UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

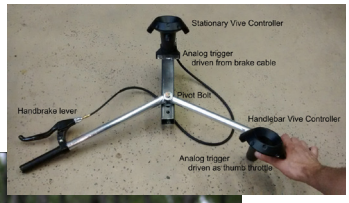
Virtual Reality Vehicle Simulator Phase 1

Orion Lawlor, PhD, Jonathan Metzgar, PhD

Background

Despite accounting for 17% of America's land area, Alaska has less than 0.4% of America's lane-miles of highway. Although Alaska's major cities have paved highways, most of rural Alaska's transport is non-traditional, with long haul travel occurring by airplane or boat, and local trips taken via ATV or snowmobile. Further, Alaska's trails are often irregularly maintained, terrain and weather can be challenging, and unpredictable events such as wild animal encounters are common. Because of these factors, Alaska has the second-highest ATV fatality rate in the nation.

Several previous projects have incorporated virtual reality (VR) technology to improve driver safety. The most broadly applied projects incorporate 360 video, which allows drivers to view accident sites. More specialized projects, such as those training heavy equipment operators, allow actual interactive use of the vehicle. This project seeks to use VR technology to improve the safety of nontraditional vehicles.



Research Project

Our goal is to provide a single integrated hardware/software platform capable of training operators of ATVs, bicycles, and snowmobiles to use their vehicles safely. We'll do this by using modern virtual reality (VR) technology to put people "in the driver's seat" virtually, so they can safely experience accidents like skids and rollovers, and see a slow-motion replay to understand and visualize the physical cause of each accident, and the effect on a driver with or without a helmet, with the aim of preventing that kind of accident.

Our initial proof-of-concept hardware consists of a VR headset and a stationary exercise bicycle seat where the user sits. The user interface consists of a set of instrumented handlebars, allowing the user to steer by turning the handlebars, and control the throttle and brake by using natural physical controls.

The bulk of our work will be building software, using the Unity engine as our main tool for building the simulator's graphics, vehicle simulation, and VR interaction features. Key to successfully visualizing accidents will be our depiction of the forces on the vehicle's tires and frame. VR is uniquely useful for this, by providing the option of an "out of body" view of an accident, and the option to explicitly illustrate vehicle dynamics in 3D either in realtime or in replay.

ABOUT THE AUTHORS

The research team consisted of Orion Lawlor and Jonathan Metzgar of the University of Alaska Fairbanks.

ABOUT THE FUNDERS

This research was funded by the Pacific Northwest Transportation Consortium, with additional support from the University of Alaska Fairbanks.

EXPECTED DATE OF COMPLETION

August 2021

FOR MORE INFORMATION

http://depts.washington.edu/pactrans/research/projects/virtual-reality-vehicle-simulator-phase-1/