
Microscopic modeling of large-scale pedestrian-vehicle conflicts in the city of Madinah, Saudi Arabia

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**SUMMARY**

This paper presents a micro-simulation modeling framework for evaluating pedestrian–vehicle conflicts in crowded crossing areas. The framework adopts a simulation approach that models vehicles and pedestrians at the microscopic level while satisfying two sets of constraints: (1) flow constraints and (2) non-collision constraints. Pedestrians move across two-directional cells as opposed to one-dimensional lanes as in the case of vehicles; therefore, extra caution is considered when modeling the shared space between vehicles and pedestrians. The framework is used to assess large-scale pedestrian–vehicle conflicts in a highly congested ring road in the City of Madinah that carries 20 000 vehicles/hour and crossed by 140 000 pedestrians/hour after a major congregational prayer. The quantitative and visual results of the simulation exhibits serious conflicts between pedestrians and vehicles, resulting in considerable delays for pedestrians crossing the road (9 minutes average delay) and slow traffic conditions (average speed <10 km/hour). The model is then used to evaluate the following three mitigating strategies: (1) pedestrian-only phase; (2) grade separation; and (3) pedestrian mall. A matrix of operational measures of effectiveness for network-wide performance (e.g., average travel time, average speed) and for pedestrian-specific performance (e.g., mean speed, mean density, mean delay, mean moving time) is used to assess the effectiveness of the proposed strategies.

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