IJIREEICE

ISSN (Online) 2321 – 2004
ISSN (Print) 2321 – 5526

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING
Vol. 4, Issue 5, May 2016

An Automatic Embedded Toll Plaza with Document Verification and Speed Detection System

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Abstract: Automated toll collection system performs the collection of toll taxes electronically in addition by sending a message of the deduction of toll to the respective motor owner. Automated toll collection system was implemented around the world by dedicated short range communication technology. The system also includes the verification of documents such as driving license whose validity is checked in the data base and the deduction is done based on the given condition. All these communication between the motor owner and the system takes place through RFID technology. In addition to these features it also includes the detection of speed in the speed limiting zones using IR sensor technology.

Keywords: RFID, IR Sensors, BASCOM.

1. INTRODUCTION

An Automated Toll System is used for toll collection without making traffic congestion and waiting in long queue with help of RFID technique. Also, by using this system, it will save time, i.e. by avoiding long queue as no need to stop the vehicle and no need of manual transaction. Most importantly, the stolen vehicle will be able to be caught easily with help of RFID technology.

Now-a-days we hear about accidents on highways very frequently. And in most of the cases the main reason for accident is violation of speed limit i.e. over speed. Although all highways do have signboards indicating maximum speed limit for the sake of driver's safety, but still people do not obey highway speed limit. So by considering this problem another feature that we have implemented in our project is over speed detection & penalty collection for speed limit violators. This feature is designed by making use of two IR sensors.

2. METHODOLOGY AND PROPOSED SYSTEM

• Automatic Toll Collection and Document Verification

An RFID tag is installed on each vehicle with read/write memory. A reader device reads this data when near to toll system from the vehicle and compares it with the data in the computer database, if ID is in defaulter i.e. complaint is in police station about lost or something for security purpose, then the vehicle will be noted and penalized accordingly. But, ID is not in the defaulter list, toll is collected

If it is found that the validity of the documents has expired, the owner will be penalized accordingly in order to pass through the toll gate. An alert message is sent to the users in the form of SMS from the centralized system.

• Speed detection and Monitoring of vehicles in speed limited Zones

When the first pair of sensor is interrupted by a vehicle, the Microcontroller starts the timer and waits till it reaches the second pair of sensor. Once second pair is interrupted, timer stops, and based on the distance between the sensors and time interval between 2 interrupts, speed is calculated and compared with the limit applicable. If the speed is beyond the limit, RFID reader placed next to the second pair of sensor will be activated immediately and fetches the vehicle information and synchronizes the vehicle information with the centralized server of the traffic department. The entire system is developed as an embedded system using micro-controller and associated devices.

3. TECHNOLOGY USED

• IR Sensor Technology

An IR sensor is a device which detects IR radiation falling on it. The principle of working of IR sensors is explained in the Fig. 1.

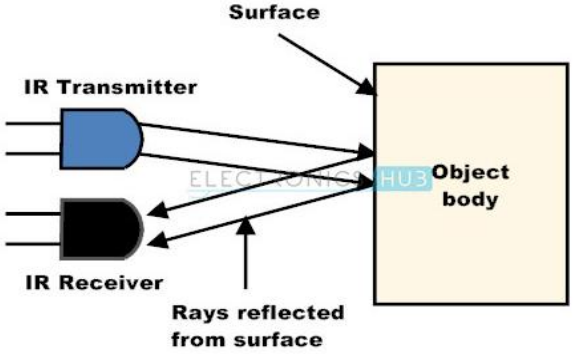

Fig.1: Block Diagram of IR Sensor

DOI 10.17148/IJIREEICE.2016.4577

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IR LED is used as IR transmitter and photodiode as receiver. When the vehicle passes through the booth, IR rays going to receiver are cut and signal is send to microcontroller [1]. An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo – Coupler or Opto – Coupler. When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is obtained.

