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Automated Toll Booth Management System using QR Code Scanner

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ABSTRACT: The population of world is growing rapidly because of which the number of vehicles is also increasing. The objective of this project is to design an optimal toll system that uses a web interface which will provide all the information related to the car by scanning the QR Code present on the windscreen of the car. This has led to a lot of commotion on the roads. The user can then select the route he wants to travel i.e. single way or double way based on which the receipt is given. The payment gateway is encrypted to ensure security. A perfect tradeoff between accuracy and cost of the system is accomplished by choosing appropriate sensors which are QR Code scanner, BAR CODE reader and, R305 (Fingerprint sensor). A sensor is applied in every signal, to dig up the time at which the vehicle has passed the toll. These details can be used for further actions. Thus this system reduces the manual labor of the toll authorities, saves time and effort.

KEYWORDS: Fingerprint sensor, barcode reader, QR code, toll collection.

I. INTRODUCTION

Toll Plaza System (TPS) is a web-based portal through which National Highway users may easily access information related to toll fee and other details viz. current toll charges and concessions/discounts available for local vehicles at various toll plaza(s) in the Country, commercial operation date.Date of toll fee notification, effective and due date of toll rate revision name and contact details of key personnel on toll plaza. Details of nearest police station, hospitals etc. in addition to facilities available near toll plaza(s). The portal is GIS based wherein toll plazas may be easily searched on a map. Toll plaza(s) can also be searched between any two stations with shortest path on map and applicable toll fee at various toll plazas along the route can be ascertained. Copy of Gazette Notification for Toll Fee is available for downloading. Toll Rates can also be accessed through mobile phones by sending SMS to 56070 with predefined text messages. TPS can be opened through internet on any browser through the URL www.nhtis.org. This manual is prepared for the public/road users.

This Manual explains in detail how to access various information related to the toll plazas. Toll tax is collected to recover the total capital outlay which includes the cost of construction, repairs, maintenance, expenses on toll operation and interest on the outlay. The new facility thus constructed should provide reduced travel time and increased level of service. In India most of the highway projects are given on PPP basis, i.e. Public Private Partnership. In this the private organization finances and constructs the facility and recovers the capital from the users in the form of toll tax. This tax is collected for a reasonable period of time after which the facility is surrendered to the public.

There are two types of toll collection systems available. These are: (i) Open Toll System, and (ii) Closed Toll System.

*A.*OPEN TOLL SYSTEM

In an open toll system, not all patrons are charged a toll. In such a system, the toll plaza is generally located at the edge of the urban area, where a majority of long distance travellers are committed to the facility, with a minimum likelihood of switching to the parallel free route, or at the busiest section of the toll way.

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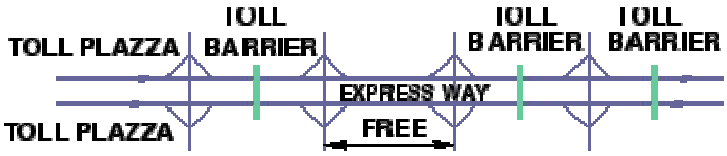

Fig. 1 Open Toll System

*B.*CLOSED TOLL SYSTEM

In a closed toll system, patrons pay the toll based on miles of travel on the facility and category of vehicle. There are no free-rides. In a closed toll system, plazas are located at all the entry and exit points, with the patron receiving a ticket upon entering the system. Upon exiting, patron surrenders the ticket to the collector and is charged a prescribed fee based on category of vehicle and distance travelled.

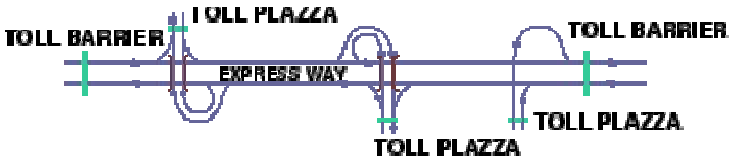

Fig. 2 Closed Toll System

II. RELATED WORK

In the 20th century, road tolls were introduced in Europe to finance the construction of motorway networks and specific transport infrastructure such as bridges and tunnels. Italywas the first European country to charge motorway tolls, on a 50 kilometers (31 mi) motorway section near Milan in 1924. It was followed by Greece, which made users pay for the network of motorways around and between its cities in 1927. Later in the 1950s and 1960s, France, Spain, and Portugal started to build motorways largely with the aid of concessions, allowing rapid development of this infrastructure without massive State debts. Since then, road tolls have been introduced in the majority of the EU Member States.[4]

