

Distributed Driving & Pedestrian Simulation and NADS and Hank Lab

David Heitbrink

ABSTRACT

Driving simulation is widely used for driver safety research. As compared to test track, and on-road based experiments, driving simulations are more reproducible, avoid the risk of injury, death, and property damage attributed to high-risk situations. In addition, a wide variety of variables can be recorded with high precision for later analysis. Simulation-based research has recently been extended to cover pedestrian road crossing. As with driving simulators, pedestrian simulators enable researchers to create replicable conditions in a safe environment in which behavioral variables can be precisely recorded. Simulation-based research for both drivers and pedestrians has predominantly been conducted with a single participant. One important dimension this research has been missing is the interaction between a pedestrian and driver. Although research has examined how drivers react to simulated pedestrians crossing the road and how pedestrians and bicyclists react to simulated traffic, very little research has been done on the interactions between drivers and pedestrians and bicyclists, and how they mutually influence the behaviors of one another. To study this, the National Advanced Driving Simulator (NADS) and the HANK lab have begun to create a distributed simulation system that will allow actual pedestrians and drivers to interact. To accomplish this, an actual participant in the Hank pedestrian simulator will be represented by an avatar in the NADS driving simulator. Similarly, an actual participant in the NADS simulator will be represented by a driver in a virtual vehicle in the HANK simulator.

This paper presents our approach to dealing with the technical challenges with this type of distributed simulation. The paper covers how to deal with the motion capture of the pedestrian, adapting that data to drive the avatar at NADS, and customization of the pedestrian model at NADS in addition to network communications and latency.

BIO

PRIMARY AUTHOR

David Heitbrink is the lead Software Engineer at the National Advanced Driving Simulator. He is responsible for maintaining many of the software systems that run the NADS simulator, including scenario control system, scenario authoring tool set, and many other smaller systems. He was the lead software developer on the effort to design a new Image Generator for NADS, a new vehicle cabs, as well a new audio subsystem. Mr. Heitbrink received his Bachelors of Science from the University of Toledo in Computer Science and Engineering. He continued to receive is Master of Science in Engineering at the University of Toledo in the spring of 2005, after which he joined NADS.