# TOLL PLAZA BASED ON VEHICLE CATEGORY USING RFID

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## ABSTRACT

*Now a days there is a huge vehicle traffic in the toll plazas in order to pay the toll.. 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 toll tax payment using RFID. We have made the automatic toll plaza using combination of microcontroller, RFID and Load cell technology. This report explains the implantation of automation in toll plaza which is a step towards improving the monitoring of vehicles. The aim of our project is to design a system ,which automatically identifies an vehicles and record vehicles number and time. If the vehicle belongs to the authorized person, it automatically opens the gate and amount is automatically deducted from its account. This useful to reduced Traffic jam at toll plazas and helps in lower fuel consumption. This is very important advantage of this system.*

**Keywords:** RFID, IR TRANSMITTER AND RECEIVER.

## 1. INTRODUCTION:

**1.1 PROJCET STATEMENT:-** As the name suggests "Toll Plaza Based on vehicle category using RFID". So we will just take the look of what is mean by Automation. So in very simple language the Automation means to replace the human from the process with the machines .Means what presently the human is doing on the process now onwards the machines are going to do. Before moving further we will just take the overlook of history of the toll plaza. So before the 91's decade the toll plazas were fully manual controlled. Means there are two people for opening & closing of the gate & another two are for reception of the money & data keeping etc. But in 1996 when the Express ways had been developed the semi automatic toll plazas were launched in which data is stored in harddisk of computer & gate operation is automatic, only two persons are required for single booth. But here we are going to see the Automatic toll plaza.

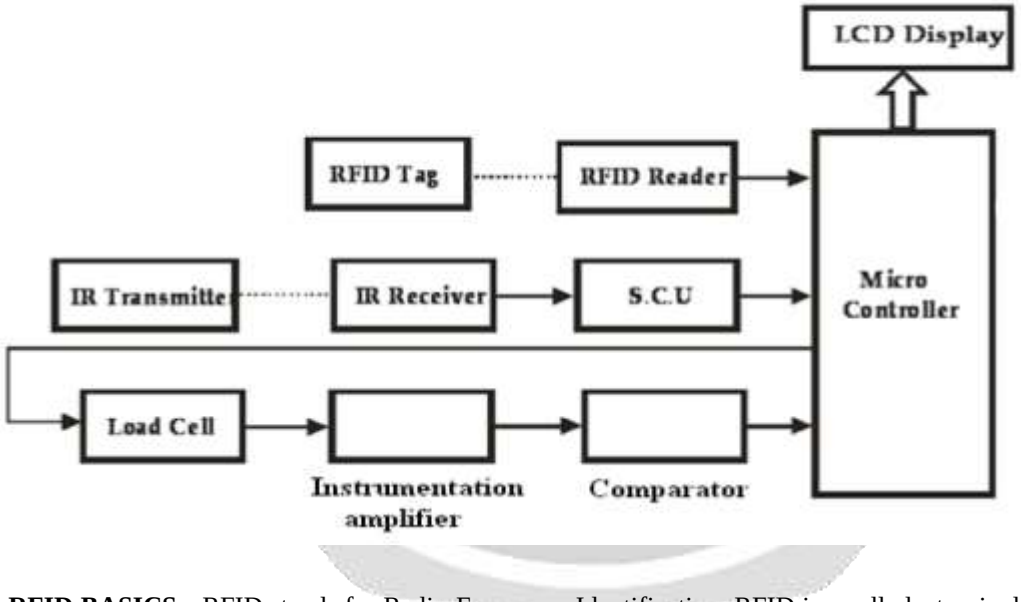
**1.2 CONCEPT OF PROJECT:-** Flow of project:- A)Detection of vehicle B)Weighing C)Display of toll
D) Payment through smart card When the vehicle is going to enter into the toll plaza, the first aim is to detect the type & no. of the vehicle. For this purpose it has to first pass through the IR transceiver gate. Then we have here the RFID system. In this system the tag which is stickered at the front glass of the vehicle is detected by the RFID reader & the data is matched with the data base provided at every toll booth & gives the analog signal to the controller which then displays the respective amount of the toll value. Then the consumer has to just swap his smart card so that desired amount of toll will be deducted from his account. This is the simple concept of our project.