In the United States, prior to the introduction of the InterstateHighway System and the large federal grants supplied to states to build it, many states constructed their first controlled-access highways by floating bonds backed by toll revenues. Starting with the Pennsylvania Turnpike in 1940, and followed by similar roads in New Jersey (Garden State Parkway (1946) and New Jersey Turnpike, 1952), New York (New York State Thruway, 1954), Massachusetts (Massachusetts Turnpike, 1957), and others, numerous states throughout the 1950s established major toll roads. With the establishment of the Interstate Highway System in the late 1950s, toll road construction in the U.S. slowed down considerably, as the federal government now provided the bulk of funding to construct new freeways, and regulations required that such Interstate highways be free from tolls. Many older toll roads were added to the Interstate System under a grandfather clause that allowed tolls to continue to be collected on toll roads that predated the system. Some of these such as the Connecticut Turnpike and the Richmond–Petersburg Turnpikelater removed their tolls when the initial bonds were paid off. Many states, however, have maintained the tolling of these roads as a consistent source of revenue.

As the Interstate Highway System approached completion during the 1980s, states began constructing toll roads again to provide new controlled-access highways which were not part of the original interstate system funding. Houston's outer beltway of interconnected toll roads began in 1983, and many states followed over the last two decades of the 20th century adding new toll roads, including the tollway system around Orlando, Florida, Colorado's E-470, and Georgia State Route 400.

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III. PROPOSED ALGORITHM

- Concessionaire shall provide required number of Toll Plazas for Collection.
- Fee Collection System must be speedy, efficient and user friendly.
- Keeping track of previous and current vehicles.
- Providing the current and previous users with a better and efficient technique.
- Design of the toll plaza system should be such that they are aesthetically pleasing.

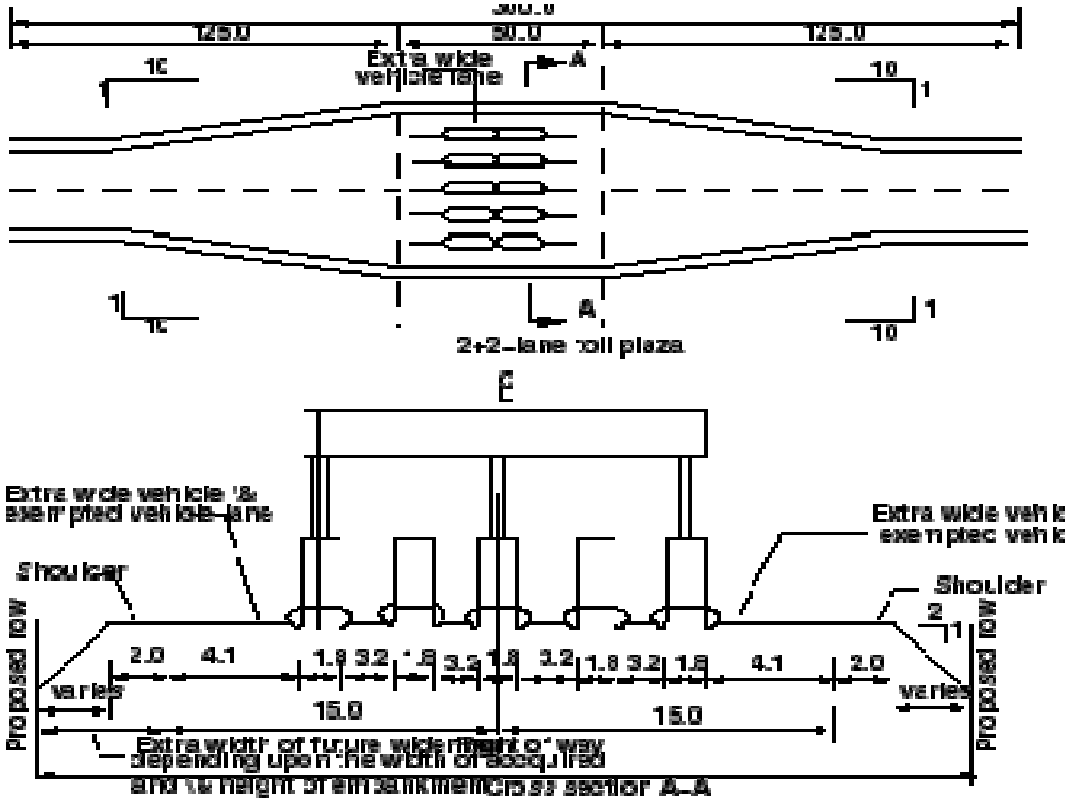

Fig. 3 Toll Plaza Design

When the whole Coding and the layout is completed, the developer who is developing the project, runs it on any operating system so as to know how the developed java project runs. To make this project notepad is used where the java code is written and to compile this command prompt is used.

