



# Studying Driver Route Choice Using a Physics Based Driving Simulator

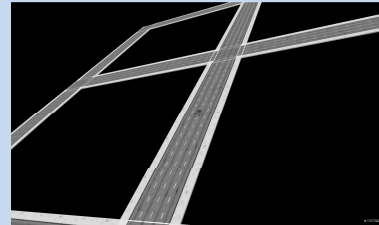
REU Student: James Pendergrast, University of Rochester

Graduate Student: Aly Tawfik, Transportation Institute

Mentor: Nicholas Polys, Visual Computing Lab



The view from inside the car.



An overview of the course.

## Project Summary

We want to study driver behavior and route choice in order to:

- Develop models to simulate traffic
- Design driving facilities
- Understand how drivers think to help them make better choices.

## Goals

To address this problem, we developed a driving simulator to be:

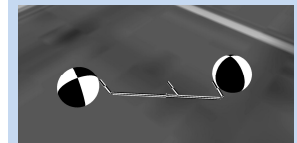
- As physically realistic as possible
- Less expensive than using real cars
- Safer than driving on roads.

## Environment

- The physics-based driving simulator is X3D with rigid body physics extensions using Open Dynamics Engine (ODE).
- X3D is an ISO standard for durable, cross-platform, interoperable 3D assets consisting of scene descriptions.
- The standard is developed by the Web3D consortium in cooperation with W3C, IETF, OGC, DICOM, IMS.

## Design, Implementation, and Progress

- Gathered specifications for vehicle physics, for example:
  - Maximum engine power
  - Vehicle mass.
- Design choices:
  - Braking and accelerating forces act directly on the wheels.
  - Steering uses Ackermann geometry through a physical model or a mathematical model.
- Prototyped car and driving environment

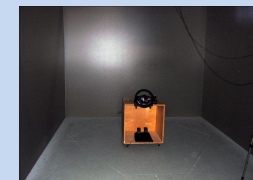


Ackermann Steering Geometry

## Hardware



Driving on a Stereo Wall



Driving in a CAVE

## Results

- Initial test vehicle systems and roads created.
- Subjective observations of naturalness made.
- Initial results allow further study to be done.

## Future Work

- User Study:
  - Compare steering control models
  - Measure driver effectiveness
  - Survey drivers on which model was most like driving a car.
- Adjust physical model for different vehicles.
- Create large worlds and traffic models.
- Study how drivers' route choice is affected by the display methods.



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