Background

- Given the current transportation financing challenges faced by government agencies, toll roads are becoming a more common feature along freeway facilities.
- As toll roads become a more common feature in America’s transportation infrastructure, it is important to better understand the traffic operational characteristics of toll plazas. One such way to gain this understanding is through simulation modeling.
- CORSIM is the most commonly used microsimulation program in the U.S., and generally has a good reputation with respect to its underlying models and algorithms given its long history of development and testing. However, CORSIM currently does not directly accommodate toll plaza modeling.

Development Approach

- To implement toll plaza simulation into CORSIM, new algorithms, inputs, and outputs were developed.
- Based on previous research, a toll plaza lane selection algorithm was developed. This algorithm identifies adjacent toll booths with compatible payment type and compares the queue length of a vehicles’ currently selected toll booth to the queue lengths of the adjacent toll booths to determine the most desirable toll booth based on the number of lane changes and a sensitivity factor.

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LV_D = \frac{\Delta Q}{LCSP}
\]

- New inputs developed include service time, payment distribution, payment acceptance for toll booth, queue setback, lane change sensitivity factor, and toll plaza warning sign.
- Outputs developed for toll plaza simulation include volume throuput for toll booths based on payment type, average service time, delay, and density.

Verification Testing Results

Verification testing produced distribution percentages with reasonable accuracy.

Recommendations for Future Research

- Investigate acceleration/deceleration rates at toll plazas to determine if these values are higher than along standard freeway segments.
- Investigate possibility of developing a Logit model for toll plaza lane selection.
- Develop way to integrate open road tolling lanes into same toll plaza link developed for CORSIM.
- Develop CORSIM toll plaza simulation capabilities to allow adjustments to the toll plaza inputs during multiple time period simulations.

Validation Study

- In the near future, CORSIM’s toll plaza modeling will be calibrated using field data to determine the validity of the underlying models/algorithm.
- Two toll plazas were chosen for validation testing: Leesburg toll plaza along the Turnpike Mainline, and the Beachline West toll plaza along the 528 toll road in Orlando.