Now the basic core language i.e. Java, is used to make those layouts work properly and to shift from one class to the other and setting up all the key actions performed by the user while using the application or when the project is in the running state.

This field holds the basic coding language written by the user to make the project run properly. When the whole Coding and the layout is completed, the developer who is developing the project, runs it on JVD (Java Virtual Device) so as to know how the developed project runs. To make this project I firstly prepare the layouts for the screens on the

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notepad files and then I put the code in the JAVA file and after that I compile it on command prompt. Once the developer is satisfied, the project can be posted on the play store so that various users can use it.
By using this method we can manage the database for Toll Plaza. Here different type of the method and the flowchart are present to show it working.
Let us consider the way of tracking, firstly we start from the choice which is given in three options.

- Admin Login
- User Login

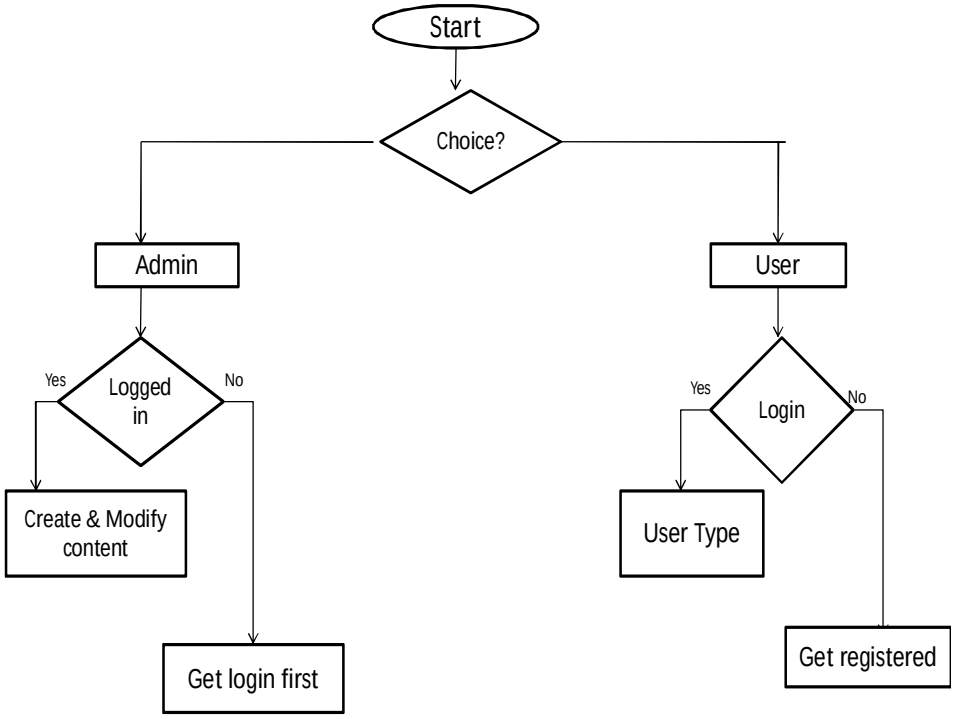

Fig. 4 Toll Plaza flowchart

ADMIN LOGIN**:** Firstly we logged in with admin page, if the condition is true, then we get all the details, otherwise if the condition is false then we get registered.
USER LOGIN: Firstly we logged in with user page, if the condition is true, then we get all the details, otherwise if the condition is false then we get registered.
Through this project we manage the toll plaza system.

