

Automatic Toll Tax Collection System Using RFID system and GSM module

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Abstract: *As the world is moving towards automation, in order to fit on the same page, UPLP based automatic toll tax collection system using RFID technology have been developed. The problems faced in the current scenario are, the total work is being carried out manually, the amount of time spent in the toll by a traveller is comparatively more, the digital payments are not involved in the system. To tackle these issues, we have developed a system which makes everything simpler by incorporating the RFID technology in ULK kit. The proposed system can be operated without a man power and makes the system to work faster and in an efficient manner. The main challenge in this system is that, every vehicle should be fitted with a RFID tag which is quite complex to implement in a large scale.*

I. INTRODUCTION

Transportation is the backbone of any country's economy. Improvement in transportation systems result into the good lifestyle in which we achieve extraordinary freedom for movement, immense trade in manufactured goods and services, as well as higher rate of employment levels and social mobility. In fact, the economic condition of a nation has been closely related to efficient ways of transportation. Increasing number of vehicles on the road, result into number of problems such as jamming, increase in accident rate, air pollution and many other. All economic activities for different tasks use different methods of transportation. For this reason, increasing transportation is an immediate impact on productivity of nation and the economy. Reducing the cost of transporting resource at production sites and transport completed goods to markets is one of the important key factors in economic competition. Automatic toll tax collection is a technology allows the automated electronic collection of toll costs. As it is studied by researchers and also applied in various expressways, bridges, and tunnels require such a process of Automatic Toll Tax Collection. ATTC is capable of determining if the vehicle is registered or not, and then informing the management center about to process violations, debits, and participating accounts. The most excellent advantage of this ATTC system is that it is capable of eliminate congestion in toll plaza, especially during those seasons when traffic seems to be higher than normal. The Benefits of this System for motorists are: 1) Shorter queues at toll plazas by increasing toll booth service rates. 2) Faster and more efficient service 3) The ability to make payments by keeping a balance on the card itself and 4) Overcrowding can be avoided. 5) Minimization of fuel wastage and reduced emissions by reducing deceleration 6) rate, waiting time of vehicles in queue, and acceleration. For Toll Operators, the benefits include: 1) Less Traffic 2) Better audit control by centralized user account. 3) Expanded capacity without building more infrastructures So ATTC system is useful for both the motorists and toll operators.

II. RESEARCH REVIEW

The toll tax collection involves collection of tax amount by the workers. Each vehicle has a particular amount to be paid. The entries are made manually by the worker. The bill is given to the travellers. After the tax amount is collected, the toll will be opened which is controlled by a person. The average amount of time spent in the toll by a traveller is around 5-10 minutes. The traveller also finds it difficult when the amount has to be paid in change. Toll Tax collection has been made in different ways. The methods are discussed in the following sections. Jones. A.K and Hoare. R.R (1986) had proposed the toll collection or tax collection is the one of the source. This paper of tax payment system will be an advantage for the government and this system will be monitoring the vehicles which are crossing the gates. This is the first system has been implemented then only accidents has been reduced. Bean Michal (1994) had proposed the system of tool collection established in England and Wales from about 1986 in responded to the need for better road way. The trusts were ultimate response for the maintenance and improvement of most of the main roads in England. Don. F (1990) had proposed this system he used the technique of tax collecting system which is the earliest system for tax collecting and here advantage of this system is to collect the tax ordered by the processor and the demerits is of the higher time consumption. The authors present a high-rate lossless wireless sensing the platform. Edwin.G(2000)had proposed this technique in street by road side commercial store and done by user but not for public. Then after it become good result and implemented in to highway roads. Jerry.L and Barbara.C (2005) had proposed the technique used is of Smart Card Based Toll Gate Automated System which enables the user to access the system, toll booth in less time and a maximum of human effort is needed. Data produced from wireless sensor network deployments lacked the measurement quality and data set richness associated with previous cable-based test programs, thereby limiting the perceived

