NADS Overview

DAWN MARSHALL

DIRECTOR, SAFETY RESEARCH USING SIMULATION (SAFER-SIM) UTC

RESEARCH SPECIALIST, NATIONAL ADVANCED DRIVING SIMULATOR (NADS)

THE UNIVERSITY OF IOWA

NOVEMBER 4, 2015

THE NATIONAL ADVANCED DRIVING SIMULATOR

THE UNIVERSITY OF IOWA

National Advanced Driving Simulator (NADS)

- A driving safety research center within the University of Iowa
- Established in 2001 with funding from US Dept. of Transportation and State of Iowa
- Self sustained through contract-based research for government and industry
- Available for use by any sponsor (government, industry, military, international)

OUR SPONSORS:

NHTSA www.nhtsa.gov
GM
HYUNDAI
FHWA
NIDA NATIONAL INSTITUTE ON DRUG ABUSE
SAIC
TOYOTA
JOHN DEERE
Bausch & Lomb
MERCK
Iowa Department of Transportation
CATERPILLAR
Cargill
HONDA

THE NATIONAL ADVANCED DRIVING SIMULATOR

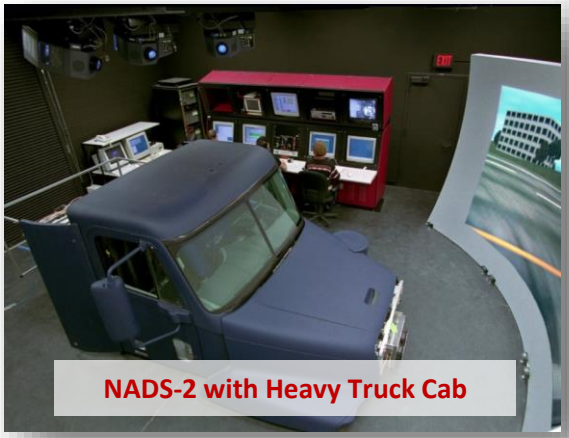
THE UNIVERSITY OF IOWA

We Conduct Research and Provide Simulation Services

- Research/assess new vehicle technology with local human subject population
- Provide data to regulatory agencies and industry
- R&D partnerships with institutions around the world


