

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 & Simulation Model Attributes

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.

	DOT Design file	Simulator Attribute
Visual Model	X	X
Road centerline	X	X
Lateral profile	X	X
Lanes	X	X
Junctions	X	X
Pavement surface	X	X
Surface type	X	X
Shoulders, ROW	X	
Grading (fill, granular, special, side slopes, pavement bottom, earth fill)	X	
Underlayment	X	

Table 1. Design vs. Simulator attributes

Workflow

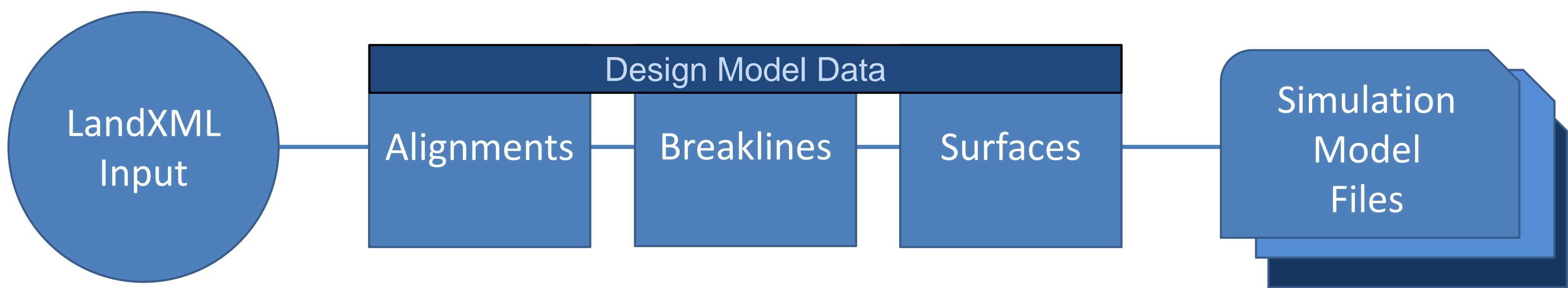


Figure 1. Conversion process overview

Design Model Test Cases

Developing a robust conversion tool required several roadway design models to exercise the algorithms and work flow.

