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Toll Plaza Automation using GPS

Gaurav Tyagi[1], Kanika Paliwal[1], Faisal Mohammad Ganaie[1],Dr. Suman Sharma[2]

[1]U.G student, Electrical Engineering Department, Swami Keshvanad Institute of Technology, Management and Gramothan Jaipur, Rajasthan 302017 (India)

[2]Associate Professor, Electrical Engineering Department, Swami Keshvanad Institute of Technology, Management and Gramothan Jaipur, Rajasthan 302017 (India)

Email: gauratyagi887580@gmail.com , kanikapaliwal2909@gmail.com,Sahilahmad786787@gmail.com, Suman@skit.ac.in

ABSTRACT:

Developing countries like India need major improvements in infrastructure like roads or highways. The construction of this expressway is an expensive undertaking that cannot be invested by the government alone. Public-private partnerships are usually formed to build such massive projects. The money spent on these projects can be recouped by collecting tolls from road users. The toll collection system, especially in India, is prone to long queues, avoiding toll booths, etc. facing some problems like This system can only handle 200 vehicles per hour, and if more than this number of vehicles enter a certain area, the server can block. To solve this problem, we propose to create a geo-fence using GPS by entering the angle width and length of the toll field. By comparing the location of the vehicle with the toll booth, the owner of the vehicle can be charged.

Keywords– GPS, Database, Tracking, Payment

INTRODUCTION :

Payback is the process of getting back the investment in the infrastructure from the people who use it. In the Indian scenario, there are toll collection issues such as non-uniform toll rates in different parts of Indian highways. The prices are also not uniform because these institutions are usually run by private organizations and people often complain about being underpaid or overpaid. There are many allegations regarding non- remittance/notification of dues to these private institutions. Heavy traffic congestion, congestion and overcrowding of toll plazas with around 200 vehicles per hour, causing waste of fuel and time.

GPS is used here to accurately locate the vehicle's position using the triangulation method. The GPRS set in the vehicle is used to send the location of the vehicle to the server. Each GPRS has a unique SIM (Subscriber Identity Module) which is used to uniquely identify the vehicle. The status of the vehicle is checked against the geo-fence of the toll area and if it fails, the money is deducted from the owner's account

LITERATURE REVIEW :

Toll plaza automation using GPS technology involves the development of a mobile application that facilitates vehicle registration based on selected vehicle types and deducts toll charges using GPS technology. The system defines toll points by specific latitudes and longitudes at short distances to accurately calculate toll fees for each segment of the journey. This approach ensures seamless toll fee deduction at predefined toll points, enhancing userexperience and operational efficiency.

The technology behind this system integrates GPS technology for precise location tracking and toll calculation. GPS technology enables the mobile application to determine the vehicle's location and calculate the distance traveled. This information is used to accurately deduct toll charges based on the vehicle type and distance traveled.

The system can also utilize various sensors, such as inductive loops, light beams, scanning devices, and profilers, to assess the bulk or mass of a vehicle. These sensors can help ensure accurate vehicle classification and toll fee calculation.

In addition, the system can employ violation enforcement technologies, such as pay-by-plate, to cater to bone fide infrequent users who may not have a transponder. This mechanism involves capturing a video image of the license plate and identifying the vehicle owner through the Department of Motor Vehicles registration records to send a bill to his/her home address.

minivan, etc. The phone is located at the toll plaza, and incoming traffic information is stored in a temporary database. The vehicle status is compared to the range of a mobile tower, and the database is updated when the toll plaza is less than 200 m away from the vehicles.

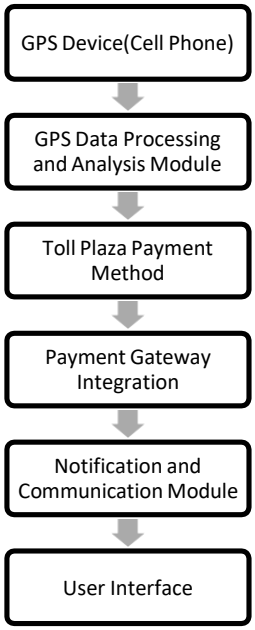

Fig. 1 Working Module

The integration of GPS and mobile applications for toll plaza automation has shown promising results in streamlining the tolling process. By accurately determining toll charges based on vehicle type and distance traveled, the system enhances operational efficiency and reduces manual interventions, improving the overall tolling experience for drivers.