NADS-1 Dome in Bay


NADS Instrumented Vehicle

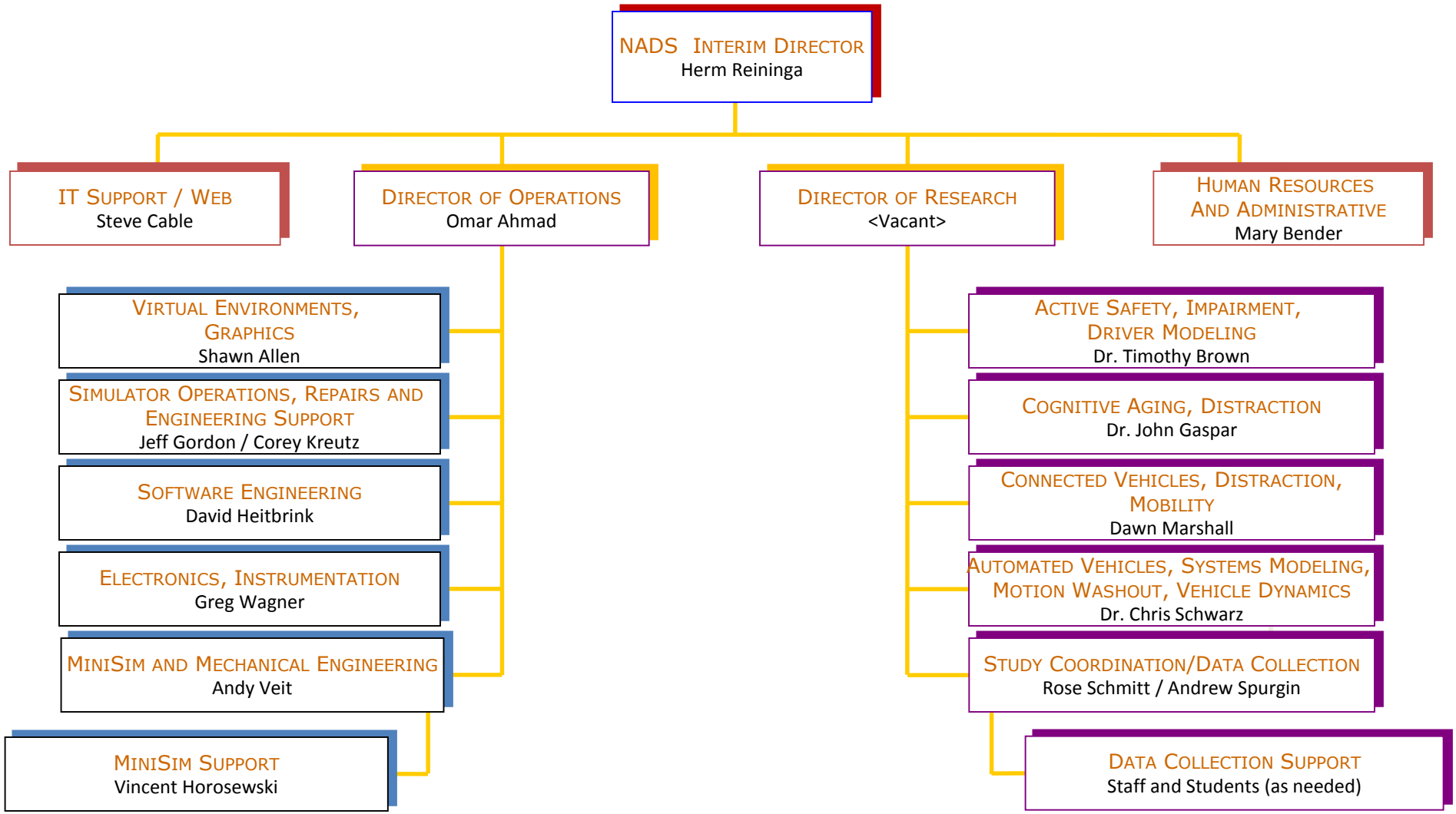

NADS-2 with Heavy Truck Cab


NADS miniSim™

The National Advanced Driving Simulator

The University of Iowa

We Have a Broad Range of Simulation Expertise



NADS-1

- Large envelope motion base
- Vibration actuators
- 360 degree of visuals
- Swappable vehicle cabs
- Validated vehicle dynamics
- Large library of scenarios and driving environments

NADS-1 is Ideal for Studying Behavior in Near Crash Situations

- Study conducted in 2006
- Participants drove with and without help of ESC system
- 5 different types of crash situations

Recent Enhancements to Capabilities

- Projectors and Image Generator
- Pedestrians
- Automated vehicle driver models
- Driver state detection algorithms
- Voice detection
- More realistic driving environments
- HD cameras and video capture
- Control room upgrades
- Facility upgrades, staff training and procedures to support Cannabis/drug studies
- Garage enhancements to support naturalistic and instrumented vehicle studies

The NADS-1 Has Vastly Improved Visuals

The National Advanced Driving Simulator

The University of Iowa

Realistic Pedestrians Are Increasingly Important in Driving Environments


Springfield
The National Advanced Driving Simulator
The University of Iowa

What's Next

- New vehicle cab: 2015 model year
- Performing the upgrade internally will enable capability for repeating the process more efficiently in the future
- Evaluating eye-trackers for new cab

NADS-1 Research Examples

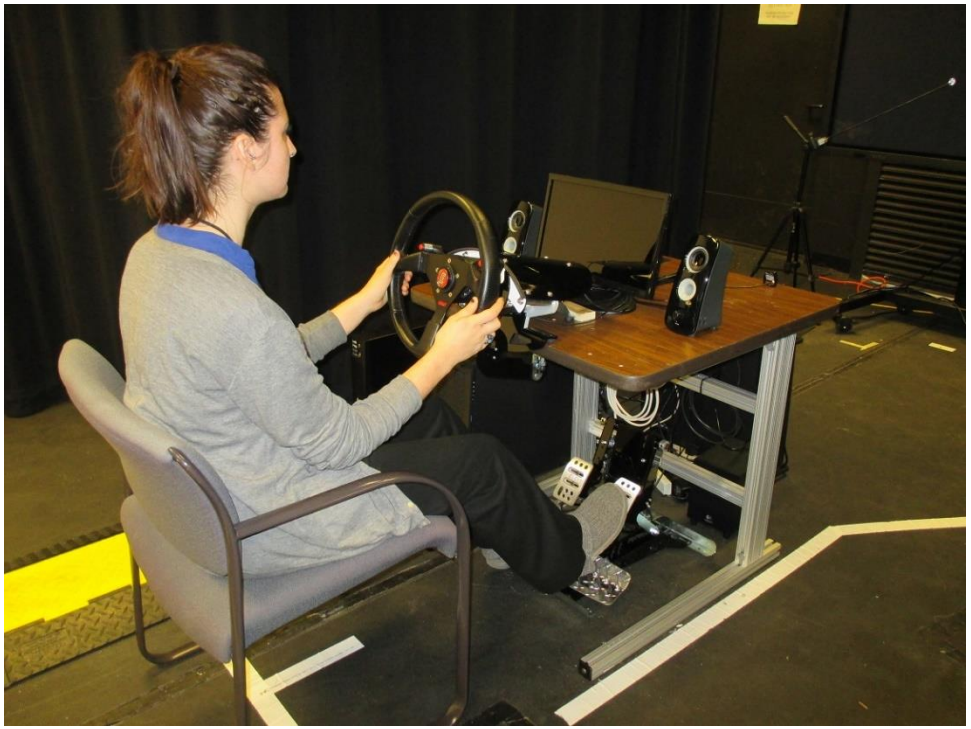
- Driver State Detection
  - Algorithms for detecting driving impairment from alcohol, distraction, and drowsiness
  - Off-line vs. real-time
- In-vehicle safety systems
  - Forward collision
  - Lane Departure
  - Electronic Stability Control
- Driver Modeling

NADS miniSim™

- Portable, small footprint
- Off-the shelf parts. Single PC.
- Cost Effective, Reliable
- Multiple configurations
  - Quarter Cab
  - Simplified Cab
  - Desktop
- Tool for collaboration across institutions/industry/agencies
- Compatible with NADS-1, NADS-2 simulators
- Customized version for vision testing

