Abstract
The simulation system allows users to create and display vehicles that realistically move on a specified road network.

Motivation
Existing traffic simulators are currently independent of crowd simulators with human agents. Incorporating simulated vehicles into a crowd simulation will provide an additional level of detail and realism. Combining the simulations would create a highly realistic backdrop for any type of virtual world. Goal: To design a realistic traffic simulation that can be extended to work with crowd simulation software.

Background
Current Simulations
• Focus on individual behavior of vehicles with personality traits
• Focus on large scale traffic with entire simulation controlled by single computational cell

Our Simulation
• Each vehicle moves realistically
• Vehicles can be extended to act as agents alongside human agents
• Agents can subsequently work together to achieve goals

3D System Pipeline
City Engine sends street network data to Vehicle Simulation Codebase. Vehicle Positions are sent to Unity Pro Game Engine for animation updates.

Screenshots
City Engine, Road Network, 2D OpenGL, 3D Unity

Features
- Road Network: Parse street data from City Engine, build road network in simulation from data
- Reserved Space: Calculates distance to the next vehicle, accelerates if sufficient space available, maintains speed or decelerates otherwise
- Collision Prevention: Vehicles decelerate or stop upon detection, maintain specific following distance, only turn when no vehicles in the way
- Turning Animations: Vehicles calculate proper turning radius, travel along the arc of the turning circle
- Traffic Lights: Placed at every four way intersection, vehicles decelerate on approach
- Display: 2D user interface created in OpenGL, 3D integration with Unity game engine

Results
Vehicle Collision Over Time
The number of collisions occurring between vehicles in the simulation drastically decreased as development continued.

Conclusion
Designed and implemented a full vehicle simulation system which is realistic, extensible, and compatible with existing crowd simulation codebases.