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AUTOMATIC TOLL COLLECTION AND DATA MONITORING

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ABSTRACT

Now 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 paper for the automation in toll tax payment using RFID. We have made the automation of toll plaza using combination of microcontroller, RFID and Load cell technology. This paper explains the implantation of automation in toll plaza which is a step towards improving the monitoring of vehicles, travelling in predetermine routes. The aim of our paper is 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.

Keywords: Radio frequency identification(RFID); Simple Network Management Protocol(SNMP)

I. INTRODUCTION

"Design and develop a Automatic toll plaza which is based On microcontroller, RFID technology and load cell to save the time at toll plaza And having cash free operation" As the name suggests "Automatic Toll Plaza" the key theme of our paper is the automation. So here we will just take the overlook of what is mean by Automation. So in very simple language the Automation means to replace the human being 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 plazas. So before the 90'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 1995 when the Express ways had been developed the semi-automatic toll plazas were launched in which data is stored in computers & gate operation is automatic, only two personals are required for single booth. But here we are going to see the human less toll plaza.

II. CONCEPT:-

When the vehicle is going to enter into the toll plaza, the first aim is to detect the type & no. of the vehicle. For that purpose it has to first pass through the load sensor. Then we have here the RFID system. In this system the tag which is stickled 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. When further vehicle is going towards the Load cell

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plate it has to pass through the IR transmitter - receiver gate. Which we are using to detect the exact location of the vehicle on the load cell plate because the load cell plate has one property that it can't weigh the objects which are not stable on the plate, So for detection of exact location & steadiness of the vehicle on the load cell plate we are using here the IR Transmitter Receiver gate. Now when the vehicle is at steady position on the load cell plate, it weighs the vehicle accurately & 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 paper.

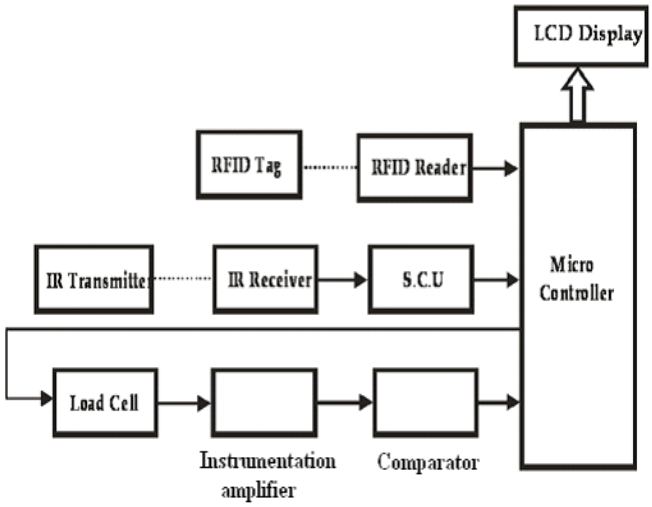

Fig.1 Block diagram

As you are able to see in the above fig. there is the engineering block diagram of our paper that we have designed at the primary stage of our paper.So, the diagram consist of RFID tag, RFID reader, Stepper Motor, micro controller, load cell sensor, GSM Module, 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 i.e. type & no. of vehicle stored in 12 digit code form in the tag to the controller to match with data base provided at booth.

Automatic toll collection system is an efficient method of collecting tolls as the vehicles passing through the toll plaza do not stop to pay toll and the payment is automatically deducted from the driver's account.

The main difference in idea in our paper is the placement of the reader and the tag which avoids collision majorly, where the tag is placed in the front side number plate and the reader is placed in a strip which is laid beneath the road in an opening on the track of the vehicle.

As the vehicle approaches, the sensor which is placed on the side of the road activates the stepper motor and raises the strip and the information on the tag is read by the reader and the transaction takes place. Simultaneously the transaction details or details regarding if the user is valid or not is sent to the microcontroller and this will intimate the gate control which is supported by a stepper motor to open if the user is valid.