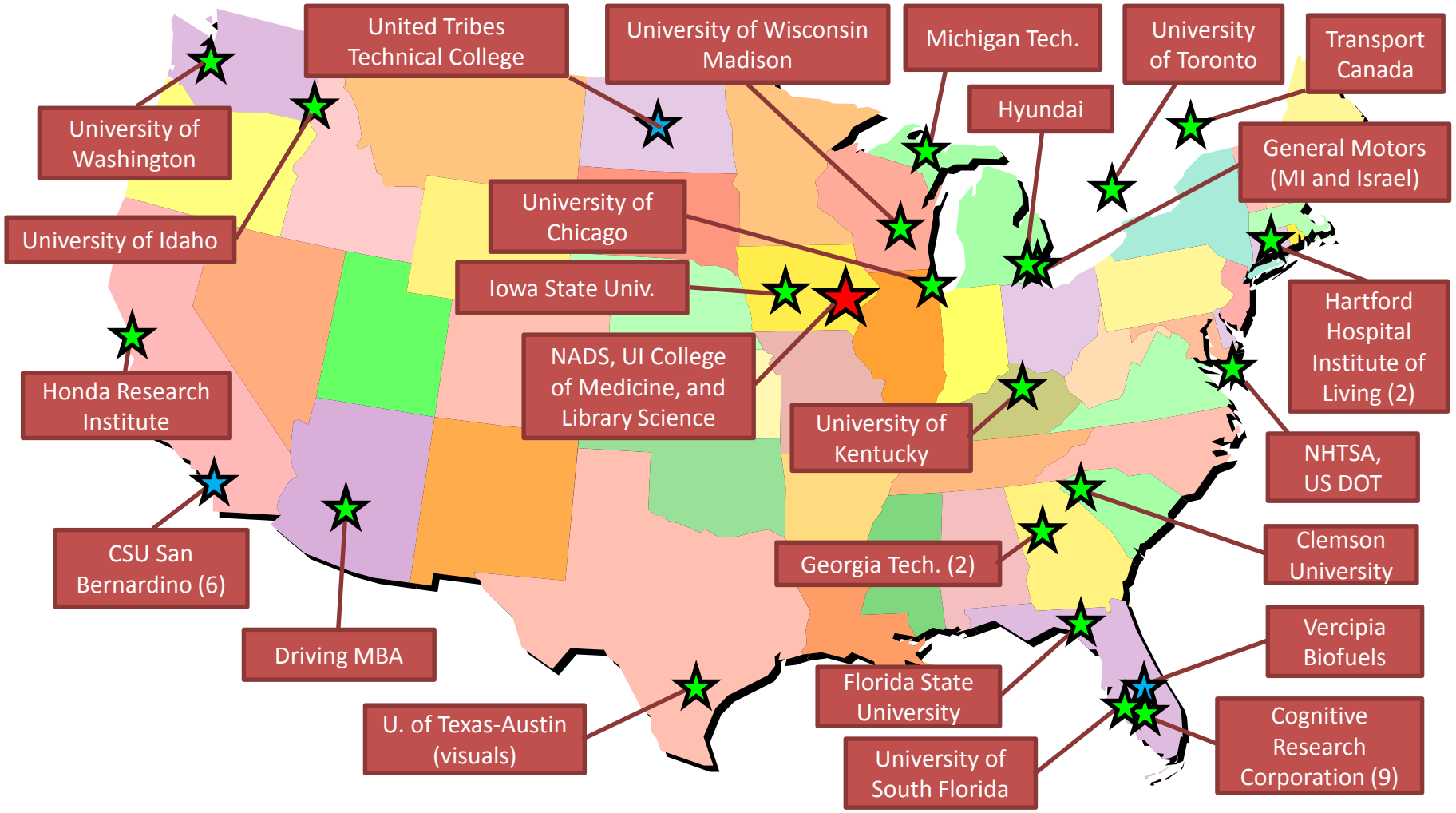
miniSim™ Features

- Single PC
- Robust steering and pedals
- Realistic audio and vibration
- Programmable glare source
- Easy to duplicate, off the shelf parts
- Portable