**2.LITERATURE:-** Here we are going to see some points regarding to purpose behind choosing this topic & what is the requirement of this type of the project in our day to day life. 1) Avoid the fuel loss. 2) Saving of time in

collecting toll. 3) Avoid financial loss. 4) To monitor the traffic. So, according to survey of Maharashtra Goverment carried out in 2010,they have proposed to get the annual toll collection of 1501 croers/year .But in the present situation only 1200 corers of the toll value is collected. Means there is loss of 300 crores due to some human errors. So, we have to control corruption. Now the present system we have with us on the high ways takes 2 minute to complete the toll collection process for one vehicle. With this automatic process, it will take just 40 to 45 sec. to complete the whole process. As there is reduction in time for completion of the process so indirectly there will be no traffic as such & as there is no traffic so no fuel wastage takes place & the purpose of designing the highways is achieved i.e. reduction in journey time & also the money loss will be reduced.

## 3. INSTRUMENTATION:-

**3.1 ENGINEERING BLOCK DIAGRAM AND DESCRIPTION:**As you are able to see in the below fig. there is the engineering block diagram of our project that we have designed at the primary stage of our project. So, the diagram consist of RFID tag, RFID reader, IR transceiver, signal conditioning unit, micro controller, load cell, amplifier, ADC,LCD display. Then what is the flow of the diagram? so, the flow starts from the RFID tag which is detected by the RFID reader & sends the data of vehicle stored in digit code form in the tag to the controller to match with data provided at booth. Then the IR transceiver assembly will detect the location of the vehicle on the load cell plate to actuate the weighing operation. The load cell then weighs the vehicle accurately & transmits the analog signal through the instrumentation amplifier to comparator where it is compared with the stored data.. The controller then compares the signal with the stored value of respective toll & displays on LCD. So the consumer has to just swap his smart card so amount will be deducted from his account.



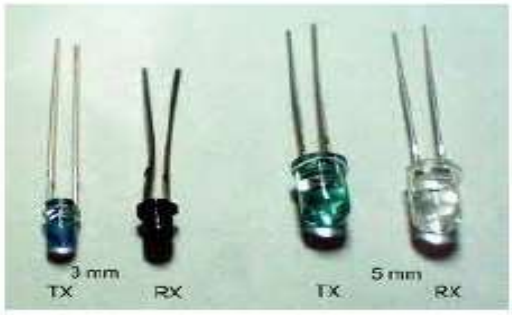

**3.2 RFID BASICS:-** RFID stands for Radio-Frequency Identification. RFID is small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2kbps of data or less.

| Region | Frequency (Hz) | Wavelength (m) | Energy (eV) | Size Scale |
|---|---|---|---|---|
| Radio waves | < 109 | > 0.4 | < 7x 10-8 | Mountains, building |

The RFID device serves the same purpose as a bar code or a magnetic strip on the back of ATM card; it provides a unique ID 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 information. RFID WORKS much BETTER THAN BARCODES. A significant advantage of RFID devices over the others mentioned above is that the RFID device does not need to be positioned perfectly to the scanner. RFID devices will work within a 20 feet of the scanner. For example, you could just put all of your shopping material in a bag, and put the bag on the scanner.

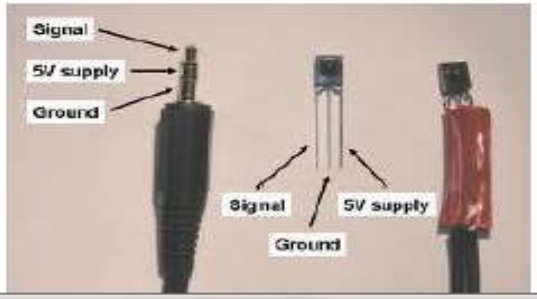
**3.3 IR TRANSMITTER & RECEIVER:-** The IR Transmitter Receiver gate we are using in our project to detect the exact location & position of the vehicle on the load cell plate. Because one problem with load cell plate is that it is unable to weigh the moving object. The IR transmitter is continuously emitting the IR rays towards the IR receiver. When the vehicle is going to come across the gate the rays are deflected from the vehicle & IR receiver doesn't get any signal. The IR Receiver will give the replying signal to the controller.