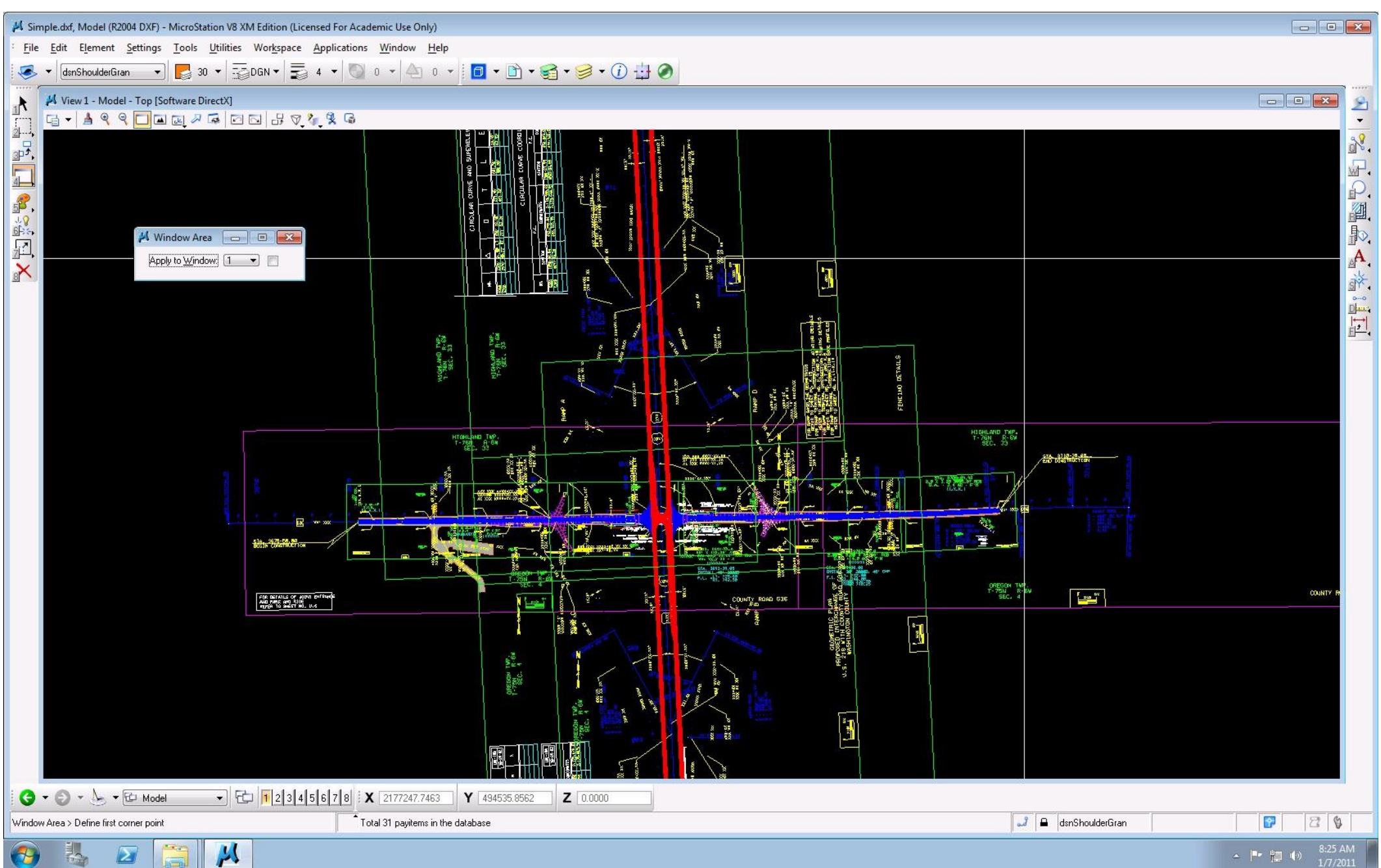


Figure 2. Interchange

