

Research Report Summary



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Automating the Transportation Design to Simulator Model Process

Converting Transportation Design Models to Driving Simulation Models

The goal of this project is to remove the need for simulator domain expertise from the process of converting a design to a simulator model, thus facilitating visualization on interactive driving simulators for research, design review and outreach activities.

Our method of automatic conversion relies on exporting design models to LandXML¹, then processing that file to generate simulator resource files. This work expands on a previously developed converter created by the authors. A minimum number of design elements, which are detailed in the project report, must be included for the development of a robust converter tool.

A number of simulator resources are generated by the converter. These files may be used in normal simulator workflow using

tools that are distributed with the NADS miniSim™. These simulators are in use today in the US and Europe for driving research, training and clinical trials. A broad range of users utilize these simulation tools, which are supported and maintained by the National Advanced Driving Simulator (NADS) at the University of Iowa.

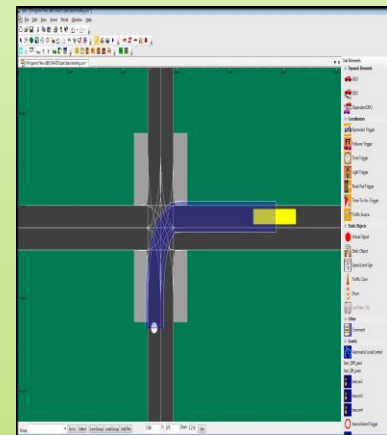
This project developed several enhancements to the converter. Most importantly, the range of convertible designs was widened significantly. Additionally, the integration of XML and spline libraries resulted in significant processing improvements in terms of speed and the creation of smooth junction curves.

This version also produces textured geometry in the form

Model visualization



Roundabout Design Model



4-way miniSim™ Model

“LandXML design models are converted to NADS miniSim™ driving simulation environments by producing textured Wavefront .OBJ, OpenFlight™ and all necessary meta-data objects.”

of .OBJ files, which are a common 3D format supported by third-party simulators and 3D modeling software, either directly or via import operations.

The converter also produces simulator meta-data files that can be integrated into the NADS Tile Model Library, which allows the converted model to be reused in multiple virtual environments.

This integration phase introduces another step in processing a design model for use in the driving simulator; however, NADS has built a graphical tool (the Tile Model Integrator Tool) to manage most of these integration tasks.

Two library meta-data files remain to be integrated and are currently outside the scope of the integrator tool. Since this tool is written in Python,

extending it is within the capability of most simulator labs.

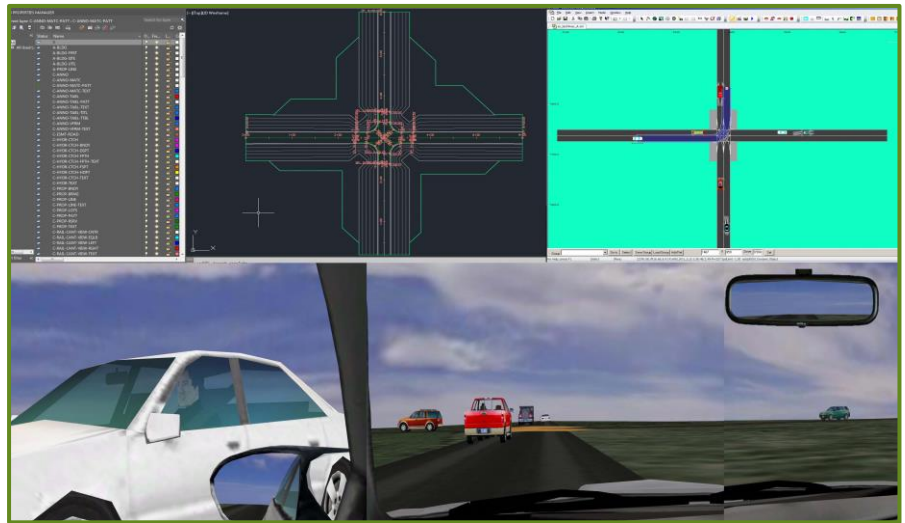
Several test cases were used to exercise converter capability, including:

- Simple straight
- Simple curve
- Super-elevated curve with elevation changes
- Simple hill
- Three-way acute angle intersection
- Four-way intersection
- On-ramp

- Multiple-road “city”

While these test cases lack the complexity of real-world design files, taken as a whole they provide a functional snapshot of the conversion process.

Current limitations include the inability to process complex models. Although the multiple-road city model does process, the visual model output demonstrates significant algorithmic limitations since not all road geometry is produced. The roundabout model also proved to be too difficult for this version of the converter to process.



- Roundabout

References

1. Crews, Nathan (2007). Autodesk Civil 3D 2007 LandXML Support.doc