

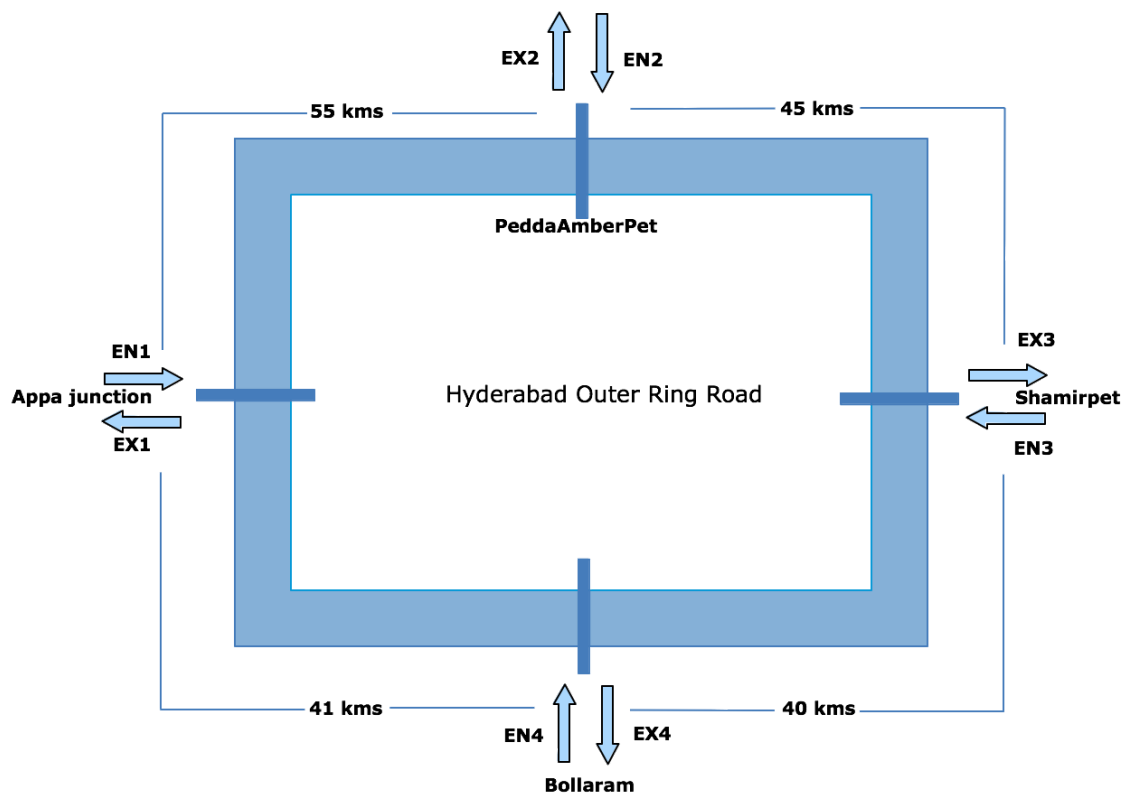
Electronic Toll Collection: Problem of Hyderabad outer ring road

Hyderabad Outer Ring Road (ORR) has several entry and exit gates. Usual process of toll collection is manual. This causes traffic jam at the tollgates and commuter inconvenience is getting increased which eventually causes commuters to take other routes like service roads etc.

Below is the automated process to speed up the toll collection process. A commuter will purchase a smart card, he/she will get it installed in vehicle (between the windshield and bonnet). When a vehicle (installed with smart card) is 100 meters away from the toll gate, the antenna above the gate will automatically read the card and check its authenticity, validity and account balance. If the three parameters are valid, the toll gate will open and an entry will be made in the system about the vehicle, when the same vehicle exits ORR from any other gate, balance will be deduced from card according to rates. If any component is missing or card is not installed then that vehicle will be directed towards another lane where toll will be collected manually.

For the sake of convenience this data will be feeded into the application via command line.

Here is a diagram showing the structure of Outer Ring Road and distance between different gates:



Note : All other distances can be calculated from these distances.

Commuters apply the smart card with the details like commuter name, vehicle number, type of the vehicle.

Type of the Vehicles:

LMV - Light Motor Vehicle - Car/Jeep/Van
LCV - Light Commercial Vehicle - Mini Bus
2A - 2 Axle - Bus/Truck
3A - 3 Axle - Trucks
4A - 4 Axle - Trucks
5A - 5 Axle - Trucks
6A - 6 Axle - Trucks
7A - 7 Axle - Trucks

Rate list:

Fixed rate list for LMV and LCV

<u>Entry point</u>	<u>Exit point</u>	<u>LMV</u>	<u>LCV</u>
Appa Junction (EN1)	PeddaAmberPet (EX2)	60	100
PeddaAmberPet (EN2)	Shamirpet (EX3)	50	90
Shamirpet (EN3)	Bollaram (EX4)	45	80
Bollaram (EN4)	Appa Junction (EX1)	40	70

Distance based rate list for heavy vehicles

<u>Type of the Vehicle</u>	<u>Base Charge</u>	<u>Charge per KM</u>
2A, 3A, 4A, 5A	100	5
6A, 7A	150	7

Example

Output: Enter vehicle number, vehicle type, commuter name, advance amount:

Input: AP28DJ6000 LCV Anil 1000

Input: AP28DJ6003 3A Murali 4000

Input: AP28DJ6004 7A Ravi 5000

<Keep accepting these till user quits>

Output: Enter vehicle number, tollgate number.

Input: AP28DJ6000, EN1

Input: AP28DJ6003, EN3

Input: AP28DJ6000, EX3

Output: Commuter name: Anil, balance deducted: 190, remaining balance: 810

Input: AP28DJ6003, EX1

Output: Commuter name: Murali, balance deducted: 505, remaining balance: 3495

<Keep processing till the user quits>

Extensions:

- Rates to be modelled correctly to be sustainable with future changes. Change the rating type. Change the vehicle type from current rating model to different rating model. Get Axle 2 vehicles to fixed rating instead of per km charge. Or Come up with different type of ratings for the type of vehicle. Like extra tax for Axle 6 and Axle 7.
- Discounts can be given to balance the load at tollgates. More charge in peak hours and less charge on non-peak hours.
- List the number of vehicles currently on outer ring road. Vehicles which entered and not exited will be the vehicles on ring road.
- Find the tollgate flows with the given hours.
- Monthly passes with slight different rating.
- Given the customer, find out the routes commuted in last one day.
- Many more....

Validations to be taken care:

- Vehicle can not enter and exit at same place.
- Report the error when balance is not sufficient.
- Vehicle can not enter more than one place without exit.
- Vehicle can not exit without entering onto outer ring road.
- Customer can have more than one smart cards per vehicle.