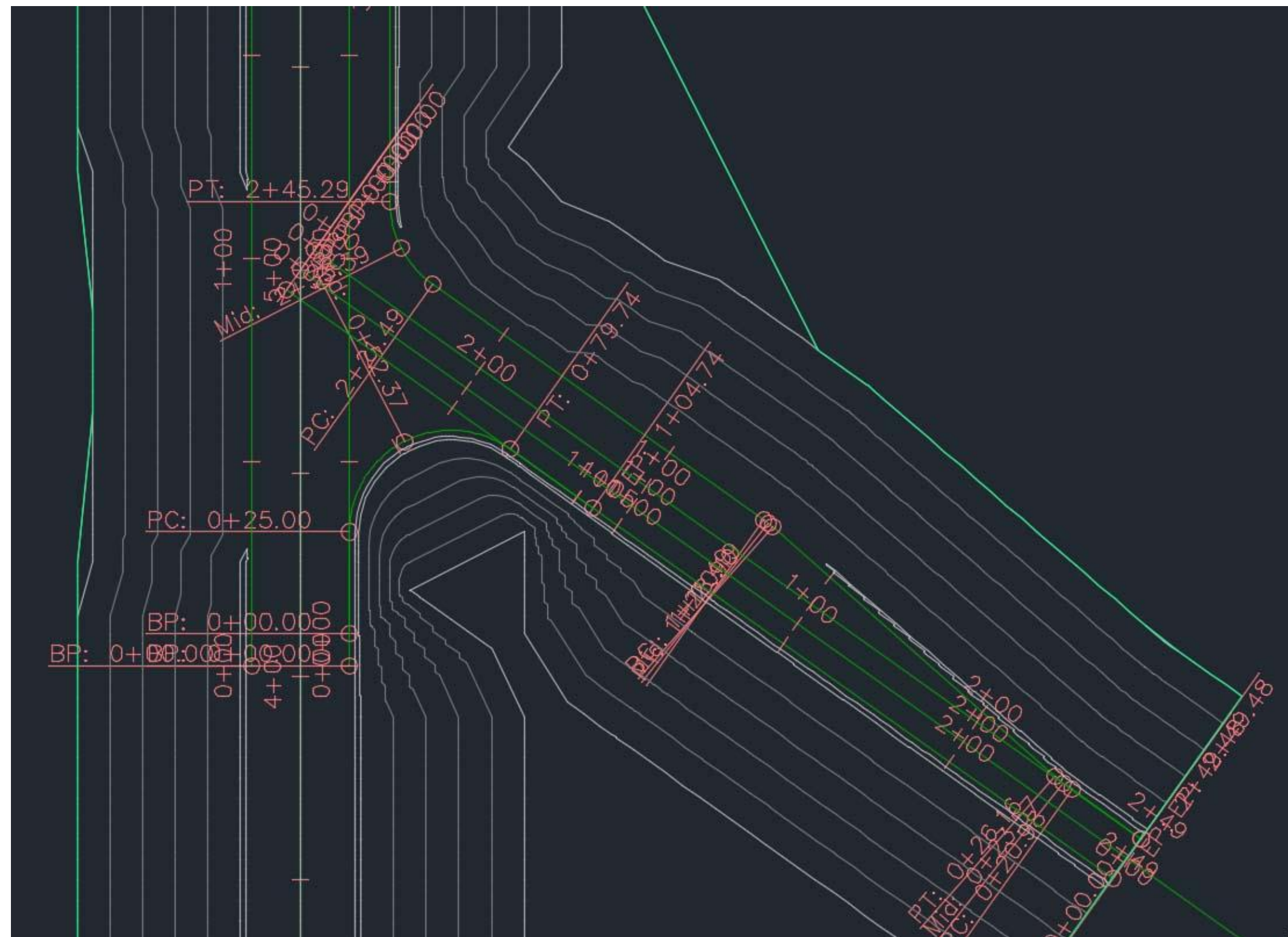


Figure 4. Interchange on-ramp

