

Traffic Flow

Exploring dynamic vs. static toll pricing in
a traffic network simulation model



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Management Summary

Many cities across the world have experienced, and are currently experiencing, increased traffic on highways and urban networks. At the same time, roads and highways have a limited capacity and are only capable of transporting a limited number of travelers. An increase in the number of travelers has increased all of the following factors associated with travel:

- Travel time
- Number of stops
- Travel costs
- Delays
- Air pollution
- Accidents
- Noise level

The first four on this list are factors that we will use in our investigation of the traffic flow problem.

Road pricing is one tactic used as an effective demand management strategy to reduce traffic congestion and improve performance during peak periods in many cities. In our simulation model of Knoxville, TN we added tolls to certain roads in the network in order to acquire data that would help us distinguish whether changing tolls during peak hours would improve average travel time.

Several sets of simulations were run and the data was recorded. It was concluded that changing the toll prices in general did not have a major impact on the average travel time and average travel distance. However, static and dynamic pricing structure comparisons showed that dynamic prices yielded lower average travel and stop times than static prices.

Background and Description of the Problem Situation

When driving down a toll road in any major city, people may wonder why they would pay money to drive on a specific road that may not actually get them to their destination any faster. Do toll road improve the average travel time of drivers in a traffic network? It seems as if toll road would help traffic spread out over more roads, as not all people are willing to pay tolls. If this is true, then adding tolls to certain major freeways should help average travel times decrease for drivers in the network, but is this really the case? We wanted to look at this specific problem.

To answer this question, we acquired a simulation model of the traffic flow network of Knoxville, TN. We wanted to modify the simulation by adding tolls to roads in the network to see if this would change the average travel time for drivers in the