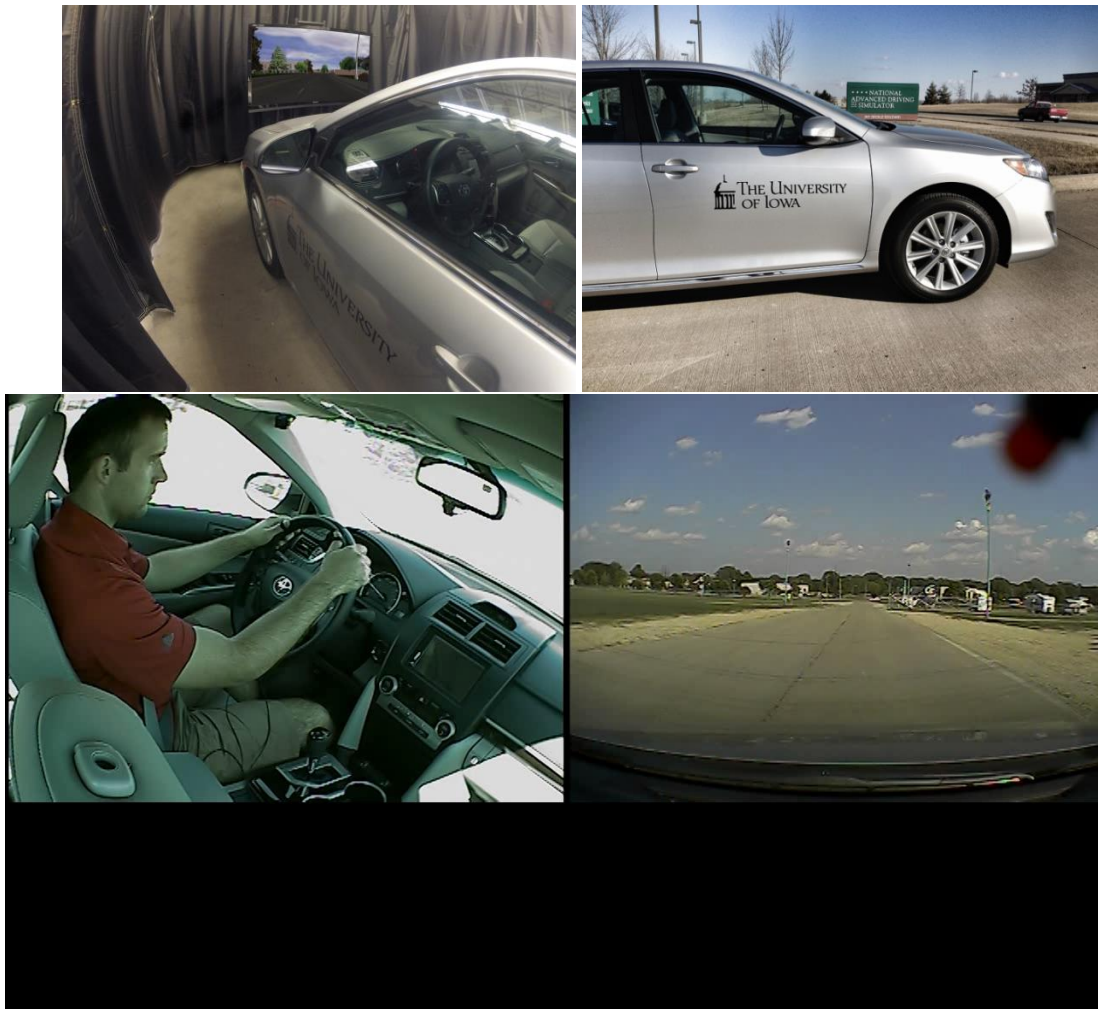
2012: NADS MiniSim™ Partners

(Green=Vehicles, Blue=Heavy Trucks, Red=Both)



Dual-Purpose Instrumented Vehicle

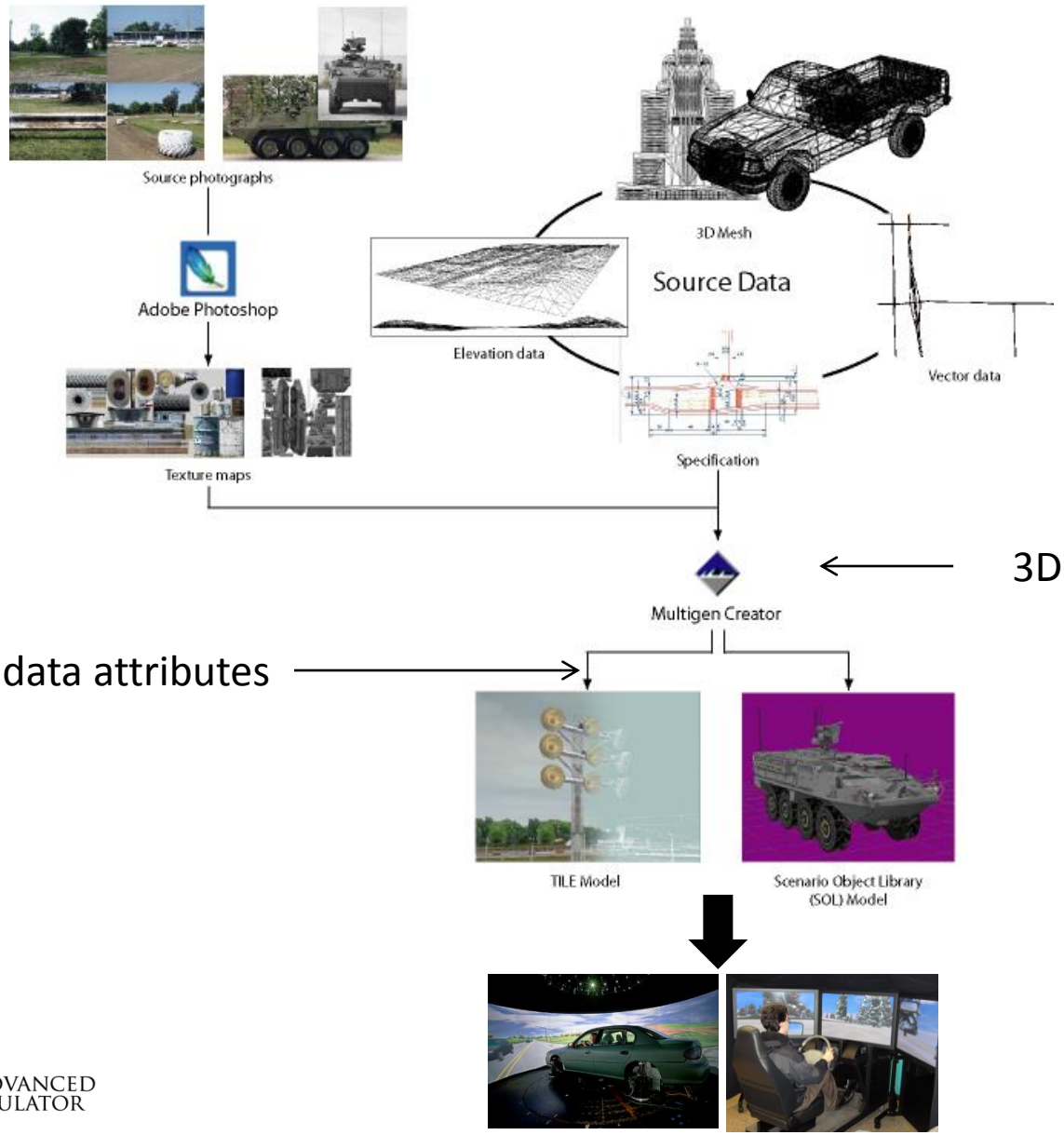
- Modern 2012 Toyota Camry with navigation
- Instrumented sensors and CAN bus integration
- Repositionable video cameras for cab and roadway views
- Can link to part-task simulator