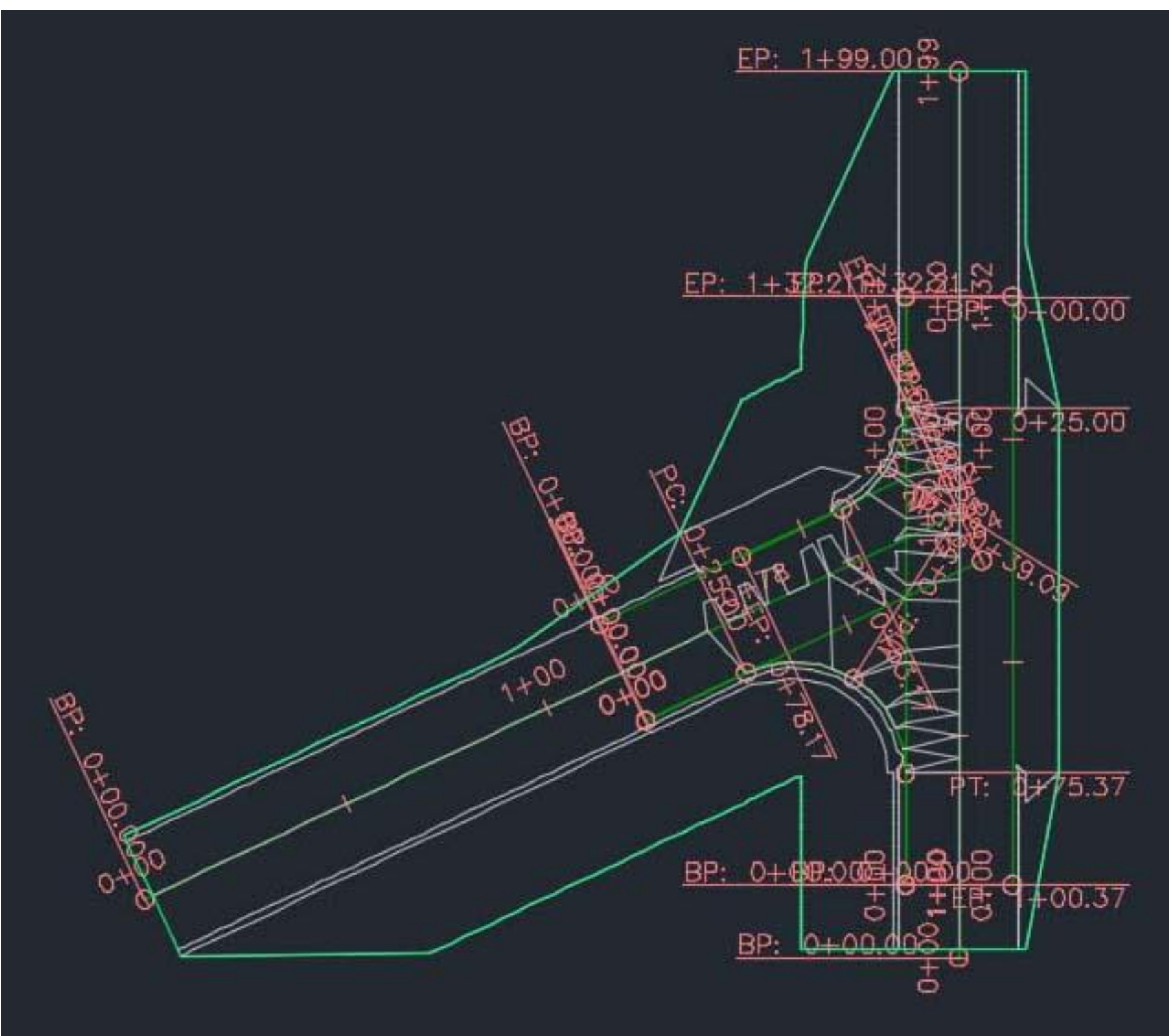


Figure 3. Angled intersection

