



Smart Toll Collection using Embedded Linux and Things Speak

1. Rohini H, Dept of Electronics and Communication, KLE Technological University Hubli,
rohini_sh@kletech.ac.in
2. Suganda. Pendem, Dept of Electronics and Communication, Rural Engineering college Hulkoti,
sugandasjp@gmail.com

ABSTRACT— Numerous gadgets toll frameworks are created in India to spare time utilization that gets squandered in manual toll assortment system. Utilizing the new drifting advances to build up another proficient toll assortment framework which will be a righteous minimal effort elective among the current electronic toll assortment framework. So as to give zero postpone toll assortment system. This paper presents keen toll assortment utilizing web of things (IOT) Platform and Embedded Linux environment. The whole framework is structured utilizing implanted Linux board (raspberry pi) and things-speak, an open source web of things application and API. In this framework the separate RF-ID number labels is given to 2/4 Wheeler's and substantial vehicles 6/8 Wheeler's. The RFID label per user peruses the tag. This data is changed over into identical paired worth and sent to the server to distinguish proprietor and kind of vehicle. This correspondence is finished utilizing IOT to store and recover information from server utilizing HTTP and MQTT convention over the internet. The controller forms the data further and suitable toll is charged for vehicle and showed on android monitor. This framework likewise keeps up the no of passages of vehicle. The information can be recovered from server database straightforwardly at any time.

INDEX TERMS- Raspberry-pi, things-speak, RFID, Toll.

1. INTRODUCTION

In India most tasks are created by a private divisions on (PPP) basis. This association holds development capitals and sensible benefit from people. After the development of streets for some passable period charge is gathered by companies. This charge is called Toll tax. There are a wide range of toll assortment framework practised by different organizations at all extraordinary toll squares. These toll squares sit around idly and increment time. Each and consistently an ever-increasing number of vehicles are quickly expanding which has become a serious issue at the site of all toll stalls because of overwhelming traffic causing perpetual number of issue. The sole motivation behind this paper is to basic and productive e-toll assortment framework and the innovation that we utilized is the utilization of RFID per users/labels. Fundamentally to handle this issue, the utilization of RFID label that must be interestingly fixed onto subject's vehicle and RFID per user module must be fixed at e-toll booth. At the point when a subject's vehicle passes through the door, the per user will identify an approaching recurrence of 125 kHz of the RFID tag and read a novel no that has been allotted by govt. authority and the client's data and sort of vehicle is known through RTO database and toll sum for that vehicle is shown. This framework is fit for sparing time just as fuel protection which can spare a ton of person's economy. This specific framework is far much better and exceptionally productive towards individuals as they won't remain in a long and extensive line in this way computerized e-toll framework will dispose of the hardships of individuals leaving vehicles in a long line. RFID has the capability of disposing of defilement at neighbourhood level and furthermore lessen operational expenses just as blunders in human activities. WSN's for example remote sensor systems are essentially utilized in various situations, for example, home, office, medicinal services, farming and furthermore at toll assortment square which can catch and transmit information from every single approaching vehicle and active vehicles on account of their steady and particular properties.

2. LITERATURE REVIEW

The ATC framework in the paper "An audit on mechanized toll assortment framework" the two sorts of study were analyzed in particular the RFID based investigation and Leach-C based examination demonstrated promising and proficient approach to build up the framework yet it additionally indicated us absence of a point where the Leach-C framework dealt with advanced picture handling where the number plate of subject's vehicle was examined utilizing innovative camera. Utilizing the RFID based execution and disposing of the DIP based usage to make framework better time productive. The review done in the paper named "A 5.8 GHz ISM band Microstrip radio wire for RFID applications" indicated us the way utilizing and creating RFID reception apparatus for examining the subtleties of subject's vehicles from a helpful separation in this way improving the separation of vehicle and RFID per user would cover an enormous zone. The study done in the paper named "A 5.8 GHz ISM band Micro-strip receiving wire for RFID applications" indicated us the way utilizing and creating RFID receiving wire for examining the subtleties of subject's vehicles from a helpful separation in this way upgrading the separation of vehicle and RFID per user would cover a huge zone. Smart Toll Collection System dependent on IoT. The survey was done of the paper "Computerized toll assortment framework utilizing RFID" En-lightened us the different segments that can utilized while building up our own framework in efficient and in productive manner to make a cross breed framework that is referenced in the paper "A survey on robotized toll assortment framework". Internet of Things (IoT) visualizes by and large converging of a few "things" while using web as the foundation of the correspondence framework to build up a shrewd collaboration among individuals and encompassing items. Cloud, being the critical part of IoT, gives significant application explicit administrations in numerous application areas.