IV. **PSEUDO CODE**

Step 1: Start and make a choice.
Step 2: Select Admin or User.
Step 3: If selected Admin then login.
Step 4: If logged in
then Create and Modify content
else

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Get login first.
Step 5: If selected User then login.
Step 6: If logged in
Select User Type
else
Get registered.
Step 7: End

V. SIMULATION RESULTS

On an open toll system, all vehicles stop at various locations along the highway to pay a toll. (Not to be confused with "open road tolling", where *no* vehicles stop to pay toll.) While this may save money from the lack of need to construct toll booths at every exit, it can cause traffic congestion while traffic queues at the mainline toll plazas (toll barriers). It is also possible for motorists to enter an 'open toll road' after one toll barrier and exit before the next one, thus travelling on the toll road toll-free. Most open toll roads have ramp tolls or partial access junctions to prevent this practice, known as "shunpiking".
With a closed system, vehicles collect a ticket when entering the highway. In some cases, the ticket displays the toll to be paid on exit. Upon exit, the driver must pay the amount listed for the given exit. Should the ticket be lost, a driver must typically pay the maximum amount possible for travel on that highway. Short toll roads with no intermediate entries or exits may have only one toll plaza at one end, with motorists travelling in either direction paying a flat fee either when they enter or when they exit the toll road. In a variant of the closed toll system, mainline barriers are present at the two endpoints of the toll road, and each interchange has a ramp toll that is paid upon exit or entry. In this case, a motorist pays a flat fee at the ramp toll and another flat fee at the end of the toll road; no ticket is necessary. In addition, with most systems, motorists may only pay tolls with cash and/or change; debit and credit cards are not accepted. However, some toll roads may have travel plazas with ATMs so motorists can stop and withdraw cash for the tolls.
The toll is calculated by the distance travelled on the toll road or the specific exit chosen. In the United States, for instance, the Kansas Turnpike, Ohio Turnpike, Pennsylvania Turnpike, New Jersey Turnpike, most of the Indiana Toll Road, and portions of the Massachusetts Turnpike, New York Thruway, and Florida's Turnpike currently implement closed systems.

Fig. 5 Middle Screen

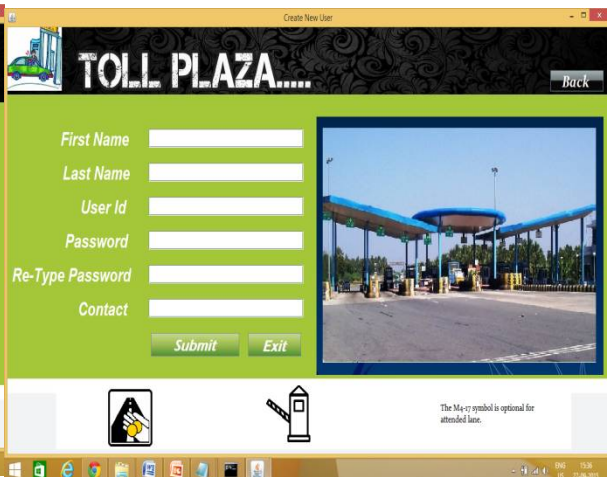

Fig. 6 Create New User

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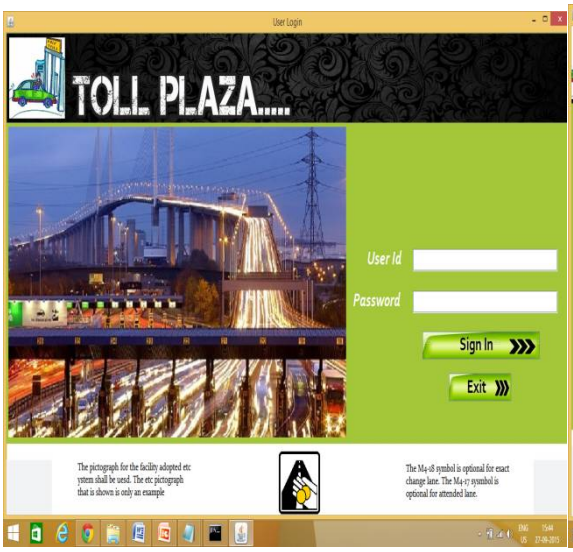