Road Data Visualization

- Quickly building simulated driving environments is a growing area of R&D
- Tile Automation projects:
  - Extracting road information from aerial imagery
  - Converting a MicroStation design file to simulator drivable tile
  - SHRP-2 data using a Python script to create a road centerlineFunding from different sources

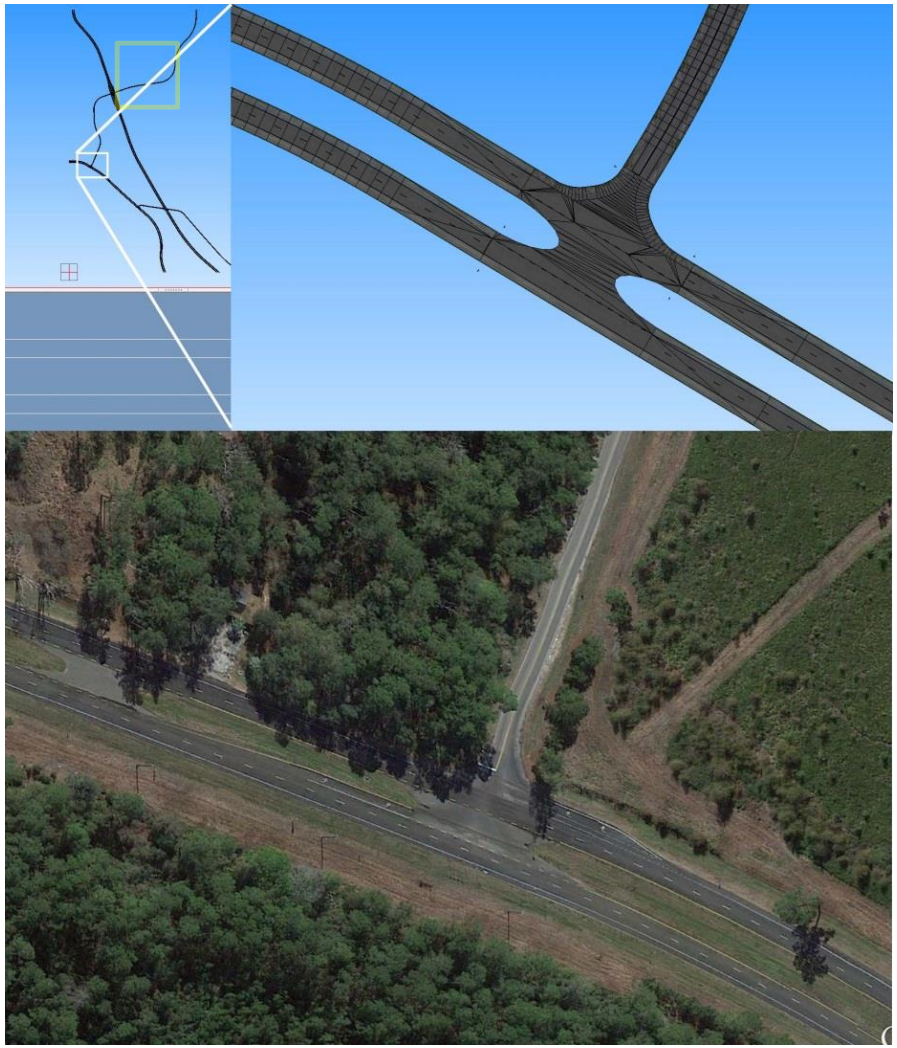
