



ARDUINO BASED AUTOMATED TOLL COLLECTION USING IMAGE PROCESSING

Suvarna Hugar, Dr. Divakar Harekal

Dept. of Computer Science Engg., M.S Ramaiah Institute of Technology, Bangalore,
Karnataka 560054, India
Suvarna.h50@gmail.com

Assistant Proff. Dept. of CSE, M.S Ramaiah Institute of Technology, Bangalore, Karnataka-
560054, India, divakar.h@msrit.edu

ABSTRACT

The traditional toll collection system is time consuming, results in traffic jams and is inefficient. This paper provides solution to this problem by automating the process of toll collection. The system provides fast toll collection and automatically controls the vehicle movements at toll area through Image Processing. There are RFID and FASTag which requires a smart tag to be attached with the car. Here we propose such a system, so that neither anything needs to be installed at toll area nor anything needs to be attached with car, as the processing can be done from the pic received through Camera installed at toll area. In this system we eliminate waiting time at toll area and make the entire process automated. And also in this project we address to overcome the problem of stolen vehicles and Hit and run cases.

I. INTRODUCTION

Image processing Based Automatic toll collection using Camera which is based On microcontroller, Image processing and load cell to save the time at toll booth and having cashless operation.” Our theme of our project is to automate the toll collection.

There are different types of toll system such as manual toll system, Electronic toll system and automated toll system. Manual toll system is a system where toll is collected manually. This system requires man power and toll collector and so on. The drawback of manual toll collection is waiting time, long queue and traffic congestion. Electronic toll system is a system where toll is collected electronically like amount is

deducted from user account using smartcard. Now, existing system is automated toll collection using RFID. Drawback of this system is electronic jamming, wireless hacking and if RFID fails the whole system leads to failure. To overcome these problems we come up with a solution as Image processing based automated toll collection. In our system we proposed toll collection system using image processing technology. And we also address the problem to overcome stolen vehicle and hit and run cases.

II. DRAWBACKS OF EXISTING SYSTEM

- Now, existing system automates toll collection using RFID, in that system we found a disadvantage i.e, if RFID fails entire system fails.
- Wireless Hacking is possible while passing rays.
- Electronic Jamming is possible.

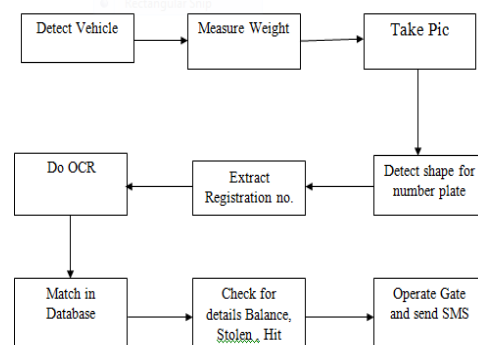


Fig 1 System Block Diagram

Our system is implemented with following major components such as

- Arduino Uno
- DC Motor L293D

- Load Cell
- Proximity Sensor

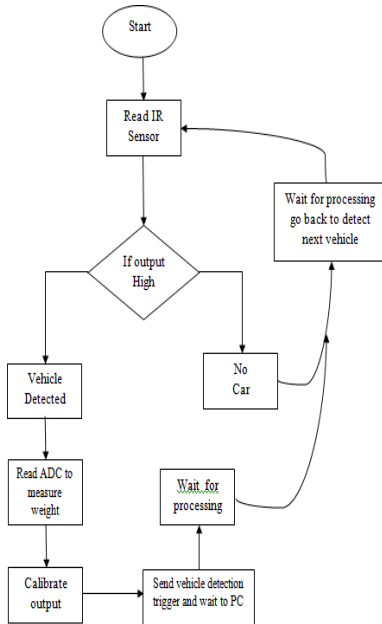
Loadcell: in our project we used load cell that has capacity of 10kg. Normally loadcell has capacity from kg to tons.

Proximity Sensor: As proximity sensor is a sensor that is used to detect obstacles.

DC motor: Dc Motors are the used to operate the gate in our project.

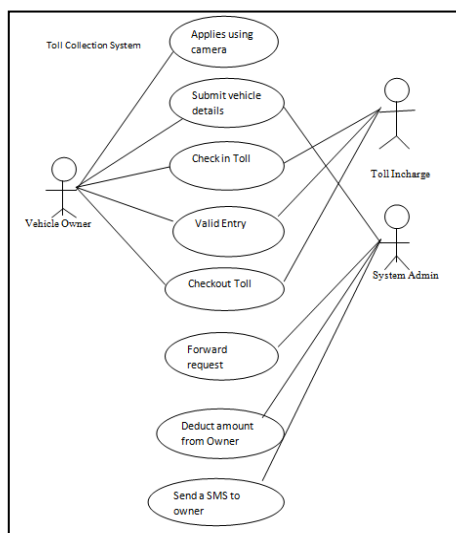
IV. IMPLEMENTATION

Flowchart:

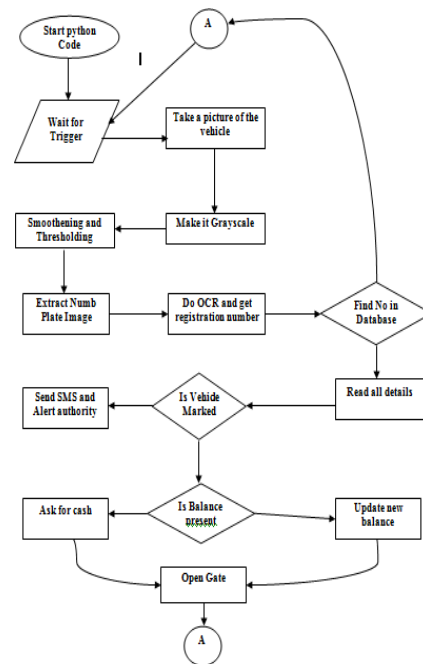


The above diagram that represents the flowchart of our system. Initially it reads IR sensor, if the results is high then the vehicle is detected or else no vehicle. Once vehicle detected it enters into toll area and measure the weight of the vehicle then process go on.

Use Case Diagram



The above diagram represents use case. In our system we have 3 users that is vehicle owner, System admin and Toll In charge.



The above diagram represents the activity diagram. Its represents the flow of working process of our project.

Algorithm: Explanation of Algorithm- Canny Edge Detector Algorithm

User login

Step 1: Start

Step 2: Enter user id and password Step 3 User name And Password valid

Access Granted Or else

Access Denied Repeat step 3

Step 4: Stop for 10 sec

Admin Login

Step 1: Start

Step 2: Enter user Id and password

Step 3: Username and Password are valid Login Or Else Access Denied Repeat step 3

Step 4: Stop

Admin Registration

Step 1: Start

Step 2: Enter details (Owner Name, Car Model, Mobile number, Vehicle Number, Vehicle color)

Step 3: if(data valid)

Registration Successful Or Else

Re-enter the valid details Repeat step 3

Step 4: Stop.

V. SYSTEM WORKING

In our system, the user has to record his vehicle data in the administration which includes fields like new registration, model number, vehicle color, phone number and balance as the vehicle enters the tollgate; it passes through the proximity sensor that detects the vehicle. When the vehicle is detected, then enter the load cell for weighing, classify the vehicle type as heavy and light vehicles. Once the vehicle is weighed, detect the amount based on the vehicle type and verify if there are any violations. No violations, then open the barricade send an SMS to users. If there are any violations, then send an sms to police saying that a vehicle found at a particular toll booth and do not open the barricade. If there is a proper balance in the corresponding user account, then the motor driver will open the gate for 30 seconds and the vehicle will pass through the toll booth.

VI. TESTING

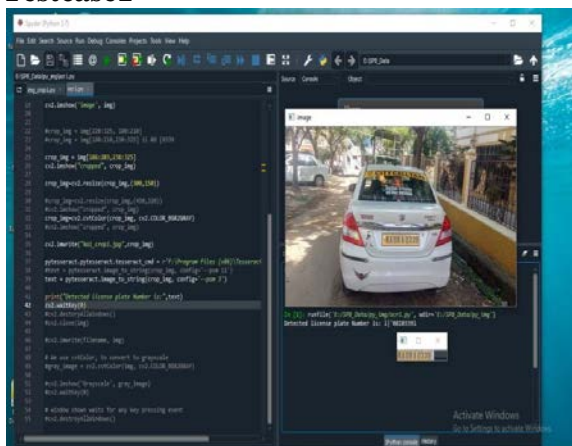
Testing is one of the major process of assessing whether the project is working according to customer requirement. In our project we have an application in such a way that toll amount is deducted from user account. This project provides more stability, reliability and efficiency.

Testing Tools and environment

For testing purpose we have used tools such as Detector algorithm , Grayscale , smoothening and thresholding to reduce the noise in pic. We need Arduino ide for Arduino testing. The environment used is Windows and other OS as the software is applicable on any OS.