- **RFID Technology**

RFID stands for Radio-Frequency Identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less [2].

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. Radio Frequency Identification (RFID) technology is a wireless technology, mainly consists of three components, RFID tag or smart label, RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader also called an interrogator. The reader then converts the radio waves to a more usable form of data. Information collected from the tags is then transferred through a communication interface to a host computer system, where the data can be stored in a database and analyzed at a later time.

4. IMPLEMENTATION

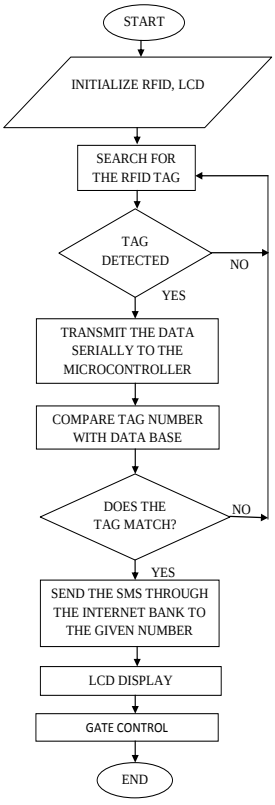

Fig.2: Flow Chart of Toll Collection System

The implementation part of the project work includes the circuit schematic of entire system, the software used and the source code.

A reader device reads this data when near to toll system from the vehicle and compares it with the data in the computer database, if ID is in defaulter i.e. complaint is in police station about lost or something for security purpose, then the vehicle will be noted and penalized accordingly. But, ID is not in the defaulter list, toll collection is taken, documents like RC, validity of Emission and Insurance will be verified and gate will be opened with corresponding traffic light indication. In case, if it is found that the validity of the documents has expired, the owner will be penalized accordingly in order to pass through the toll gate [3, 4]. An alert message is sent to the users in the form of SMS from the centralized system as shown in the Fig.2.

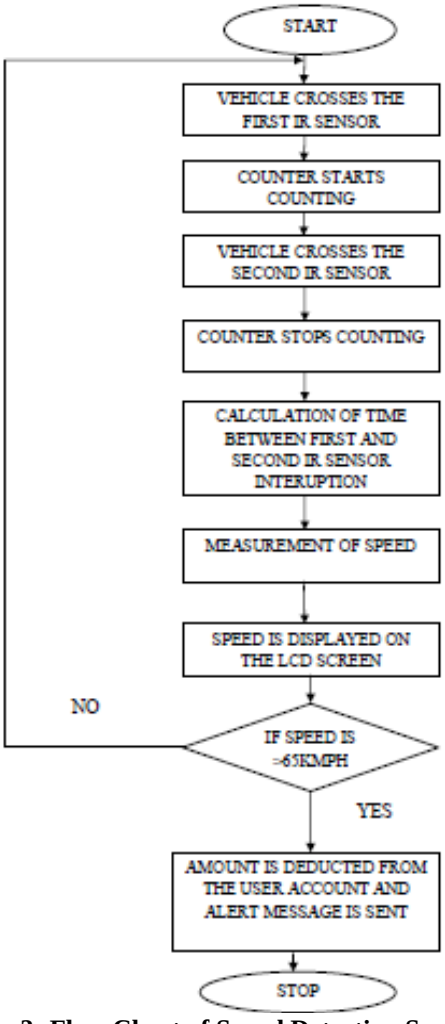

Fig.3: Flow Chart of Speed Detection System

Here first pair of sensor is interrupted by a vehicle, the Microcontroller starts the timer and waits till it reaches the second pair of sensor. Once second pair is interrupted, timer stops, and based on the distance between the sensors and time interval between 2 interrupts, speed is calculated and compared with the limit applicable. If the speed is beyond the limit, RFID reader placed next to the second pair of sensor will be activated immediately and fetches

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the vehicle information and synchronizes the vehicle information with the centralized server of the traffic department [4]. The entire system is developed as an embedded system using micro-controller and associated devices as shown in the Fig 3.