Tile Model Workflow



3D modeling tool

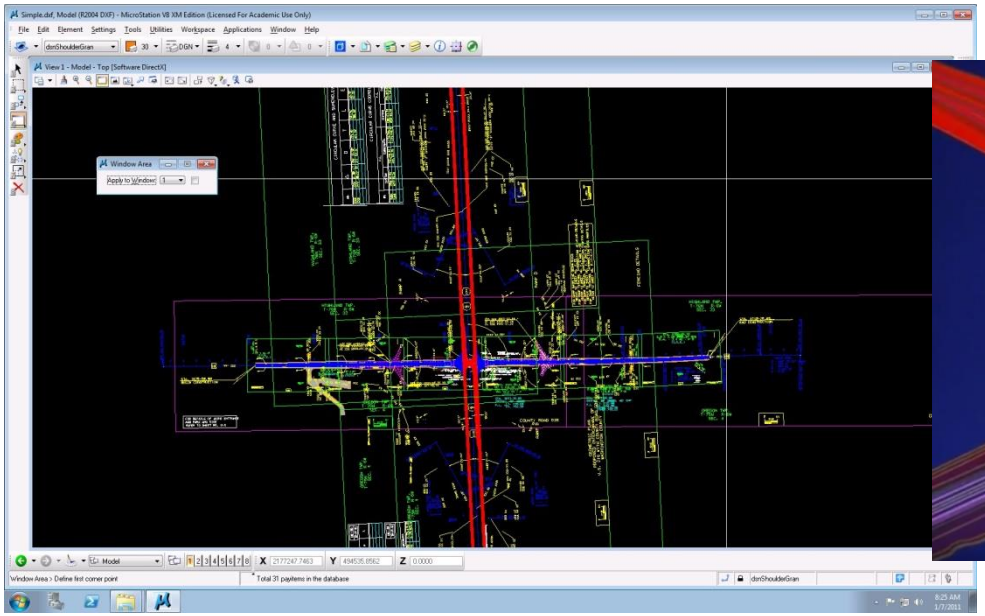
Additional data attributes

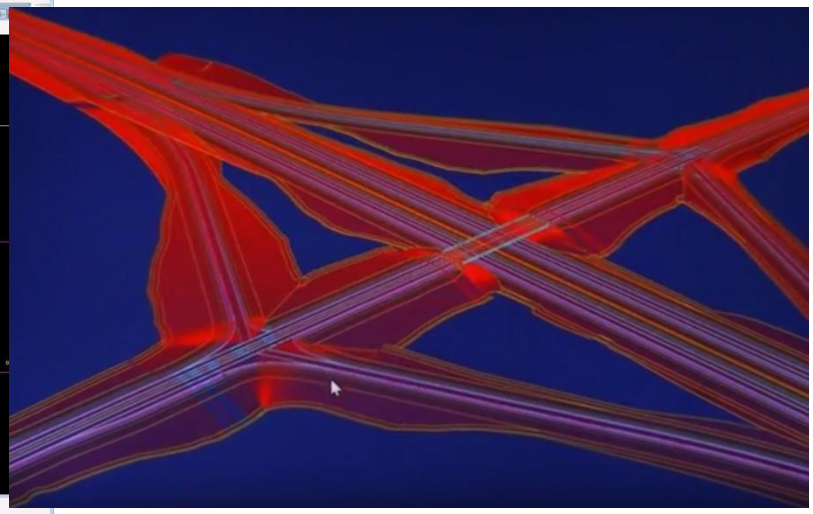
Manual Construction Methods Produce Great Results..



Automating Tile Model Creation

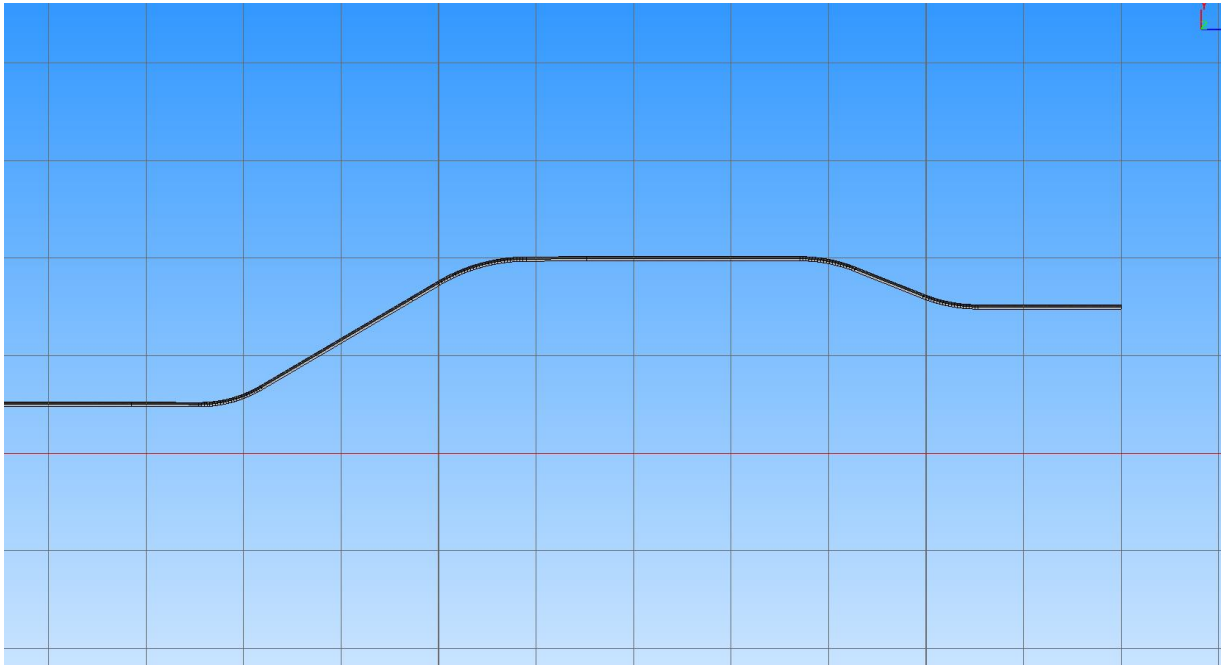
- Convert an existing model
- Develop simulator data
- Integrate into existing processes