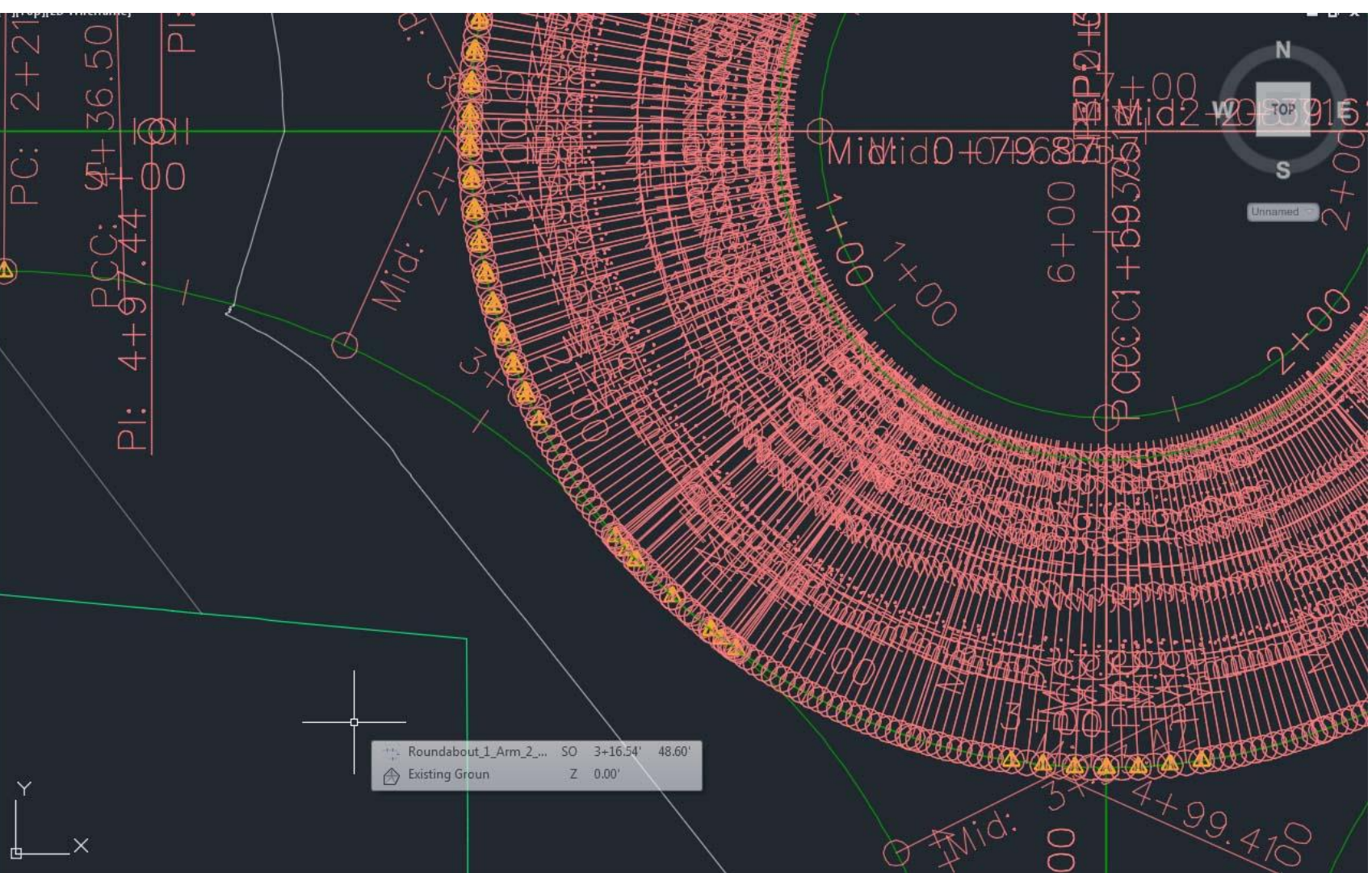
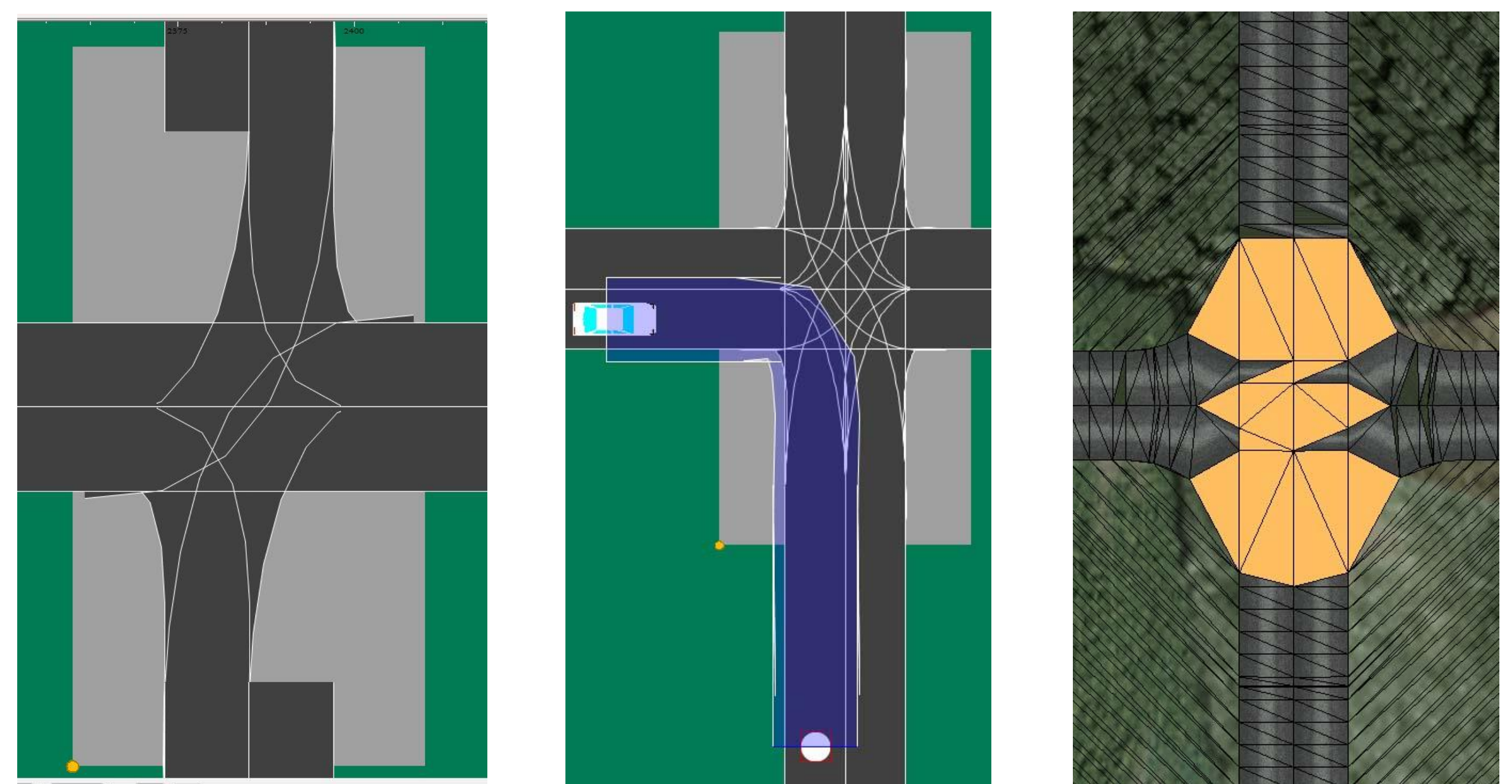


