REAL-TIME DATA EXTRACTION PROGRAM FOR RESEARCH SIMULATORS

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ABSTRACT

The purpose of this research was to develop a program to extract data in real-time for specific events occurring during driving simulations conducted in DriveSafety research simulators. This research is motivated by two needs. The first need is for a more efficient process to reduce datasets collected during driving simulations. This brand of driving simulator has the capability to collect a variety of data variables throughout a simulation and export that data for post simulation analysis. It can capture these variables at a rate of 60 Hz for up to the full duration of the simulation. Additional tools are available that allow the user to name specific locations and/or segments of roadways. When the simulator vehicle occupies these named locations, the corresponding data in the data file is marked. In the post simulation analysis, the user must then go through a data reduction process of sorting the data for the specific locations from the greater data set. Depending upon the size and complexity of the simulation and the resulting data file, the data reduction process can be quite onerous. The second need is for a process to evaluate driver performance in real-time. Although the driver already possesses the necessary driving skills to operate the simulator vehicle, the driver needs time to adapt his/her use of the controls until the desired responses from the simulator system are achieved. During this adaptation period, the performance of the driver improves until it becomes consistently good. Tracking the performance in real-time would allow the user to evaluate whether the driver has learned to interact and is therefore ready to participate in an experiment.

To address these two needs, a real-time data extraction program was developed. Using a client-to-server model, a socket was established to provide the real-time flow of data from a research simulator to the external data extraction program. The functioning of the socket and program was verified by running a driving simulation scenario, and comparing the data recorded by the driving simulator to the data captured using the data extraction program. Both data collection methods were functioning at 60 Hz and provided identical data for the specific locations in the scenario. Further tests showed that 40 Hz was sufficient to produce identical data. The program was then enhanced to capture data for both specific points and/or segments in the scenario and similarly tested.

The real-time data extraction capability will allow the user to track the driving performance during the simulation, and thus facilitate the evaluation of performance improvement to determine whether the driver has learned to interact with the research simulator. The data extracted in real time is recorded in a text file and therefore serves as a valuable dataset for post simulation analysis. This dataset is in addition to that created by the research simulator, and includes only the data for the specified locations, thereby avoiding the sometimes onerous data reduction process. While the socket and data extraction program were developed to integrate with a specific brand of research simulator, it could easily be adapted for other simulators which permit external connections.

BIO

JACQUELINE JENKINS

Dr. Jacqueline Jenkins holds a B.A.Sc. degree in civil engineering from the University of Waterloo and M.E. and Ph.D. degrees from Texas A&M University. She has industry experience in collision reconstruction and transportation planning engineering, and is currently an Assistant Professor in the Civil and Environmental Engineering Department at Cleveland State University. Specializing in transportation, her ambition is to contribute to the safety and efficiency of transportation facilities and the education of future civil engineers.

One of her continued areas of research is the use of driving simulation for transportation and traffic engineering studies. Dr. Jenkins has conducted experiments to test the impact of cellular telephone conversation on driving performance, evaluate drivers' comprehension of various protected permitted left turn signal displays, and study the impact of longer impeding vehicles on passing behavior. Her ongoing driving simulation work is focused on developing a methodology to identify when drivers have received enough practice to participate in an experiment. She has studied how drivers improve their speed control over successive acceleration and decelerations, and how drivers improve their steering control over successive lane changes. She has examined whether the steering and speed control improvement observed during the repetition of one task transfers to the performance of a subsequent task. The current work is focused on examining whether performance declines over prolonged practice. The results of these studies will culminate in a practice protocol for future driving simulation studies to examine transportation and traffic engineering issues.