• **BASCOM:** It is a relatively new programming language it was introduced in 1995.The BASCOM test board was designed for the testing of programs.

5. EXPERIMENTAL RESULTS

The experimental results comprises of the results that are obtained while working with the entire module. It includes the results of both toll collection and effective speed detection.

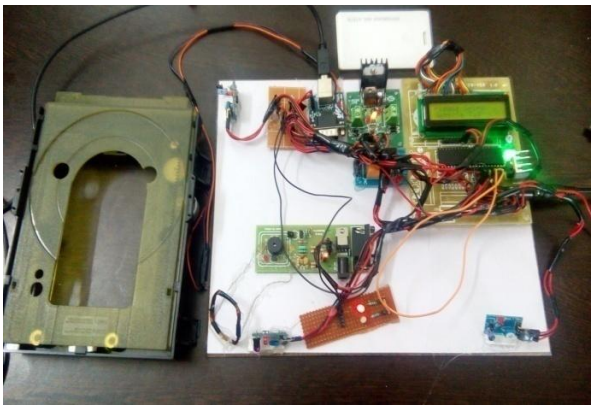

Fig.4: Overall System Module

The overall system module shown in Fig.4 consists of a toll system with the toll gate as well as speed detection system. It comprises of an RFID tag, RFID reader, IR sensors, L298motor driver, SPDT relays and Toll gate, all connected to microcontroller AT89S52.

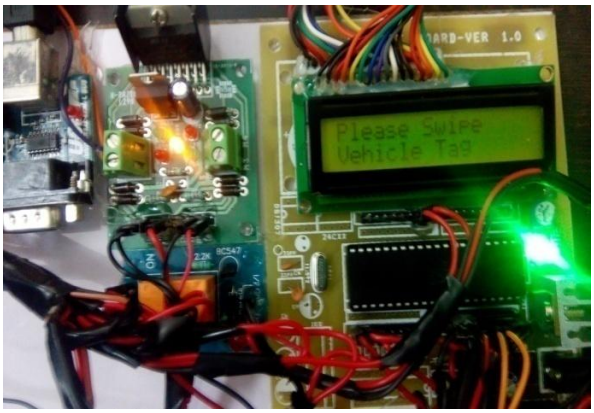

Fig.5: Initializing the System

For speed detection we make us of two IR sensors. Initially, we bring the RFID tag near first sensor. At that moment the message displayed on the LCD is shown in Fig.6. Speed detection mode is activated & counters starts counting, until it approaches second sensor. At the second sensor, counter stops counting & according to the distance & time taken speed is calculated[5]. Based on the over limit speed conditions specified in the program, message will be displayed on the LCD accordingly.

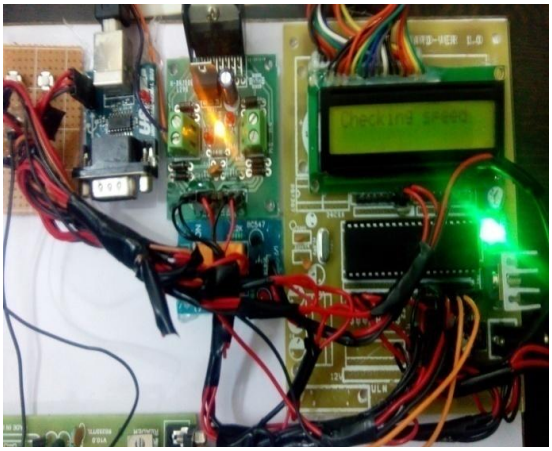

Fig.6: Interruption of First IR Sensor

Then when the tag is brought near the reader, tag acquires power & information from it, is sent to the reader.
Toll system application processing is similar to the one used in speed detection system. In this when the tag is brought near the reader, reader reads the tag number stored in the chip with the help of decoder, which is then sent to host computer for further processing. We make use of Microsoft access for the database. The results that are displayed on PC are shown in Fig.7.