**IR TRANSMITTER –RECEIVER LED PAIR**



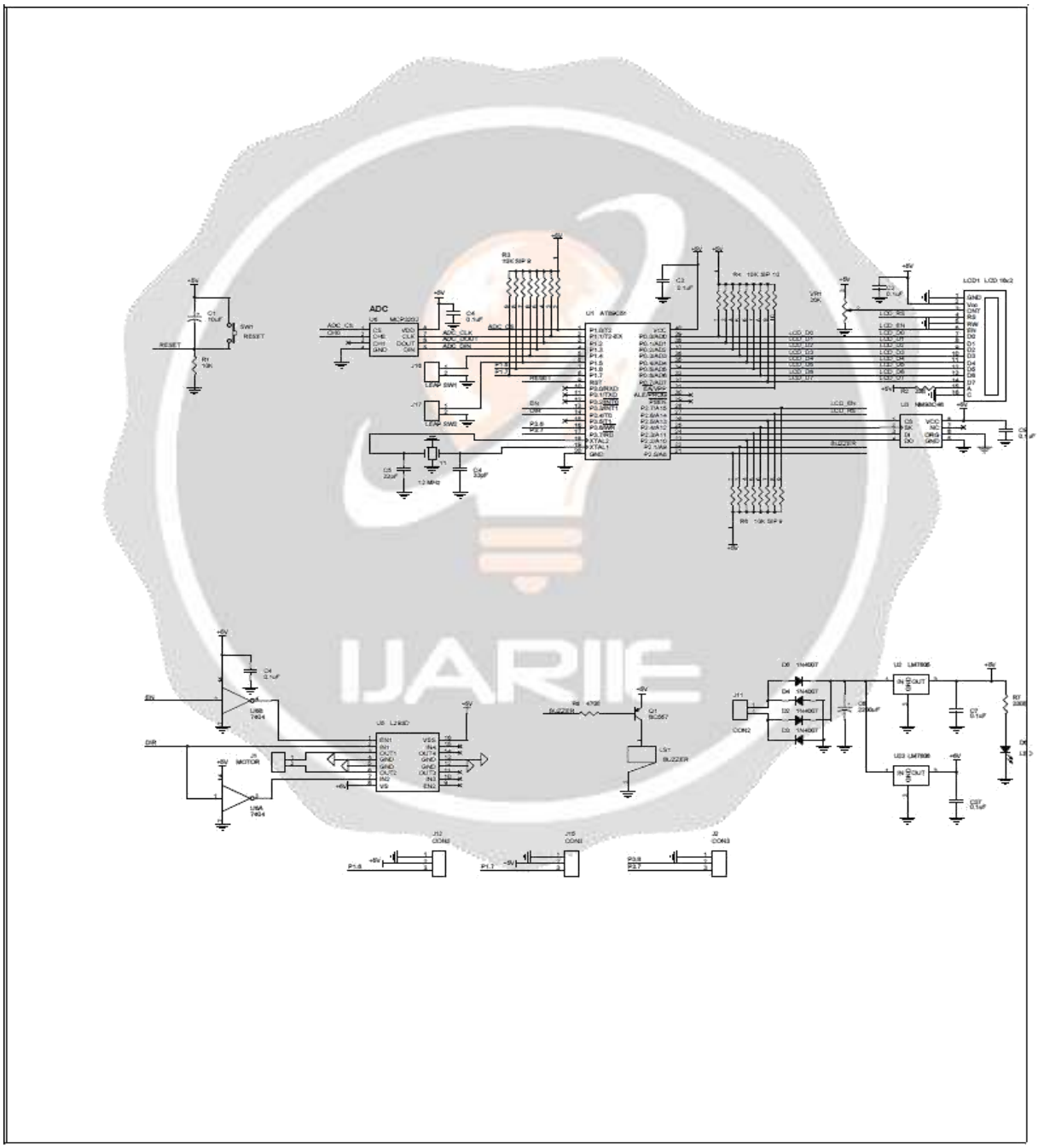

**IR TRANSMITTER**

**IR RECEIVER**

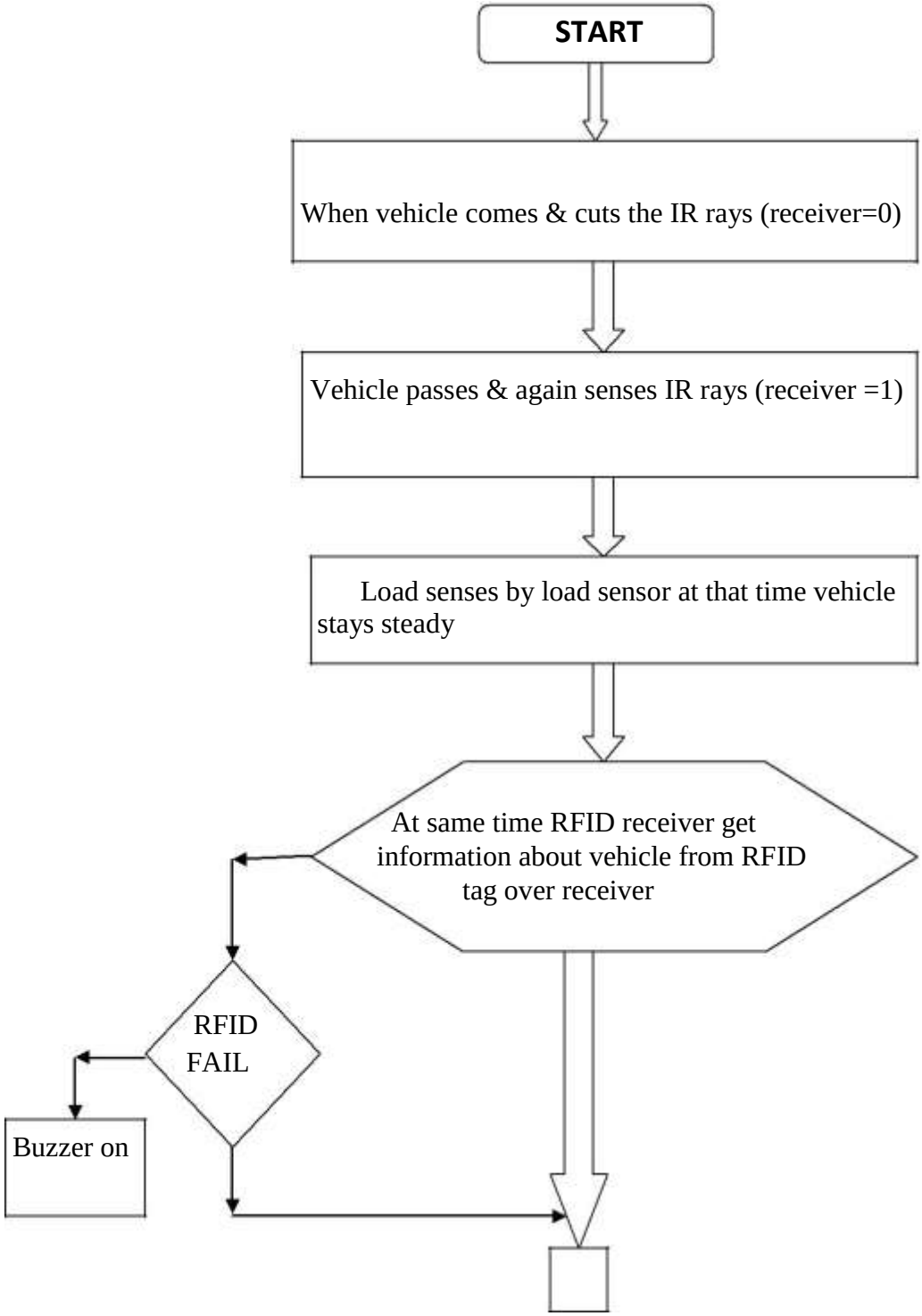