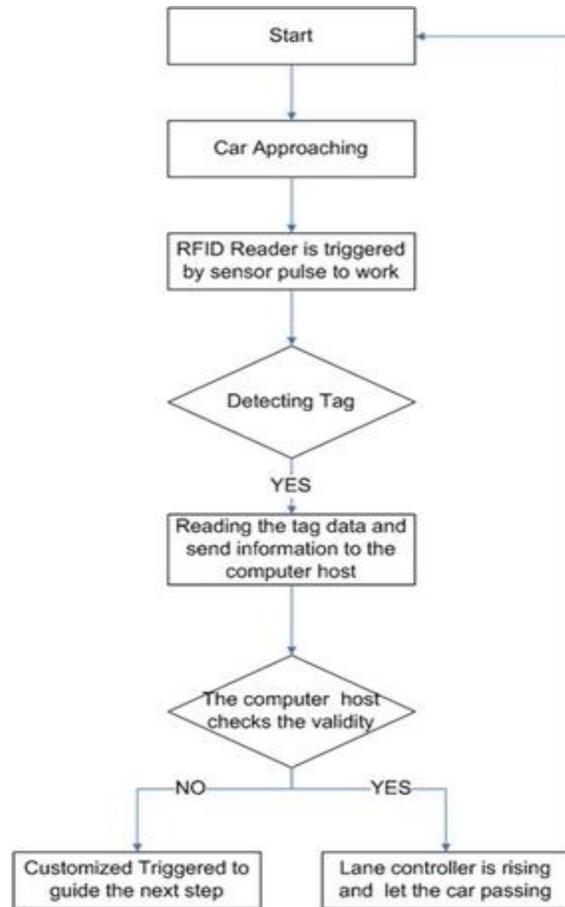
role of wireless King Seong Leong (2005) had proposed the technique implemented is of Laser Technology by this technique the process time has been reduced to an higher extent. To construct an historic vibration database, periodic real-time transmission of vibration measurements would be required, but only at a very low duty-cycle. Limiting the use of the radio transceiver, which accounts for the largest power consumption of the device, reduces the average current consumption to a level that is sustainable with a combination of AA batteries and a piezoelectric generator. Gabriel.N and Mitraszewska.I (2010) had proposed the technique implemented here is RFID Based Payment System to reduce the time consumption and easy access of the system, here the money transfer can be done by this method. Hitachi.S (2011) had proposed the processor implemented here ARM -7 Processor by the ARM-7 the processing of the details of the vehicle has been developed and the time taken is reduced to a great extent. Finkenzeller.K (2012) had proposed his technique was implemented for reducing time to waiting in toll gate. And also it is very secured. Data feed system also having to use store customer data's. S.Nandhini(2015) Electronic Toll Collection (ETC) systems around the world are implemented by DSRC (Dedicated Short Range Communication) technology. The concept is of automatic toll tax payment system and the amount transaction information sends to the cell phone of the motorists through the GSM modem technology. It is an innovative technology for expressway network automatic toll collection solution.

III. PROPOSED SYSTEM

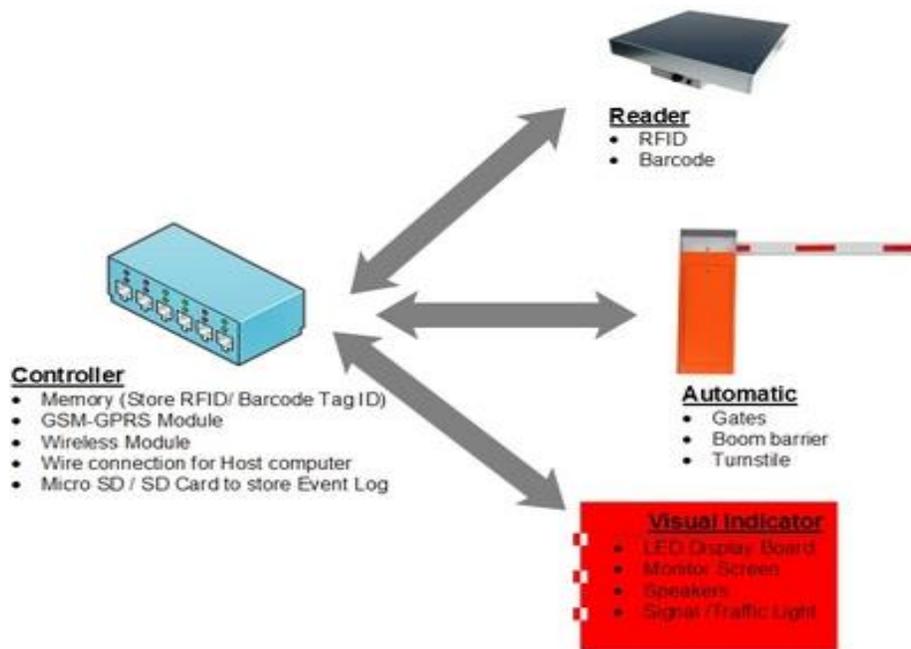
The proposed model provides a way to shift towards digitalisation. The proposed method introduces Aadhar enabled Payment System (AEPS) which is not that popularized in the country. This method can also be used to track the vehicle when stolen and also in detecting the vehicle which does not obey signals. In this system individual Aadhar card details are linked to a RFID tag, also it contains vehicle details and license of the particular person. Whenever the vehicle enters the Toll booth, finger print of the person is scanned along with RFID scanning. If the verification is success then payment is made automatically otherwise manual payment need to be done by the individual. This System was developed using UTLP kit. Whenever any vehicle is entering the Toll booth, payment can be done automatically by placing RFID tag in GLCD, so that scanning process starts. Once scanning is over vehicle ID will be displayed in CLCD and amount to be paid will be displayed in 7 Segment LED. Initially, the vehicle the license no., Aadhar no. are return into RFID tag. Then the tag is embedded into the vehicle. The RFID receiver is placed just before the toll. If the RFID tag is read by the receiver, the traveller is asked to keep his finger print. The Aadhar number is compared with the finger print in the Unique Identification Authority of India (UIDAI) database. When the Aadhar number is matched with the finger print. the amount is debited from the bank linked with the Aadhar number. If not, the payment should be made with the POS attached in the toll. After making the payment the toll will be opened.