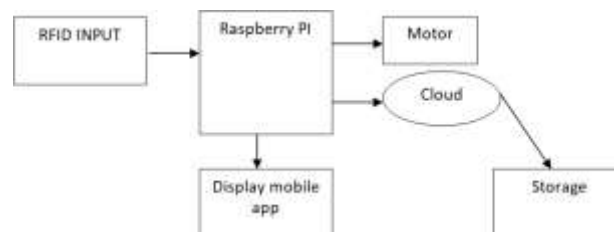


Fig. 1. Block Diagram

3. METHODOLOGY

Various IoT cloud suppliers are as of now rising into the market to use appropriate and explicit IoT based administrations. Regardless of enormous conceivable inclusion of these IoT mists, no standard cum similar explanatory investigation has been found over the writing databases. Reviews of famous IoT cloud stages considering fathoming a few assistance spaces, for example, application advancement, gadget the board, framework the executives, heterogeneity the executives, information the board, devices for investigation, sending, checking, representation, and research. A correlation is introduced for in general spread of IoT mists as indicated by their materialise. Further, scarcely any difficulties are additionally portrayed that the scientists should take on in not so distant future. At last, the objective of this system is to give point by point information about the current IoT cloud specialist co-ops and their upsides and downsides in solid structure. Domain name specific IoT cloud platforms are available. Following platforms are proficient enough to be rigorously used for development and providing solutions to sensor cum-actuator vetted problems. Examples: 1. Thing-wrox: Thing-Worx is a prevalent information driven decision making private cloud stage. Thing-Wrox provides M2M and IoT based Infrastructure as a help where model based configuration is joined with SQUEAL (Search, Query, Analysis) to incorporate pursuit based knowledge into it. 2. Aercloud: AerCloud is a cloud stage for gathering, overseeing, and breaking down sensor information for IoT and M2M applications. AerCloud an improvement of Aeris, enables user applications through a consistent versatility towards millions of gadgets while guaranteeing dependability,

security, and time-arrangement database cooperatively. 3. Things-speak: Thing-Speak is an open IoT data stage dependent on open cloud innovation. Thing-Speak empowers continuous information assortment, investigation and in citation with an Open API.

Manual toll assortment is most broadly utilized in India. In light of the characterization of vehicles distinctive unique toll is gathered by the gatherer. The administrator on obligation enters the information of vehicle on a PC, give receipt of installment and return the change. This procedure is less effective, too much moderate and takes the plenty of time. RFID Based Toll Collection System is another toll assortment technique which is drilled in certain spots of the world. RFID consequently recognize and track labels joined to the article. The RFID is having fundamentally two parts, per user, and tag. RFID tag incorporates a coordinated chip appended to a radio wire, which contains electronically put away data. RFID label substance data as well as it likewise comprises of a one of a kind sequential number. So each materialistic thing can be effectively arranged. RFID per user is a gadget which remotely speaks with RFID labels. It distinguishes the nearness of RFID labels and furthermore send and get the information from labels. For correspondence per user and label must need to drive with similar measures. In this framework, at whatever point Vehicle lands at the toll corner, Reader recognizes the tag joined to the vehicle and bring data. RFID based Toll Collection System is appeared in Fig. 2

Numeric codes: In this framework Numeric codes are mounted on the number plate of vehicles. The data identified with the vehicle is accessible on the numeric code. Numeric code Scanners accessible on the particular toll corner can process this data. The data is effectively trade between toll corner server and proprietor of the vehicle. The lacking purposes of existing toll assortment frameworks are as follows:

1. Manual toll assortment framework isn't dependable since it causes traffic blockage issues at the toll stall.
2. In RFID Based toll assortment framework, It expected to connect labels to every single vehicle for further activities, So it will hard to apply bigger nations like India where a huge number of vehicles are running out and about.
3. Scanner tags Based toll assortment framework demonstrated poor for understanding ability, when it faces severe climate.

