

ECO-FRIENDLY SMART TOLL GATES

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Abstract: Now a days there is a huge rush in the toll plazas in order to pay the toll tax. Therefore in order to reduce the traffic jam and to save time, & also to reduce the money loss of 300 cores /year, we have designed project for the automation in toll tax payment using RFID. We have made the automation of toll plaza using combination of microcontroller, FID and Load cell technology. Here the implantation of automation in toll plaza which is a step towards improving the monitoring of vehicles, travelling in predetermine routes. To design a system, which automatically identifies an approaching vehicles and record vehicles number and time. If the vehicle belongs to the authorized person, it automatically opens the toll gate and a predetermined amount is automatically deducted from its account. This translate to reduced Traffic congestion at toll plazas and helps in lower fuel consumption. This is very important advantage of this system.

Key Words: Toll tax, translate, automatic

1. INTRODUCTION

With the increase in the number of vehicles on road, the task of traffic management becomes more complex. It is hard to keep & maintain the details of the each vehicle, which is running on the road. Also in case of hit-and-run or carrying of illegal goods over inter-state cross boarder or road-robbery cases, the police may not trace the culprits very easily, as the vehicle details are not monitored continuously. Suppose The Cargo Company wants to send a message to its On-road vehicle to stop delivering the goods to customer, policeman want to stop a vehicle which is smuggling some illegal goods or city transports want to track each buses details such as departure and arrival time on bus terminal, number of round trips it has undergone in a single day. All this is possible by the use of automated toll gate systems. This system is intended to help the RTO, Police Department, Public Transport and Cargo Companies to track the vehicles.

With almost 15 crore vehicles using national highways across India, a 10-minute idling everyday Some observations, and maybe with some luck this will reach the powers to be to ponder about the challenges and the resultant wastage in fuel, price rise, pollution, stress , wear and tear etc.

2. Literature survey

- In the direct method the tolls are taken directly from the drivers passing that road or street.

- There are millions of drivers passing through toll gate systems every day.
- They need to stop the car by the toll gate stations and then pay the amount to the toll collector.

3. Outcome of literature survey

- As per Estimates an average of 150000-200000 toll able vehicles pass through the Gurgaon-Delhi expressway daily, as per NHAI.
- With numbers as huge as above it takes a vehicle a minimum of 2 minutes to pass through a single toll.
- In the direct method of collecting toll this causes long queues of vehicle, no checking for overloaded vehicles, manual operation traffic problem.

4. Objective

There are two ways of collecting toll tax being in practice at present. First is the traditional manual method where one person collects the money and issues a receipt. The other one is Smart Card system where the person needs to show the smart card to the system installed at the toll tax depot to open the barrier. This consumes lot of time. To avoid this automated collection of toll is done. This saves the man power and time. Security has been upgraded and all the records are stored in the database.

5. Methodology

5.1 Block diagram

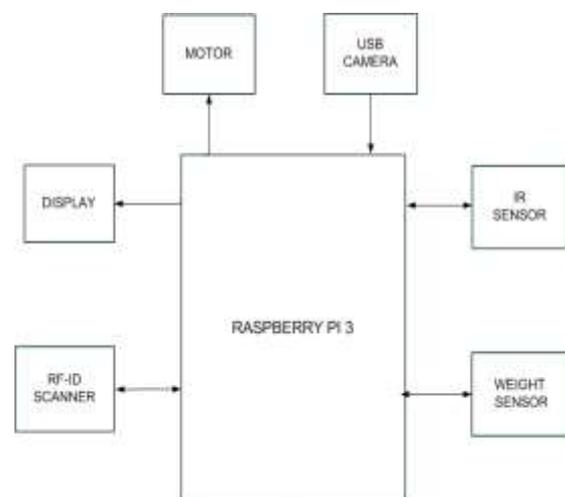


Fig.1: Toll gate System



Fig.2: User mobile Application

Each vehicle will be provided by an RF ID tag containing an ID, this ID is unique for each vehicle and it is synchronized with license plate of the vehicle. RF ID tag will continuously emit RF signals. When the vehicle will reach at the toll booth the Ultrasonic sensor detect the presence of vehicle, RF receiver will detect these RF signals. The signals are amplified and are passed to Raspberry pi. USB camera is used by the concept of image processing the license plate of the vehicle is captured for the security purpose and stored in the database. Pi will check whether the user is valid or not, if valid the pi will intimate the gate control which is supported by a stepper motor. To avoid the time consumption a mobile application is developed that includes One-way, Two-way and Local option. By using wireless communication application can be used. Once the user provides specific input, respective amount is deducted from the account. If the RF ID is not verified the gate remains closed. LCD Display is used to see the status of the vehicle. Details like date, time, weight and id will be stored in the database.

5.2 Requirements

Hardware requirements:

Sl No.	Component	Specification	Quantity
1	Raspberry Pi 3	Model B	1
2	Stepper motor	5v	1
3	USB Camera		1
4	LCD Display	16x4	1
5	IR Sensor		1
6	Load Sensor	5kg	1
7	RF-ID Scanner	13.6Mhz	1
8	Android Mobile		1
9	SD Card	16GB, Class 10	1

Software requirements:

Sl No.	Software	Version
1	Raspbian	Jessie
2	OpenCV	3.0.1
3	SD Formatter	-
4	Win32DiskImager utility	-
5	Android Application	-
6	Open ALPR	-

6. Application

- This project can be used in Toll collection plaza on Highway.
- Smart toll gate can be used in octroy collection booths for faster access.
- Can be used in all types of public parking in Airport, Railway Station....etc, to collect parking charges.
- Can be used in private campuses like College, Industries...etc, to identify the permitted vehicles

7. Advantages

- **Financial leakage control:**
 - As per survey it is clear that, for every year there will be the loss of 300crores of money from the gross toll collection value which is estimated up to 1500 crores. By utilizing fully automatic mechanism we can nearly able to control this financial loss.
- **Fuel saving:**
 - Due to automation of toll plaza there will be large reduction in the rush at toll plaza which will cause indirectly the saving of fuel.
- **Reduced man power:**
 - The basic aim of Automation concept is to reduce the man power & to increase the accuracy of the system. So we can able to achieve the same with our own built concept.
- **Reduced time for completion of process:**
 - The present system we have in work today consumes nearly 1 minute for each vehicle to complete the process of toll payment. With our automated toll plaza we can able to reduce the time consumption nearly up to 40-42 sec. which will be very important in today's era.
- **Cash free operation:**
 - Due to smart card mechanism that we have used for the payment. There will be no necessity of hand to hand cash transaction. So causing reduction in money loss.

8. CONCLUSIONS

- By doing automation of toll plaza we can have the best solution over money loss at toll plaza by reducing the man power required for collection of money and also can reduce the traffic indirectly resulting in reduction of time at toll plaza.

- 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 load cell plate which is introduced for weighing the vehicles so as to classify them in different categories as light & heavy vehicles.
- The IR Tran receiver is used for detecting the presence of vehicle at different locations which will act as the gate pass to the toll plaza.
- By effectively utilizing these three 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.

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