TOLL GATE COORDINATES :

toll_id	toll_name	latitude	longitude
1	A	26.84615201009084	75.6255216198507
2	B	26.83961849662471	75.60173034286646
3	C	26.81020623979442	75.48362731632254
4	D	26.762395047042485	75.34767150669641
5	E	26.70352287221616	75.26527404631695
6	F	26.667939504936175	75.21171569447546
7	G	26.609714137556104	75.01010764040913
8	H	26.59920965956941	74.86912675954345
9	I	26.547329668074163	74.76926530240902
10	J	26.406676132289675	74.76926530247366
11	K	26.4066761322891	74.76926530245684
12	L	26.288236479323597	74.75237696790457
13	M	26.264534008602777	74.71933457418244
14	N	26.194535780501774	74.71772465793295
15	O	26.11694072114751	74.69152849145891
16	P	26.019678231395922	74.65223424109729
17	Q	25.806046025485923	74.61468640248 45
18	R	25.75100462545738	74.62953089675473
19	S	25.57863906141277	74.59285626369105

Fig. 2 Toll Gate Coordinates

The GPS latitude and longitude data from the device will be sent to the serial server. The width and length of the toll gate are stored in a database. We use the same SIM for this app, which is provided by a company that looks at five unique numbers. It could be the sixth number that shows the registration status of our vehicles.

The seventh and eighth numbers can indicate the vehicle registration district, and the tenth number can give the type of vehicle, i.e., weight, car,

CHALLENGES IN TOLL COLLECTION :

Capacity Limitations: The existing toll collection infrastructure often struggles to handle high volumes of traffic, resulting in long queues and delays. The capacity to process vehicles per hour is limited, leading to congestion and inefficiencies, particularly during peak hours.

Non-Uniform Toll Rates: Disparities in toll rates across different parts of Indian highways create confusion among road users and raise questions about fairness and transparency. These variations are attributed to the involvement of multiple stakeholders, including private organizations, in managing toll collection.

Allegations of Mismanagement: Instances of non- remittance or inadequate notification of dues to private institutions managing toll plazas have been reported, contributing to distrust among stakeholders and the general public. Such allegations undermine the credibility of the toll collection system and necessitate reforms for greater transparency and accountability.

USER- PROFILE AND WALLET :

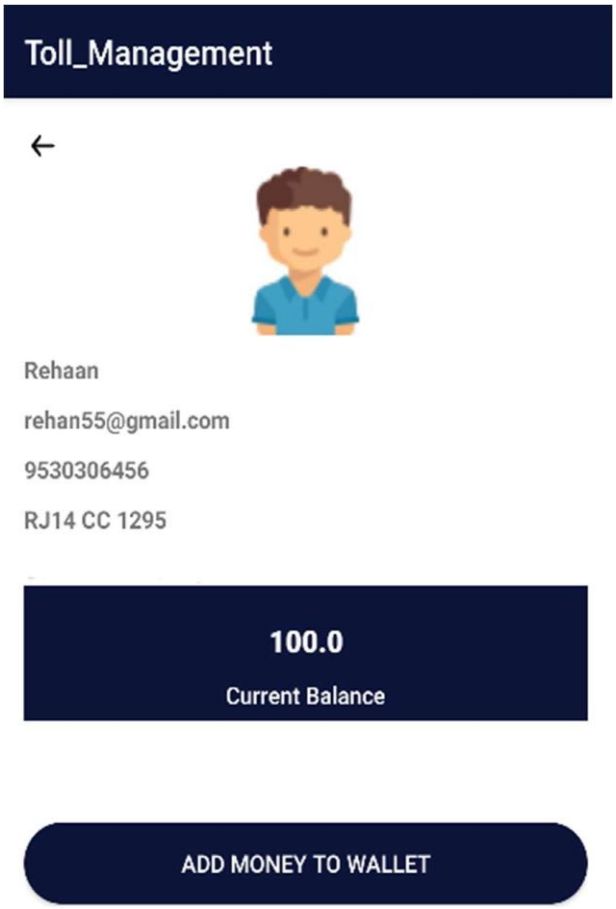

Fig. 3 User- Profile

Within this integrated system, users have the capability to securely store a range of personal information including their name, email ID, mobile number, registered vehicle number, and wallet balance. This comprehensive platform also offers a user-friendly option to effortlessly add funds to their wallet, ensuring convenience and accessibility. By centralizing user management and financial transactions, the system streamlines processes and enhances efficiency.

Users can conveniently update their profiles and manage their finances within a single interface, reducing the need for multiple platforms or systems. With seamless integration, the platform empowers users to maintain control over their information and finances with ease. Whether it's topping up their wallet balance or updating their contact details, users can navigate the system intuitively, saving time and effort.

Moreover, the secure storage of personal data ensures privacy and confidentiality, fostering trust and confidence among users. This holistic approach to information and financial management not only simplifies user interactions but also enhances overall user experience. Ultimately, the system aims to provide a seamless and user-centricsolution for managing personal information andfinances effectively.

CONCLUSION :

Vehicle owners are offered payment methods. Loss of time and fuel due to heavy traffic is solved by toll collection using GPS. Each vehicle is uniquely identified by its GPRS SIM and the amount is calculated from the vehicle owner's respective account which is confirmed by SMS/Email to the vehicle owner. Because everything is computerized, it was decided to collect funds or more by private institutions. The final cost can be collected throughout the country

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