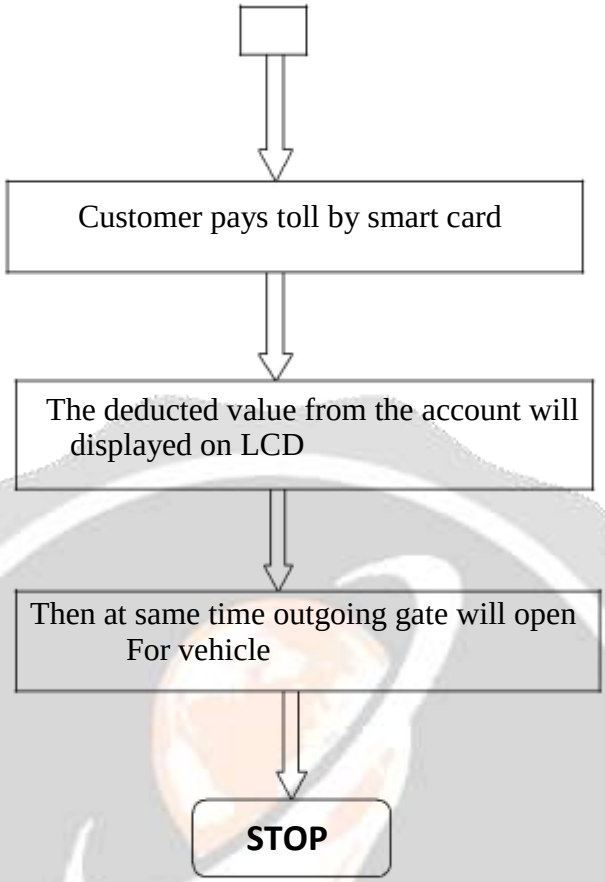
## 4. SOFTWARE DESIGN:-

### 4.1 CIRCUIT DIAGRAM:

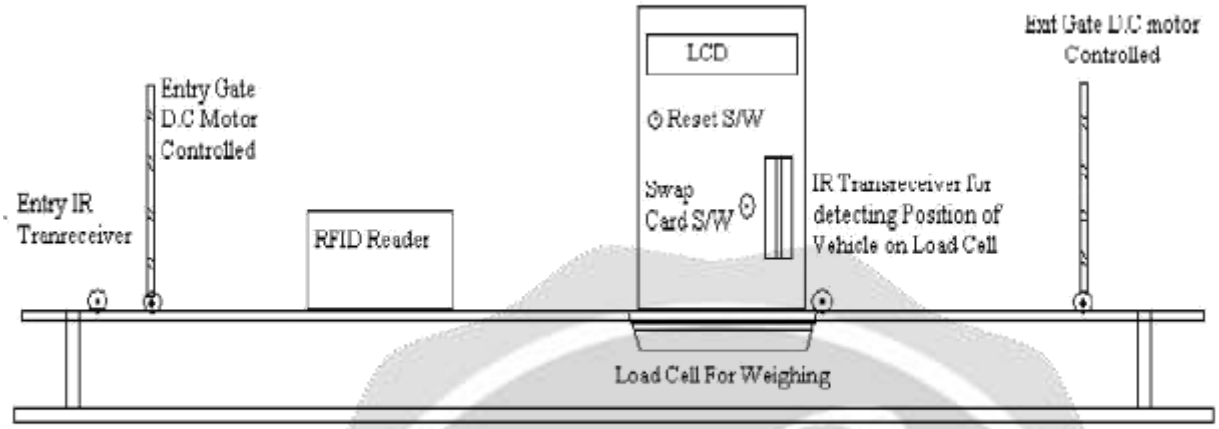


**4.2 FLOW CHART:**



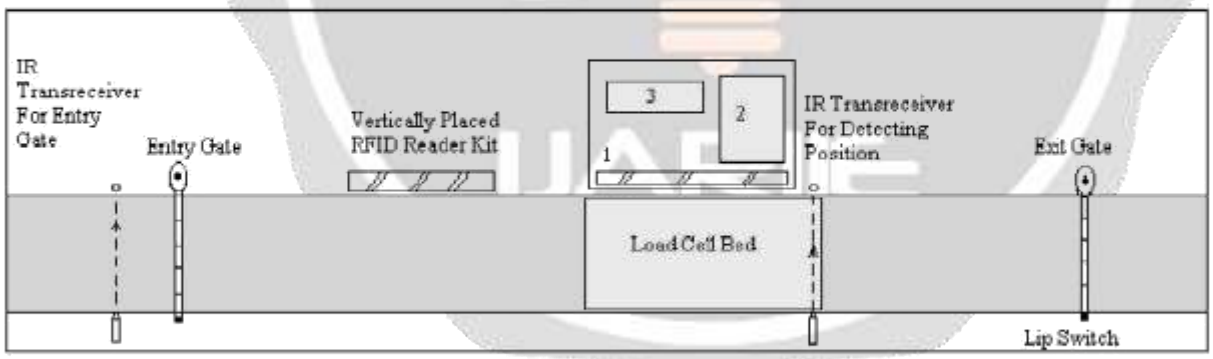

Customer pays toll by smart card
The deducted value from the account will displayed on LCD
Then at same time outgoing gate will open For vehicle
STOP

