
Software Engineering Project Synopsis

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Title : Removal of Dependence on Toll Booths for calculating tolls

Objective :

To automate the process of paying tolls by calculating the distance travelled on the highway and getting charged by the vehicle type driven based on object detection models to identify the respective vehicle

Goals :

1. Automate toll payments by calculating the amount equivalent to the distance travelled by the vehicle
2. Create an object detection model using Deep Learning to detect type of vehicle to allot the correct toll rate based on the vehicle type (i.e. LMV, Transportation vehicles etc.)

Abstract :

A **toll** is defined as a **fee** charged for the use of a roadway/waterway. Humans have had the implementation of tolls since as early as the 15th century. Tolls play an important role in the maintenance and improvement of certain stretches of roadways such as National Highways, State Highways, Express Corridors etc.

A toll booth is defined as a building with an accommodation for a toll collector. Earlier in India, toll was collected physically by toll booth employees. This used to lead to long waiting queues to pay the toll price since the collectors were given

the burden of giving back exact tender change, and had to calculate toll values for different classes of vehicles.

This burden has been certainly reduced in recent times with the introduction of the FastTAG technology by the Indian Government. But even now, there is still some queuing which occurs at toll booths due to factors such as time taken to scan the FastTAG tags, insufficient balance in the FastTAG balance of users etc.

Yet another inconvenience in the current toll system of India is that a vehicle has to pay the toll amount equivalent to the total stretch of the roadway, irrespective of how much stretch of the road the vehicle uses i.e. for example if the toll charged for a 100km roadway is Rs.80 and a vehicle entering the roadway wants to use it for only 50km, they will still have to pay Rs.80.

With these two problems, both can be solved by further automating the toll paying system.

First, the vehicle type of the user can be identified by using a deep learning object detection model and allocating the base toll charge for the respective vehicle class.

Then, the vehicle number plate can be scanned at the point of entry of the roadway and a counter initialised to 0 is associated with the vehicle and the tracking begins. When the vehicle exits the roadway, the exit toll booth will then scan the number plate again and calculate the total distance travelled and then display the final amount to be paid based on the base charge times the total distance travelled. To further streamline the process, the user's bank can be linked to the payment system so that as soon as the vehicle proceeds towards the exit,

the exact toll can be deducted from their account, thereby removing the requirement to form queues, and wait for the tags to be scanned to pay.