Fig. 7 User Login

Fig. 8 Payment Type

Fig. 9 Generate Slip

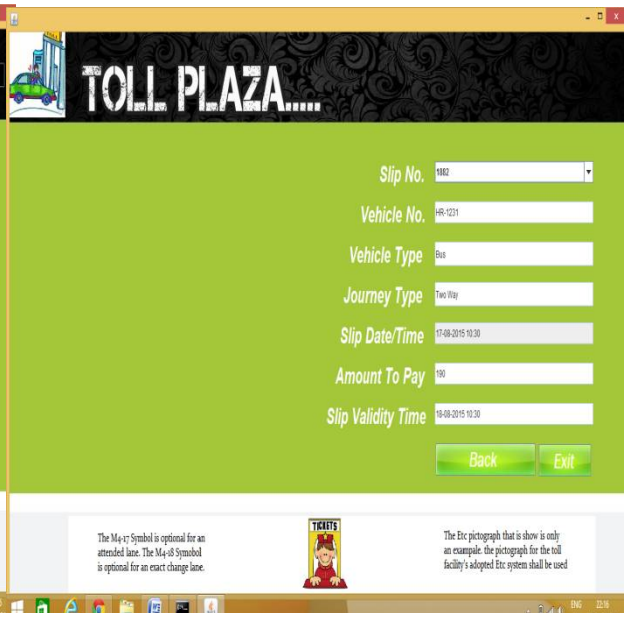

Fig. 10 Check Slip Validity

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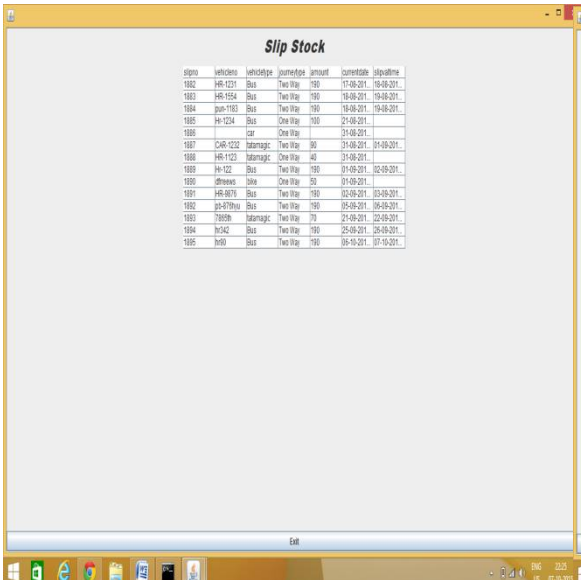

Fig. 11 Login stock report

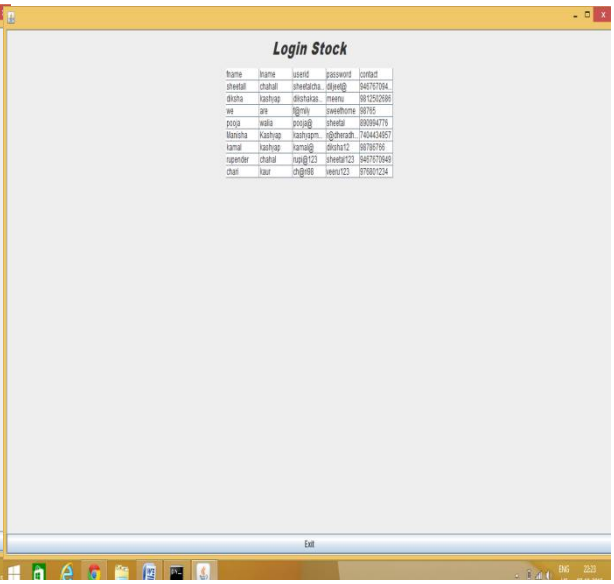

Fig. 12 Slip stock report

VI. CONCLUSION AND FUTURE WORK

By doing 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.From the above discussions we can conclude that toll tax is a fee which is used for the use of a newly constructed facility to recoup the total capital outlay. The private organization builds, operates and then transfers the facility after a projected period of time. The Electronic Toll Collection (ETC) system is the most efficient method of toll collection with minimum delays. But due to its high installation cost it's not that prevalent in India. We can find the optimum number of tollbooths by applying queuing theory to ascertain the delays in both queuing and merging areas. The optimum number of tollbooths should minimize the overall delay time. The toll plaza design should be done in accordance with the Indian Standard Codes available. Toll prices are set in a way that they attract maximum number of users and the agency should be able to recover the cost within specified period of time.Toll collection systems based on GPS technology will be implemented in the near future. The free-flow system can manage several lanes, electronically collecting tolls from vehicles as they pass beneath an overhead gantry. This system is currently being used in countries such as the United States, Australia, Canada, Chile and Israel.

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