INTRODUCTION

Recent work in transportation visualization is evolving from a focus on how projects look to a desire to see how they actually work [1]. As many walk-through simulation methods focus on a scene’s aesthetic qualities, there has been a growing need for visualization of processes. As such, developments in virtual reality simulation come as a result of an increasing recognition of the value of visualization for representing not just infrastructure, but “operations” [1].

Virtual reality can be defined as technology that enables users to interact with a simulated world. When applied to transportation, VR has the potential to not only model traffic flows; it also allows for hands-on driving simulation. Observing built and natural environments from a driver’s perspective provides a viewpoint that is often ignored in traditional planning methods. Particularly for projects where driving safety issues or transportation networks are being negotiated, real-time immersion is an alternative to other visualization tools such as image rendering and simulation, where perspectives are already chosen and the viewer’s role is more passive. First we will present the development of a system that allows for interaction with both static and dynamic transportation and infrastructure plans. Case studies of the system’s application will also be described.

METHODS

UC-win/Road software provides the interface and simulation engine for the virtual reality modeling [2]. Terrain information and digital imagery create a visual basis for the simulation while aerial photographs and maps are projected upon the terrain to provide orientation (Figure 1). Once road alignments are defined, default traffic is automatically generated from the designated start and finish points. Traffic elements perform “ideally” by obeying traffic lights, moving around road obstacles, and changing speeds in recognition of nearby vehicles. A compelling visual cue environment is composed with photo-textures and 3D models that can be created within the interface or imported from a database. Textures are applied to landscapes, buildings, roadways and moving models.

Integration with external devices allows drivers to navigate their own way through a road network. Such devices include gaming pads, steering wheel and pedal devices, and full-size driving simulators (Figure 2). Programmed driving scenarios can be initiated, allowing users to react to a series of scripted events. In accordance with input from the user during driving “scenarios”, interaction between the real-time vehicle dynamics, motion platform, and sound/image generators is synchronized.

CASE STUDIES

Road design and safety assessment

A VR simulation of the Ohashi Junction in central Tokyo has been developed mid-construction to assist with safety design [4] (Figure 3). Optimal roadway marking visibility has been tested out by running driving trials and videotaping subjects’ eye movements as they use the simulator. Subjects also took surveys on their perceptions of road markings, signs and message boards. Different driving environments can be immediately edited in VR space as options are compared.

Urban planning and public consensus

Two ongoing city planning projects include a simulation of the implementation of a new LRT line in Sakai City, Japan, created by Osaka University, and an urban model of the downtown Phoenix area, created by Arizona State University (Figure 3). The Sakai City model has been presented at monthly meetings to inform and involve citizens in decision-making [5]. The ASU team is also experimenting with presentation methods for making the
virtual reality provides an editable platform for testing out the way drivers and the built environments interact. Information gained from VR driving trials can be utilized not only for improving driver training, but also for infrastructure design. In cases where driver safety and transportation networks are being considered, real-time immersion can provide a perspective that is often overlooked in common planning methods. Ideally, developments in visualization will not only assist transportation engineering planning itself, but will help involve more people in the process.

REFERENCES
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