Figure 5. Roundabout section

Conclusions



Initial Conversion Path Through Intersection Texture Application to Converted Model

Figure 6. 4-way intersection

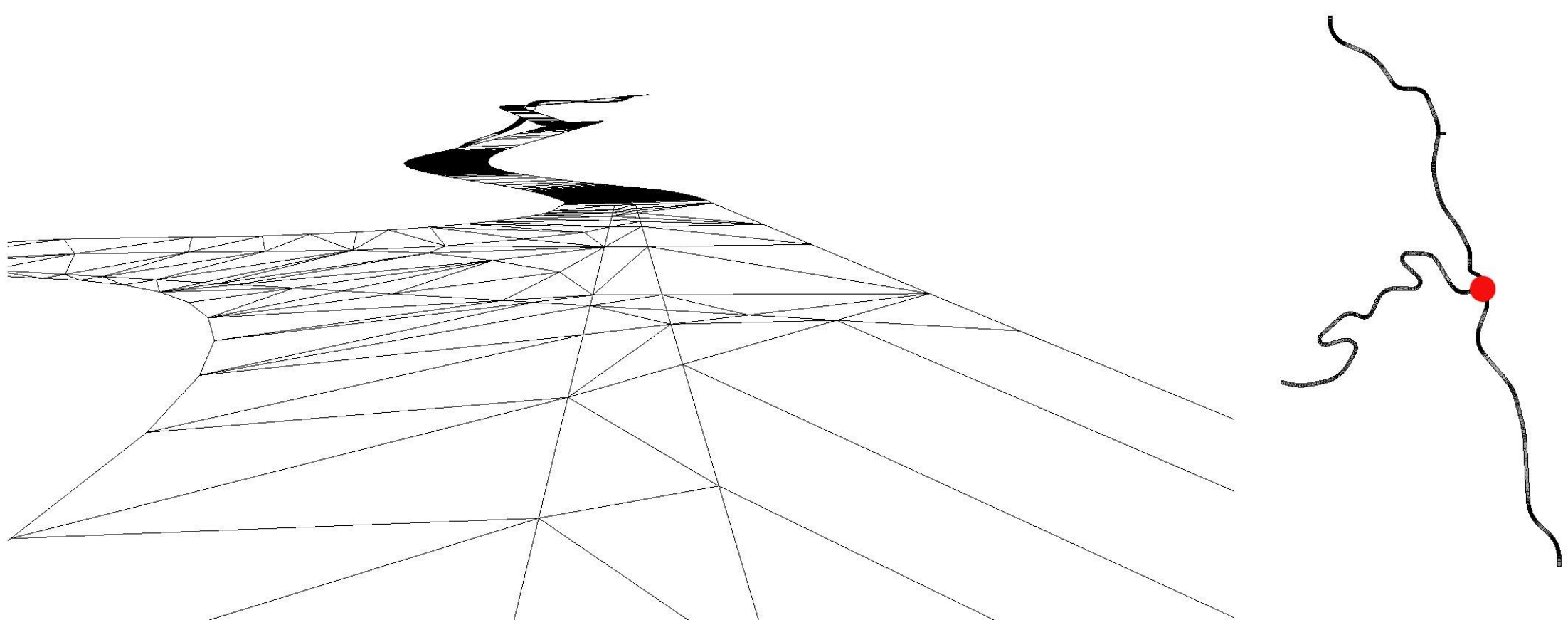


Figure 7. Hilly and winding road

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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