This work proposes a novel micro-road pricing alternative method to replace the current highway toll collection method by providing a software architecture platform. In this platform, the automated vehicle reserves (virtual) spatio-temporal sections on the road in real-time for road pricing. Time and space are divided into grids and assigned a designated charge to a grid managed on a dynamic map. An automated vehicle reserves the planned travel route and time in advance and mediates based on the reservation information. The performance evaluation results show that the system reserves grid, routes, and collects the highway tax charges with minimum communication time and no data loss. At moderate traffic volumes on the highway, it reduces travel time more than conventional tollgate systems. Consequently, our proposed system’s travel time improvements will reduce further by effectively exploiting road capacity while generating high revenue toll tax collection from all types of vehicles.

### Methodology

#### 1) PROPOSED METHOD STRUCTURE

- System configuration of the dynamic map platform is created which consists of the Network operating center/server, viewer or user, and billing center.

#### 2) SIMULATION

- Time and space divided into grid and assigned designated charges.
- In case of cell to be reserved is occupied by another vehicle. Server responds to the vehicle to pause and call back the request.

### Results & Future Work

#### a) PROPOSED METHOD PERFORMANCE EVALUATION RESULT

- Micro road pricing based on grid reservation system had been successfully established
  - Each travel time vehicle owner have the ability to audit detailed travel information and toll tax information

#### b) TRAVEL TIME, PROPOSED AND ERP1 and ERP2 RESULTS

- To mediate driving on a one-kilometer
  - PM, an average of 64 seconds
  - ERP1, average 71.8 seconds
  - ERP2, an average 66.5 seconds

### Conclusion

- Using a software platform, the proposed micro road pricing system as an alternative method to replace the current highway toll collection method has been established.
- Space and time are divided into grids where the designated cost is assigned based on the fuel consumption values for each type of vehicle and managed on a dynamic map.
- It is possible to reserve the route in a time frame according to the traffic demand by using a pricing-based control charging system over the traffic density to reduce traffic congestion.
- Since the new method is based on a reservation system, it will provide assistance to emergency vehicles in traveling to their destinations on time.
- The revenue could be generated by collecting tax fees from emergency vehicles as well, which would increase the total revenue.

### References