Augmented Reality Experiment: Drivers’ Behavior at an Unsignalized Intersection

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Abstract:

Applying new technologies to traffic engineering studies has become more urgent due to the high cost and risk associated with ordinary in-the-field testing. Augmented reality (AR) is one of those technologies, in which virtual (computer-generated) objects are added to the real scene in a way that the user cannot distinguish between real and virtual objects in the final scene. Adding virtual objects (people, vehicles, hazards, and other objects) to the normal view can provide a safe realistic environment for testing driving performance under different scenarios. This paper presents two systems, i.e., AR vehicle (ARV) and offline AR simulator (OARSim) systems, and uses them to study the left-turn driving behavior at an unsignalized intersection for drivers with different characteristics. Two experiments were performed: one using the ARV system installed in a vehicle and another using the OARSim system installed in the laboratory. Quantitative measurements of left-turn drivers’ behaviors were recorded. There was no significant gender effect on all measured parameters in both experiments. Older drivers selected larger gaps and used smaller acceleration rates to turn left than younger drivers in both experiments. The conservative driving attitude of older drivers indicates the potential presence of reduced driving ability of the elderly. While left-turn times using the ARV system were not significantly affected by drivers’ age, older drivers took longer time to complete the left-turn maneuver than younger drivers using the OARSim did. Results from this study supported the feasibility and validity of the proposed systems and showed promise for these systems to be used as surrogates to in-the-field testing for safety and operation aspects of transportation research.

Keywords:

Augmented reality (AR), drivers’ behavior, intelligent transportation system, unsignalized intersection.

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