**5. HARDWARE DESIGN**:-




SIDE VIEW

Top View




1-Vertically Placed Main PCB
2-PCB For Load Cell
3-Swap Card Memory

**5.1 TESTING AND RESULTS:-**

A.Whenever a IR rays at the entry gate get cut by the vehicle the gate opens & it remain open till the rays are mismatched.As the rays get connected again then the gate gets closed.

B.From RFID tag we get information about vehical number which is sensed by the RFID reader which will then transmite the data to the controller.

C.From laod cell we can get the load of vehical,from which we are detecting the type of vehicle that it may be the light vehicle or heavy vehicle.

D.From both load cell & RFID we get the type of vehical and it's number.Then the toll amount will be displayed on the LCD.

E.By smart card mechanism toll amount will be paid & at the same time exit gate will be opened automatically for the vehicle topass through.

F.The whole time duration for payment of toll will be less than 1 min i.e approximately 40-42 sec.

**5.2ADVANTAGES:-**

**1.Financial leakage control** As per survey it is clear that, for every year their 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.

**2.Fuel saving**Due to automation of toll plaza their will be large reduction in the rush at toll plaza which will cause indirectly the saving of fuel.

**3.Reduced man power** The basic aim of Automation concept is to reduce the man power & to increase the accuracy of the system.

**4. Reduced time for completion of process** The present system we have in work today consumes nearly 5 minute for each vehicle to complete the process of toll payment. With our toll plaza we can able to reduce the time consumption nearly up to 40-45sec.which will be very important in today.

**5.Cash free operation** Due to smart card that we have used for the payment. There will be no necessity of hand to hand cash .

**5.3 LIMITATIONS:-**

**1. Load sensing for long length vehicle becomes critical**-The load cell plate we can use in set up of project in actual is approximately 60feet.But if the vehicle having the length more than 60 feet come on the load cell plate then the system will not able to weigh the vehicle correctly.

To overcome this problem we may keep the separate lane for such vehicles with fixe amount of toll amount.

2.**If RFID fails whole system fails**-The RFID system we are here using for detecting the vehicle number means the vehicle identity which we are further using for storing into memory & also to display on the LCD.

If the RFID fails to detect the correct identity of the vehicle the data regarding the vehicle will be wrong which will may create many problems & system fails because without vehicle identification load cell will not weigh the vehicle.

## 6.CONCLUSION:-

By doing automatic 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 on toll plaza.

In our project we have introduced the techniques such as RFID.This technique will include the RFID tag & reader which in coordination with each other can be used to detect the vehicle identity.

The IR Transreceiver is used for detecting the presence of vehicle which will act as the gate pass to the toll plaza.

By effectively utilizing these techniques at different stages of our project we are able to represent the automatic toll plaza which will reduce the complete processing time.

**6.1FUTURESCOPE:-**

1. **Implementation of automatic payment** In our project now we are implementing the smart debit card

mechanism for the payment of the toll amount paid by the owner .When the vehicle comes from toll gate, at that time the owner has to swap his smart debit card in the swap machine. So, desired toll amount will be deducted from the account of owner. Here we can also implement the automatic debit system. In this system we have to treat the RFID as the smart card. In the RFID card we have now vehicle information in the code format. So, we can combine the RFID card with smart card as both are the different forms of basic principle of Barcode.

2. **Implementation of image processing for data recording** In our present concept we are only using the RFID system for vehicle detection. So we can extend the scope of this concept in other way for data recording. For that purpose we can use the IR at the entry gate which is followed by the Digital Camera which will be continuesly capturing the images of the vehicles entering into the toll plaza. And the third step the RFID is collecting the vehicle information. Now when the vehicle passes through the IR gate it tresses the outline of the vehicle,in the next step the digital camera will take the image of the vehicle & followed by the RFID to record the data of the vehicle. The whole data collected together & sent to the server.This application will help in detecting the vehicles in the crime cases.

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