The controller then compares the signal with the stored value of respective toll & displays on LCD. The aftermath details regarding the deducted amount and the main account balance are intimated to the user through GSM technology. This is the simple working of our engineering block diagram that we have designed at the primary stage.

IJARSE
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2.1 RFID Basics:-

RFID stands for **Radio-Frequency Identification**. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less. The RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card; it provides a unique identifier 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 identifying information.

III. RFID WORKS 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 precisely relative to the scanner. We're all familiar with the difficulty that store checkout clerks sometimes have in making sure that a barcode can be read. And obviously, credit cards and ATM cards must be swiped through a special reader.In contrast, RFID devices will work within a few feet (up to 20 feet for high-frequency devices) of the scanner. For example, you could just put all of your groceries or purchases in a bag, and set the bag on the scanner. It would be able to query all of the RFID devices and total your purchase immediately. RFID technology has been available for more than fifty years. It has only been recently that the ability to manufacture the RFID devices has fallen to the point where they can be used as a "throwaway" inventory or control device. One reason that it has taken so long for RFID to come into common use is the lack of standards in the industry. Most companies invested in RFID technology only use the tags to track items within their control; many of the benefits of RFID come when items are tracked from company to company or from country to country.

3.1 Working of RFID

Radio-Frequency Identification system has three parts:

- A scanning antenna
- A transceiver with a decoder to interpret the data
- A transponder - the RFID tag - that has been programmed with information.

  The scanning antenna puts out radio-frequency signals in a relatively short range.

  The RF radiation does two things:
- It provides a means of communicating with the transponder (the RFID tag) AND
- It provides the RFID tag with the energy to communicate (in the case of passive RFID tags).

  This is an absolutely key part of the technology; RFID tags do not need to contain batteries, and can therefore remain usable for very long periods of time (maybe decades).

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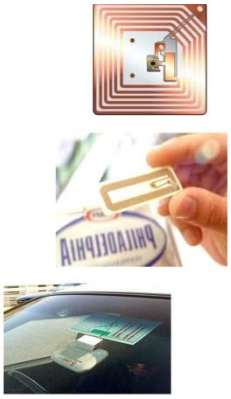

Fig.2 RFID TAGS

3.2 Active Tag (Active RFID Tag)

An RFID tag is an **active tag** when it is equipped with a battery that can be used as a partial or complete source of power for the tag's circuitry and antenna. Some active tags contain replaceable batteries for years of use; others are sealed units. (Note that it is also possible to connect the tag to an external power source.) together, the resulting mutual inductance will be equal to the geometric mean of the two individual inductances of the coils.

IV. WORKING ON

1. Implementation of automatic money debit system

In our paper now we are implementing the smart card mechanism for the payment of the toll amount paid by the vehicle owner. When the vehicle comes on the load cell plate for weighing ,at that time the vehicle owner has toswap his smart card in the debit machine. So, desired amount of 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 card also as the smart card.In the RFID card we have now vehicle number in the code format. So, we can combine the RFID card with smart card as both are the different forms of basic principle of Bar code.

2. Implementation of image processing for centralize 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 centralize data recording. For that purpose we can use the IR courted at the entry gate which is followed by the Camera which will be continue sly capturing the images of the vehicles entering into the toll plaza. And the third step the RFID is collecting the vehicle number. Now when the vehicle passes through the IR courted it tresses the outline of the vehicle, in the next step the camera will take the image of the vehicle & followed by the RFID to record the data related to the vehicle. The load cell weighs the vehicle & classifies it into two categories as light & heavy vehicle respectively. The whole data collected together & sent to the centralize server which will store it for stipulated time. This application will help in detecting the vehicles in the crime cases like terrorism & smuggling of goods & it will also reduce the load on check posts.

V. CONCLUSION

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

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time at toll plaza. In our paper 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 Trans 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 paper 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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