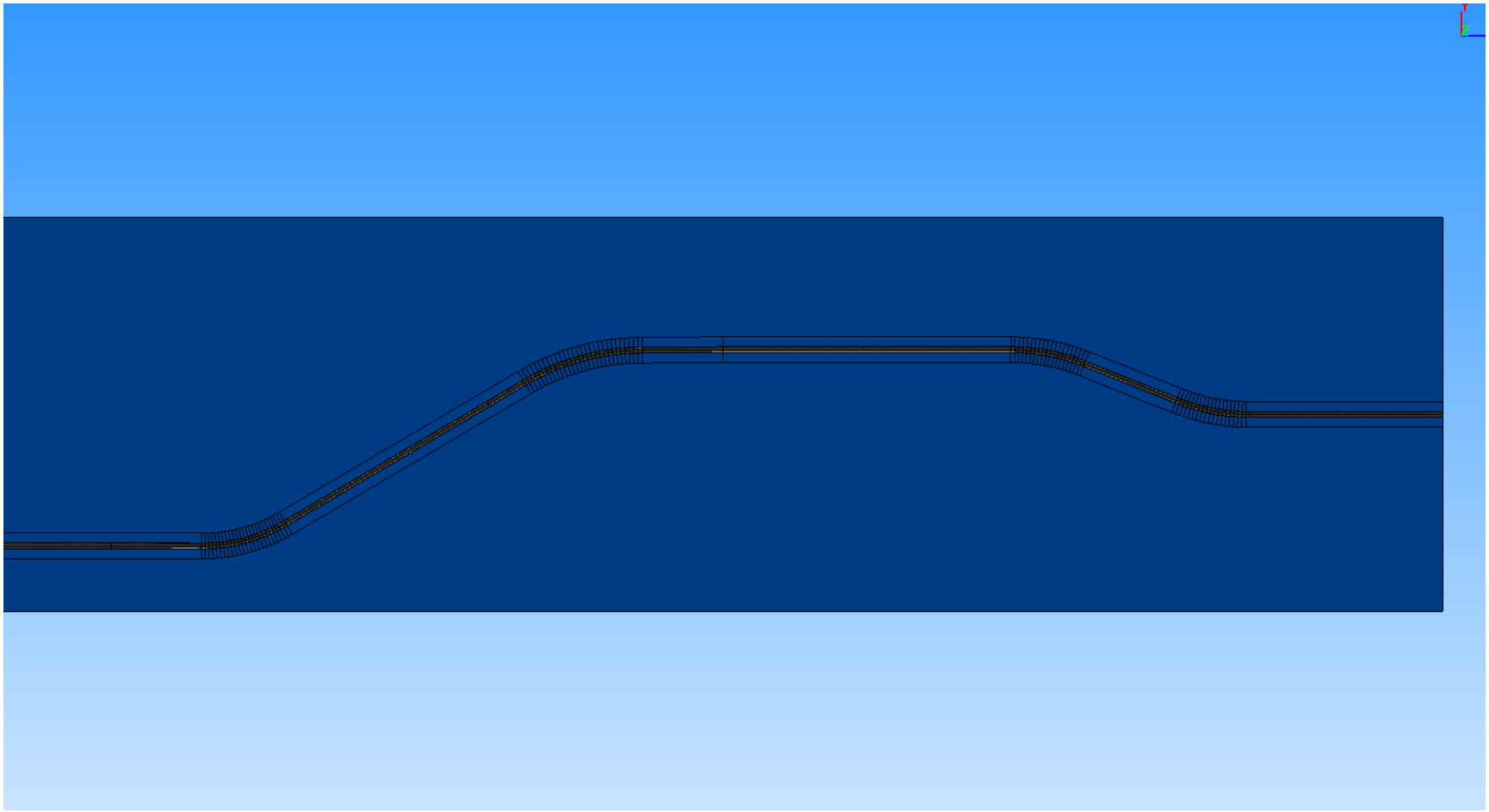


Use SHRP-2 Data to Construct Tile Model

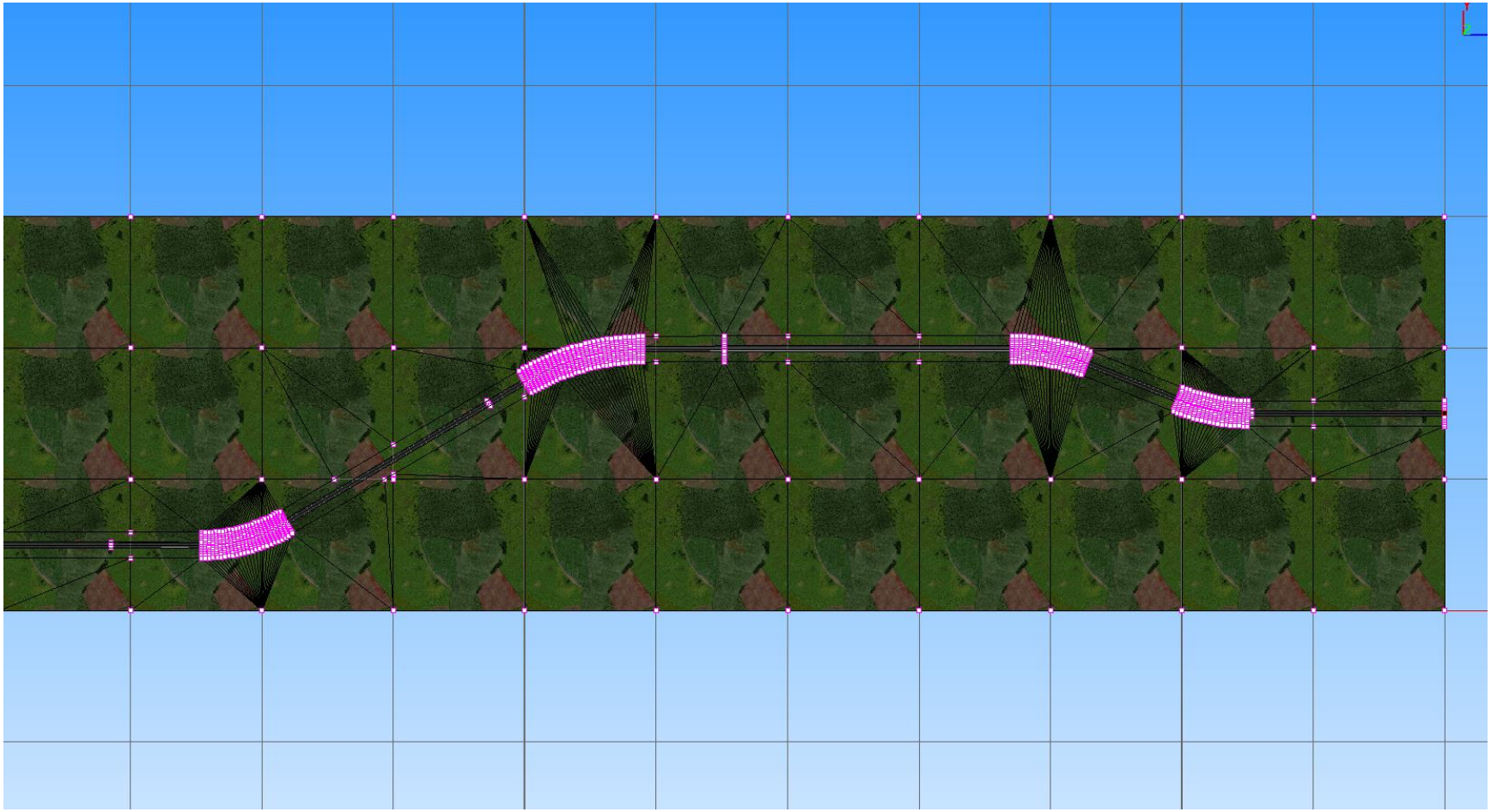
- SHRP-2 data (centerline)
- Script creates additional simulator-specific model info



