Electronic Toll Collection System

Features: Automated vehicle identification

Red – copy pasted material

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Automated Vehicle Identification (AVI) is **a process that uses an advanced Radio Frequency Identification (RFID) technology to identify a vehicle as it passes the** RFID reader. Other types of AVI systems identify vehicles through license plate recognition.

First, the roadside antenna at the entrance tollgate sends a signal to the in-vehicle device with information about the entrance.

When exiting the expressway, at the exit tollgate, the in-vehicle device sends the previously received entrance information to the exit tollgate roadside antenna, the toll is calculated, and the roadside antenna sends toll information to the in-vehicle device.

Diagram

Description automatically generated

All users who want to use the ETC lane has to register themselves and once they do, they will receive a small device that looks like a card. With this card user has permission to travel using the ETC lane. Once a person enters into the highway, they should pass through a tollgate, where the signal is sent to the card, this card picks up the vehicle’s number plate and remaining balance to check whether the person can have a guaranteed journey with the amount available.

All cards should have up to 300 rupees minimum to pass through the ETC lane, once the vehicle goes through and user reaches the exit, they have to pass through another tollgate where the tollgate will extract the signal and check the vehicle category and vehicle identification. Then do the calculation and show the price deducted, remaining balance and number plate of the vehicle to the user in an LED screen located near the tollgate.

The shortcomings:

1. The main problem with this system is that it receives the signal, which is closer to the tollgate, since the receiver is located in a high place, it would receive the signal closest to it. For instance, if a vehicle like a bus was to be in position behind another vehicle like a small car, the ETC tollgate would read the card of the bus before it reads the car’s signal. Within this time the car has the probable chance to get away without paying and causing the bus to either pay twice or the conductors in highways to open the gate for free and let the bus through.
2. Vehicles have to maintain a specified distance for the system to perform at their level best. Without the specified distance between vehicles, the system may not perform at its best. It does take almost 02 seconds to properly take the reading and get the system to display the details in the LED screen for the user to see and confirm the payment.

The strengths:

The main function and the strength of this system is to reduce the time wasted in highways. People have to pay to access the highway which leads to people waiting in queues to hand over cash physically to the counter but with the ETC lane coming into play, the queues are now reducing. Once a person has signed up for the option of using the ETC lane, they do not have to wait in queues and waste time, they can just pass through the tollgate within seconds.

Two possible improvements:

1. As mentioned above in the shortcomings section, there is a major issue with scanning the proper vehicle, due to that issue many people can get away without paying and it will be deemed unfair for everyone else who are rightfully paying to use the highway facilities. Therefore, this issue should be fixed and should make sure the system works properly within bounds.
2. Personally, it would be good if the highway patrol sent a message to the user’s phone once the amount dips below the needed amount. Usually, users cannot remember the exact amount remaining in the ETC card, with this issue it would create users to put their vehicle into the ETC lane without enough credit to pass through the tollgate. And this would create traffic jams in the ETC lane. ETC lane is a lane that should be kept free at all times for users to pass through without any challenges.