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Developing a Driving Simulator with a Navigation System to Measure Driver Distraction, Workload, Driving Safety and Performance

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Abstract : The use of driving simulators has made laboratory testing easier. It has been proven to be valid for testing driving ability by many researchers. One benefit of using driving simulators is keeping the human subjects away from traffic hazards, which drivers usually face in a real driving environment while performing a driving experiment. In this study, a driving simulator was developed with a navigation system using a game development software (Unity 3D) and C-sharp codes to measure and evaluate driving performance, safety, and workload for different driving tasks. The driving simulator hardware included a gaming steering wheel and pedals as well as a monitor to view the driving tasks. Moreover, driver distraction was evaluated by utilizing an eye-tracking system working in conjunction with the driving simulator. Twenty subjects were recruited to evaluate driver distraction, workload, driving safety, and performance, as well as provide their feedback about the driving simulator. The subjects' feedback was obtained by filling a survey after conducting several driving tasks. The main question of that survey was asking the subjects to compare driving on the driving simulator with real driving. Furthermore, other aspects of the driving simulator were evaluated by the subjects in the survey. The survey revealed that the recruited subjects gave an average score of 7.5 out of 10 to the driving simulator when compared to real driving, where the scores ranged between 6 and 8.5. This study is a preliminary effort that opens the door for more improvements to the driving simulator in terms of hardware and software development, which will contribute significantly to driving ability testing.

Keywords : driver distraction, driving performance, driving safety, driving simulator, driving workload, navigation system
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