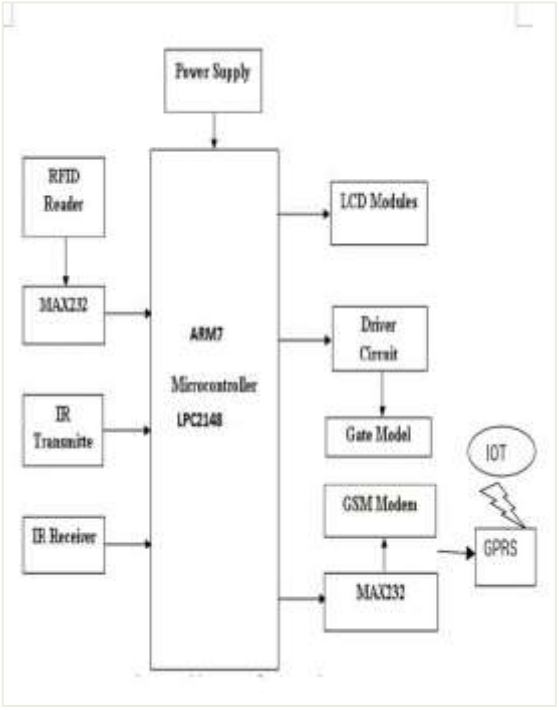


Fig.4 Block Diagram

A block diagram depicts the total blue print of the proposed project. The total essence and functioning of the project is represented in a single block diagram. it depicts the pictorial representation of working of a project. Block diagram is something which gives the overview of a project. The block diagram consists of the following components:

- Microcontroller
- Sensor
- RFID Reader
- GSM
- LCD Display
- Motor

4.1.Microcontroller

A microcontroller (also MCU or µC) is a functional computer system-on-a-chip. It contains a processor core, memory, and programmable input/output peripherals. Microcontrollers include an integrated CPU, memory (a small amount of RAM, program memory, or both) and peripherals capable of input and output.

4.2.GSM

GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second-generation (2G) digital cellular networks used by mobile phones. GSM supports voice calls and data transfer speeds of up to 9.6 kbps, together with the transmission of SMS (Short Message Service). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. Since many GSM network operators have roaming agreements with foreign operators, users can often continue to use their mobile phones when they travel to other countries. SIM cards (Subscriber Identity Module) holding home network access configurations may be switched to those will metered local access, significantly reducing roaming costs while experiencing no reductions in service.

Fig 5. GSM Module

GSM systems provide a number of useful features:

- Uses encryption to make phone calls more secure

- Data networking
- Group III facsimile services
- Short Message Service (SMS) for text messages
- paging
- Call forwarding
- Caller ID
- Call waiting

4.3.RFID

RFID stands for Radio-Frequency IDentification. The RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card; it provides a unique identifier for that object. And, just as a bar code or magnetic strip must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information. An RFID reader's function is to interrogate RFID tags. The means of interrogation is wireless and because the distance is relatively short; line of sight between the reader and tags is not necessary. A reader contains an RF module, which acts as both a transmitter and receiver of radio frequency signals. The transmitter consists of an oscillator to create the carrier frequency; a modulator to impinge data commands upon this carrier signal and an amplifier to boost the signal enough to awaken the tag. The receiver has a demodulator to extract the returned data and also contains an amplifier to strengthen the signal for processing. An RFID reader, also known as an interrogator, is a device that provides the connection between the tag data and the enterprise system software that needs the information. The reader communicates with tags that are within its field of operation, performing any number of tasks including simple continuous inventorying, filtering (searching for tags that meet certain criteria), writing (or encoding) to select tags, etc

Fig 6. RFID

The reader uses an attached antenna to capture data from tags. It then passes the data to a computer for processing. Just like RFID tags, there are many different sizes and types of RFID readers. Readers can be affixed in a stationary position in a store or factory, or integrated into a mobile device such as a portable, handheld scanner. Readers can also be embedded in electronic equipment or devices, and in vehicles.

4.4.EM18 RFID READER

This module directly connects to any microcontroller UART or through a RS232 converter to PC. It gives UART/Wiegand26 output. This RFID Reader Module works with any 125 KHz RFID tags.