Test Cases and Test scenarios

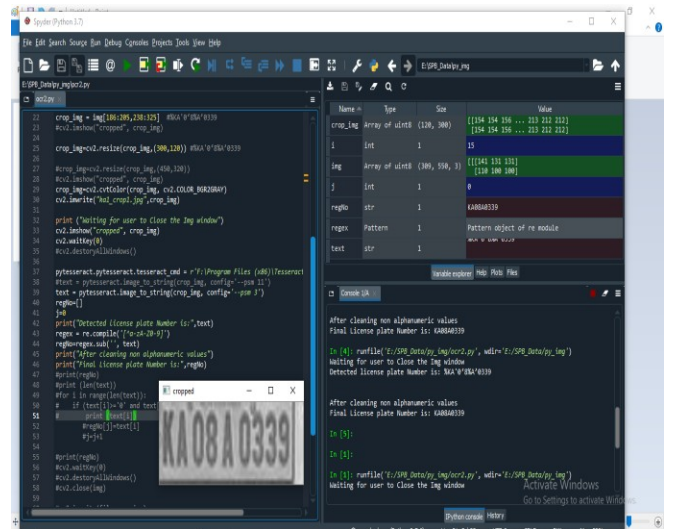
Testcase1



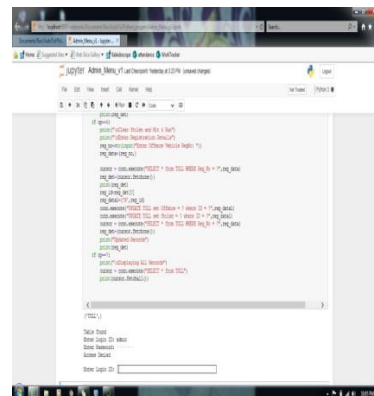
The test case 1 represents the above figure. In the test case 1 we are importing car image from the documents and extracting the number plate of the care using OCR Tesseract. As we observed few characters are missing in given output.

Test case2

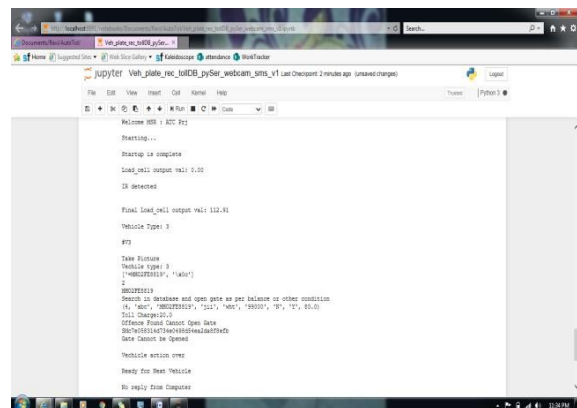
The above snapshot overcomes the test case 1 where number plate is displayed correct by cleaning non alphanumeric values.



VII. RESULTS

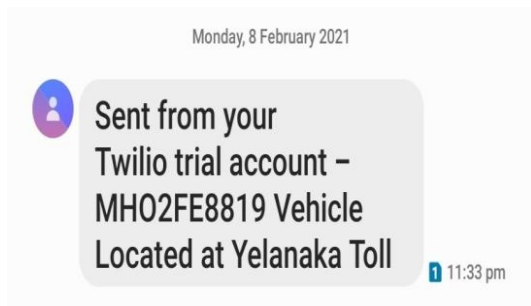


Here, the snaps which represent admin login. If we enter wrong password, access denied.



Again, ask for login Id and password.

The above snap which show initially loadcell weight as zero. Once vehicle enter on load cell then IR detected then load cell output is shown then it show what type of vehicle .In the output shown as vehicle type3. Then take a pic search in the database and gate open as per balance or any other condition . It display toll charge . In the above output we find offence found gate cannot open . Then a SMS to a police. Sms snap is shown below.



VIII. ADVANTAGE

- This system provides an alternative to RFID failure.
- Arduino is less cost than Raspberry Pi
- To overcome wireless Hacking.
- To overcome electronic Jamming

IX. CONCLUSION

Problems such as long queues are completely eliminated by the introduction of the system. This system saves time as well as fuel. Manpower is reduced on a large scale. User will get proper information of his account via sms. Skipping of toll will be avoided. Therefore, the Arduino based Automatic Toll Collection System using image processing will eliminate many issues of the toll booth at one go. This system will ensure faster commutation on highways.

X. REFERNCES

1. Mithya V, Dharani K V, Nivetha A, Praveen Rajakumari G, Roshel Infan M,"Smart Highway Toll Collection System" IJITEE 2019.
2. Akshay Bhavke, Sadhana Pai," Advance Automatic Toll Collection & Vehicle Detection During Collision using RFID" ICNTE-2017.
3. Rafiya Hossain, Moonmoon Ahmed, Md. Mozadded Alfasani, Hasan U. Zaman," An Advanced Security System Integrated With RFID Based Automated Toll Collection System" 3rd ACDT.

4. Segun I. Popoola," A Framework for Electronic Toll Collection in Smart and Connected Communities " WCECS 2017.
5. Aishwarya Agrawal,Nikita Pardakhe," AUTOMATIC LICENCE PLATE RECOGNITION USING RASPBERRY PI" International Interdisciplinary Conference on Science Technology Engineering Management Pharmacy and Humanities 2017.
6. Md. Kawser Jahan Raihan, Mohammad Saifur Rahaman, Mohammad Kaium Sarkar & Sekh Mahfuz" Raspberry Pi Image Processing Based Economical Automated Toll System" Global Journals Inc.2013.