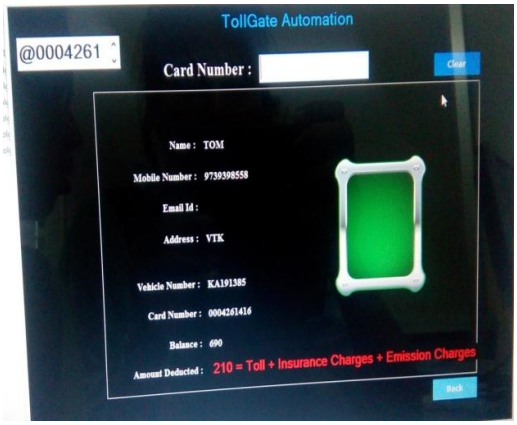

Fig.7: Display of Results in Toll Gate Application

When the desired amount is deducted, gate opens so that user can move out. In order to detect a complete passage of vehicle another IR sensor is used at the exit gate.
The insurance expiry and emission charges considered in this example are 100 rupees each with the toll amount as 10 rupees. The corresponding SMS alerts will be sent to the respective user as shown in Fig.8.

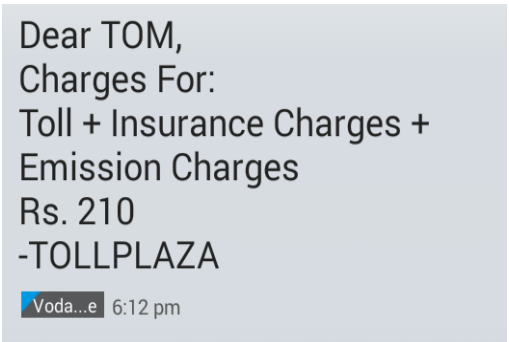

Fig.8: SMS Alerts to the User

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6. CONCLUSION & FUTURE SCOPE

In our project we have introduced the techniques such as Radio Frequency Identification. This technique will include the RFID tag & reader which in coordination with each other can be used to detect the vehicle identity. The IR sensor is used for detecting the complete exit of vehicle at toll plaza. The IR sensor technology is used in the speed detection in speed limiting zones. By effectively utilizing these techniques at different stages of our project we are able to represent the automation in toll plaza which will reduce the complete processing time by few seconds which is very important as well as helps to reduce money leakage in a very cost effective manner.
In addition to the current work, image processing can be combined with the RFID system to make the system more reliable and secure. By combining the positives of the two we can eliminate any possible discrepancies in the system. Internet banking as well as SMS banking can be used for recharging the account of the user to make it convenient.

ACKNOWLEDGEMENT

This work is carried out with the help of group of students and authors. We would like to thank all the faculty members, students and Prof. Abdul Rahman, HOD, Department of Electronics & Communication, BIT, Mangaluru for their continuous Support.

REFERENCES

1. International Journal of Science, Engineering & Technology, Research, Volume 2, Issue 1, January 2013.
2. "An Embedded System and RFID Solution for Transport Related Issues", S Srinivasan, S .Vani, Dr H Ranganathan, IEEE Volume 1, 2010.
3. "RFID Technology Principles, Advantages, Limitations & Its Applications", International Journal of Computer and Electrical Engineering, Volume 3, No.1, February, 2011.
4. "Automatic Toll Gate System Using Advanced RFID and GSM Technology", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Volume 3, Issue 11, November 2014.
5. "Automated Toll Plaza Using RFID and GSM", International Journal on Recent and Innovation Trends in Computing and Communication, Volume 2, Issue 9, September 2014.
6. "Automatic Toll Collection System Using RFID", International Journal of Electrical and Electronics Research, Volume 2, Issue 2, Month: April - June 2014.

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DOI 10.17148/IJIREEICE.2016.4577