A. Raspberry Pi

The Raspberry Pi is a progression of little single-board PCs created in the United Kingdom by the Raspberry Pi Foundation to advance instructing of fundamental software engineering in schools and in creating countries. The unique model became undeniably more well known than anticipated, [9] selling outside its objective market for utilization, for example, apply autonomy. It does exclude peripherals, (for example, consoles and mice) or cases. Notwithstanding, a few extras have been remembered for a few official and informal groups. Raspberry Pi 3 Model B was discharged in February 2016 with a 1.2GHz 64-piece quad center processor, on-board 802.11n Wi-Fi, Bluetooth and USB boot capabilities. On Pi Day 2018. Raspberry Pi 3 Model B+ was propelled with a quicker 1.4 GHz processor and a three-times quicker gigabit Ethernet (throughput restricted to ca. 300 Mbit/s by the inner USB 3.0 association) or 2.4/5 GHz double band 802.11ac Wi-Fi (100 Mbit/s). [15] Other highlights are Power over Ethernet (PoE), USB boot and system boot (a SD card is never again required). While the Pi can run many working frameworks, on the off chance that you're after steadiness and execution, at that point the authority Raspbian working framework is a decent decision, having been tuned to take full advantage of the Pi, and packaging a quick internet browser and a conventional determination of office and programming. On the off chance that you didn't introduce the Raspbian OS utilizing the Noobs installer or download the compose picture record of os on SD card utilizing Balena Etcher, and boot, if you're coming up short on space, and you can likewise go into the terminal and type 'sudo raspi-config' and afterward select the

Alternative to Grow root segment to fill SD card', which will guarantee you're utilizing all accessible space on the card.

B. IOT(Things-Speak)

Internet of Things (IoT) depicts a rising pattern where countless inserted gadgets (things) are associated with the Internet. These associated gadgets speak with individuals and different things and regularly give sensor information to distributed storage and distributed computing assets where the information is handled and broke down to increase significant experiences. Modest distributed computing power and expanded gadget network is empowering this trend. IoT arrangements are worked for some vertical applications, for example, ecological observing and control, well being checking, vehicle armada checking, mechanical checking and control, and home robotising. Thing-Speak™ is an IoT investigation stage administration that

enables you to total, picture and break down live information streams in the cloud. Thing-Speak gives moment representations of information presented by your gadgets on Thing-Speak. With the capacity to execute MAT-LAB® code in Thing-Speak you can perform online investigation and handling of the information as it comes in. Thing-Speak is regularly utilized for prototyping and evidence of idea IoT frameworks that require investigation.

C. Concept and Working

Concept During overwhelming traffic issues, to improve transportation offices after the essential checking of proper client's relying upon the kind of vehicle the toll sum set for specific sort of vehicles is sent to the user, versatile application or showed on screen for the client's convince. This is accomplished rapidly by utilizing WiFi and IOT. After installment door is opened. The time taken for this procedure is less contrasted with other toll systems. The framework is path more straightforward to execute and utilize and furthermore cost-profit.

D. Components

Hardware: Raspberry-pi3, RFID Reader, Mobile/Monitor for Display, DC motor.

Software: Operating system-Raspbian, python IDE, Things-speak platform.

E. Working procedure

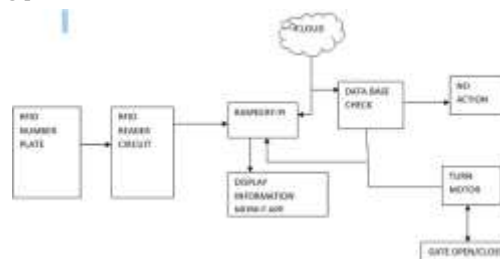


Fig. 2. FUN BLOCK DIAGRAM

The framework contains Raspberry-pi board as the principle processor. The SD card is utilized to contain the devoted working framework which is perfect with pi board. The RFID card peruser peruses the radio waves discharged by RFID card Tags and sends its parallel identical incentive to the controller. It is interfaced through sequential correspondence convention. Wifi module is inbuilt in most recent variants of Pi board which is utilized for web availability and the recovery of particular vehicle's data from server through web and correspondence occurs through IOT cloud stage things-speak. The no. of vehicles is kept up after the check of proprietor the allotted toll sum for vehicle is sent to the portable application or showed on screen. Here the Dc engine is utilized to show status of boundary/entryway whether it is opened/shut by status.

