

## Microscopic Simulation of Toll Plaza Safety and Operations

**Authors :** Bekir O. Bartin, Kaan Ozbay, Sandeep Mudigonda, Hong Yang

**Abstract :** The use of microscopic traffic simulation in evaluating the operational and safety conditions at toll plazas is demonstrated. Two toll plazas in New Jersey are selected as case studies and were developed and validated in Paramics traffic simulation software. In order to simulate drivers' lane selection behavior in Paramics, a utility-based lane selection approach is implemented in Paramics Application Programming Interface (API). For each vehicle approaching the toll plaza, a utility value is assigned to each toll lane by taking into account the factors that are likely to impact drivers' lane selection behavior, such as approach lane, exit lane and queue lengths. The results demonstrate that similar operational conditions, such as lane-by-lane toll plaza traffic volume can be attained using this approach. In addition, assessment of safety at toll plazas is conducted via a surrogate safety measure. In particular, the crash index (CI), an improved surrogate measure of time-to-collision (TTC), which reflects the severity of a crash is used in the simulation analyses. The results indicate that the spatial and temporal frequency of observed crashes can be simulated using the proposed methodology. Further analyses can be conducted to evaluate and compare various different operational decisions and safety measures using microscopic simulation models.

**Keywords :** microscopic simulation, toll plaza, surrogate safety, application programming interface

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