Automated Roadway Design Model Conversion for Driving Simulation

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Background

- Enable transportation designers and researchers to review and investigate design models through real time driving simulation
- Tools and processes do not require expert knowledge of simulation operation or configuration
- Visualization combined with event management offers high fidelity 'try before you buy' virtual experience

Objective

Generate a simulator model from a design file to permit data collection or visualization using interactive driving simulation

Design Model Test Cases

Conversion of design files into simulation models requires defining how roads join together. This is a trivial task for people, but computers work from essentially undifferentiated numbers, and must be instructed how to proceed in great detail.

Design model inputs for conversion parallel simulator attributes; User inputs are required to satisfy missing elements.

<table>
<thead>
<tr>
<th>DOT Design file</th>
<th>Simulator Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Model</td>
<td>X</td>
</tr>
<tr>
<td>Road centerline</td>
<td>X</td>
</tr>
<tr>
<td>Lateral profile</td>
<td>X</td>
</tr>
<tr>
<td>Lanes</td>
<td>X</td>
</tr>
<tr>
<td>Junctions</td>
<td>X</td>
</tr>
<tr>
<td>Pavement surface</td>
<td>X</td>
</tr>
<tr>
<td>Surface type</td>
<td>X</td>
</tr>
<tr>
<td>Shoulders, ROW</td>
<td>X</td>
</tr>
<tr>
<td>Grading fill, granular, special, side slopes, pavement bottom, earth fill</td>
<td>X</td>
</tr>
<tr>
<td>Underlayer</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 1. Design vs. Simulator attributes

Figure 1. Conversion process overview

Figure 2. Interchange

Figure 3. Angled intersection

Figure 4. Interchange on-ramp

Figure 5. Roundabout section

Figure 6. 4-way intersection

Figure 7. Hilly and winding road

Conclusions

Figure 2. Interchange

Figure 3. Angled intersection

Figure 4. Interchange on-ramp

Figure 5. Roundabout section

Future Work

- Improve design model segmentation
- Optimize TIN processing
- Improve corridor spline type & curvature
- Extend converter to support road markings and other design road furniture
- Texture mapping algorithm
- Complete integration with other miniSim simulator Library resources

Acknowledgements

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