The entire framework will function as pursues:

1. RFID per users detects the radio waves as vehicles comes nearer from permit plate going through the toll booth. The detected radio waves are utilized for creating proportional numeric code
2. This data is changed over into equal paired string and sent to the server by processor through IOT conventions.
3. It checks for the counterpart for the offered code to get suitable user's data and sort of vehicle through things-talk platform.
4. The vehicle RFID numeric code is thought about in the R.T.O database, in light of which the vehicle classification and proprietor name is known.
5. The ostensible sum is sent to the versatile application or showed on screen. The no of sections of vehicle is kept up.
6. The data can be recovered in case whenever just by referenc-ing the proper time. As toll sum is effectively paid by client's obstruction gate will open and the vehicle is permitted to go.



Fig: 3 Setup

4. CONCLUSION

The Smart Toll Collection System utilizing Embedded Linux aura and IOT is introduced here. The proposed framework is proficient than other existing framework, since it is executed based on the quick calculation and specialized technique. In the principal phase of the calculation, the RFID number tag is filtered from RFID per user. This worth is changed over into identical parallel organization and sent to the server through web utilizing IOT conventions. The data is recovered from R.T.O. database server through Things-address get the data with respect to character. In the wake of adjusting the vehicle's character, concurring the sort of the vehicle like Car, motorbike, truck and so forth., the ostensible toll sum will be sent to User's versatile application or showed on monitor. After effective instalment of the determine toll by the client the hindrance will open and vehicle is permitted to leave the toll corner. The proposed framework is neglected to recognize obscure or if in code a number misses all things considered the boundary stays close as framework can't perceive number of the vehicle and can't change over code information into its proportionate double characters. The framework can be upgraded for hostile to robbery condition by recognizing the unapproved clients.

REFERENCES

- [1] Suryatali, V. Dharmadhikari, "Computer Vision Based vehicle Detection for Toll Collection System Using Embedded Linux", ICCPCT, 2015
- [2] A. Wijetunge and D. Ratnaweera, "Real-Time Recognition of License Plates of Moving Vehicles in Sri Lanka", ICII, 2011, pp. 82-87
- [3] S. Ramiah, T. Liong, M. Jayabalan, "Detecting Text Based Image With Optical Character Recognition for English Translation and Speech using Android", SCORED, 2015, pp. 272-277
- [4] F. Fajas, F. Yousuf, P. R. Remya, A. P. Pavan, S. Ambadiyil, V. Swaminathan, "Automatic Number Plate Recognition for Indian standard number plates" 2012 IV International Congress on Ultra Modern Telecommunications and Control Systems pp. 1026-1028 2012.
- [5] R. Hossain, M. Ahmed, M. M. Alfassani, H. U. Zaman, "An advanced security system integrated with RFID based automated toll collection system" 2017 Third Asian Conference on Defence Technology (ACDT) pp. 59-64 2017.
- [6] A. A. Khan, A. I. E. Yakzan, M. Ali, "Radio Frequency Identification (RFID) Based Toll Collection System" 2011 Third International Conference on Computational Intelligence Communication Systems and Networks pp. 103-107 2011.
- [7] Huiping Huang, Shide Xiao, Xiangyin Meng, "Application of RFID and SNMP technology in highway electronic toll collection system" 2010 3rd International Conference on Computer Science and Information Technology pp. 383-385 2010.
- [8] T. Mantoro, A. M. Sobri, W. Usino, "Optical Character Recognition (OCR) Performance in Server-Based Mobile Environment" 2013 International Conference on Advanced Computer Science Applications and Technologies pp. 423-428 2013.
- [7] Available: <https://www.pcb.its.dot.gov/eprimer/images/ep8fig06.jpg>.