Fig 7. RFID Reader

Specifications:

5VDC through USB (External 5V supply will boost range of the module)

Current: <50mA

Operating Frequency: 125Khz

Read Distance: 10cm

SizeofRFIDreadermodule:32mm(length)*32mm(width)*8 mm

(height)

4.5.LCD

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

4.6.DC MOTOR

An electric motor is a machine which converts electrical energy into mechanical energy. DC motor works on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. DC shunt motors can be used where almost constant speed is required and very high starting torque is not required as lathe, machine tools, centrifugal pump and etc. Series motors are used when very high

starting torque is required such as electric traction, trolley car, crane, etc. cumulative compound motors are suitable for applications where the load fluctuates such as rolling mills, printing press, reciprocating type compressors, crusher units, etc. Differential compound motors are

rarely used because of their poor torque characteristics.

Fig 8. DC Motor

4.7.SENSOR

An infrared detector is a detector that reacts to infrared radiation.An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation.Usually it is used for collision detection or obstacle detection.

Fig 9. IR Sensor

The module consists of an IR transmitter and IR receiver gives information to the microcontroller. Infrared sensors are broadly classified into two main types reference input and gives information to the microcontroller. Infrared sensors are broadly classified into two main types:
Infrared sensors – use infrared energy as heat. Their photo sensitivity is independent of the wavelength being detected. Thermal detectors do not require cooling but do have slow response times and low detection capabilities.

Quantum infrared sensors – provide higher detection performance and faster response speed. Their photo sensitivity is dependent on wavelength. Quantum detectors have to be cooled in order to obtain accurate measurements.

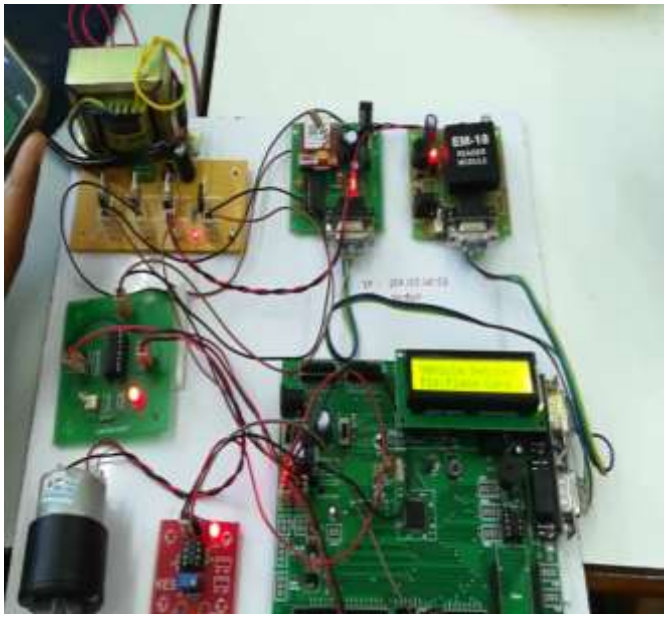
V.SOFTWARE REQUIREMENTS

1.Keil C compiler
2.Embedded ‘c’ Language
3.Flash programmer

VI.APPLICATIONS

1.IOT based Toll Booth Manager System can be used at all the Toll Plazas on the Highway
2.License recognition
3.This project can also be used at Octroi Collection booths

VII.HARDWARE RESULT



VIII. CONCLUSION

We had introduced the Smart Toll Plaza system controlled by ARM7 microcontroller i.e.LPC2148. It is a 64 pin IC which having the property of burning a program while running another program. It is reliable, flexible and of low cost. By practically implementing ,Smart Toll Plaza system System using RFID Technology & IOT. we can provide a convenient transportation for the public i.e. we can avoid traffic congestion. It is the most efficient way of toll collection which can reduce the manual effort at toll plaza. We are avoiding the emergency vehicles such as ambulance, fire force etc. from the toll collection. In this busy world we give preference for time and efficiency, so for Fulfilling this we can implement this kind of toll collection system.

IX.FUTURE SCOPE

Implementation of image processing for centralizes data recording: In our present concept we are only using the RFID system for vehicle detection. So we can extend the scope of this concept in other way for centralize data recording. For that purpose we can use the IR courting at the entry gate which is followed by the Camera which will be continue sly capturing the images of the vehicles entering into the toll plaza. And the third step the RFID is collecting the vehicle number.

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