IV. IMPLEMENTATION

Unified Learning Kit is based on Texas Instruments OMAP3530 application processor & Spartan-6 FPGA co-processor. The Spartan-6 family provides leading system integration capabilities with the lowest total cost for high-volume applications. The thirteen member family delivers expanded densities ranging from 3,840 to 147,443 logic cells, with half the power consumption of previous Spartan families, and faster, more comprehensive connectivity. Spartan-6 FPGAs are the programmable silicon foundation for Targeted Design Platforms that deliver integrated software and hardware components that enable designers to focus on innovation as soon as their development cycle begins. Various interfaces can be connected through ulk kit for various purposes such as Photo frame interface board, GSM/GPRS board, Camera Add-on board, Bluetooth interface board, CLCD, Led, 7Segment Led, GLCD and Touch panel.etc..This system uses GLCD and Touch interface as RFID scanning, where CLCD for displaying vehicle number and 7 Segment LED for displaying amount. Character LCD A 16x2 LCD shows to display 16 characters per line and has 2 lines. Each character is displayed in 5x7 pixel matrix. The 16x2 character LCD is connected through the I2C interface. Segment Led Display The Seven segment LED is used to display the characters. The 7 Segment LED have many applications such as digital clocks, electronic meters, basic calculators and other electronic devices that display numerical information etc., Touch panel and GLCD The touch screen analog signals from the external LCD will be interfaced with touch screen controller through 4 pin 2.54mm pitch header. The touch screen analog signals from the 3.5inch LCD will be interfaced with touch screen controller through the 54pin LCD connector itself. The 4-wire, 12bit resolution, low voltage touch screen controller.



Flow Diagram of Proposed System



Proposed System Architecture

V. CONCLUSION AND FUTURE WORK

Thus, the toll tax collection system is fully automated with the help of RFID technology. And digital payment method is incorporated in ULK kit. This automated system has fully replaced the man power with technology power and reduced the effort of travelers and their time spent in the toll to a greater extent. The future enhancement for this project is to track the vehicle which trespasses the toll by capturing the image of the number plate. The driver's details are obtained from the vehicle number captured.

REFERENCES

1. B. Ponmalathi, P. Rajeswari, M. Shenbagapriya, R. Shanmugasundaram, "Health Monitoring System for Soldiers using UTLK Kit" International Journal of Innovative Research in Science Engineering and Technology Vol. 4, Special Issue 6, May 2015.
2. Satyasrikanth P, Mahaveer Penna, Dileep Reddy Bolla "Automatic Toll Collection System Using Rfid" International Journal of Computer Science and Mobile Computing, Vol.5 Issue.8, August- 2016, 247-253.
3. B. Ponmalathi, P. Rajeswari, M. Shenbagapriya, R. Shanmugasundaram, "Health Monitoring System for Soldiers using UTLK Kit" International Journal of Innovative Research in Science Engineering and Technology Vol. 4, Special Issue 6, May 2015.
4. Satyasrikanth P, Mahaveer Penna, Dileep Reddy Bolla "Automatic Toll Collection System Using Rfid" International Journal of Computer Science and Mobile Computing, Vol.5 Issue.8, August- 2016, 247-253
5. Das D.P, Panda,G. and Kuo,S.M., "Research Trends in RFID Technology", IEEE Transactions on Signal Processing, Vol.15 No.8, pp.1434- 1446, 2007.
6. Debi Prasad Das, Swagat Ranjan Mohapatra, Aurobinda Routray and Basu, T. K. "RFID Security System", IEEETransactionsonSignalProcessingVol.14,pp.545-549,2006. [6]. Elliott,S.J. and Nelson P.A., "Advanced Vehicle Ta Collection", IEEE Transactions on Signal Processing,Vol.25No.12,pp.1072- 1079,1993
7. Górriz, J.M., Javier Ramírez, Cruces-Alvarez, S., Carlos G. Puntonet, Elmar W. Lang, and Deni Erdogmus, "Multiple Toll Using Passive Technology", IEEE Transactions on Signal Processing,Vol.16 No.9, pp.765-771,2009.
8. Jiashu Zhang and Heng-Ming Tai, "Modified Toll Collection System", IEEE Transactions on Signal Processing, Vol.5,pp.442- 447, 2007.
9. Liang Wang and Woon-Seng Gan, "Electronic Based Toll Collection System", IEEE Transactions on Signal Processing,Vol.17,pp.342-347, 2009.
10. S. Nandhini, P.Premkumar, "Automatic TollTax Collection using Advanced RFID and GSM Technology. Vol. 3, Issue 11, November 2014