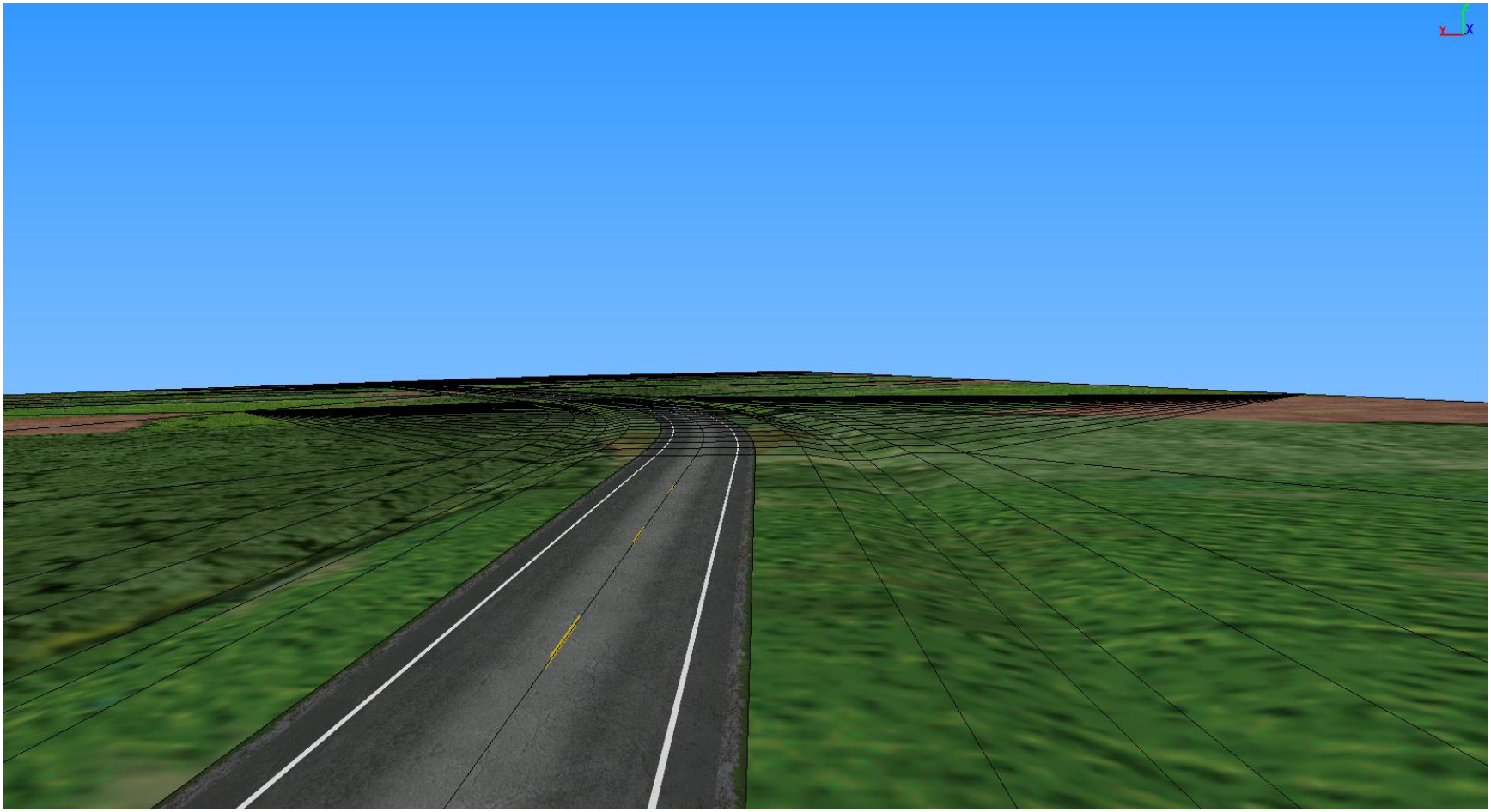
Use SHRP-2 Data to Construct Tile Model



Use SHRP-2 Data to Construct Tile Model

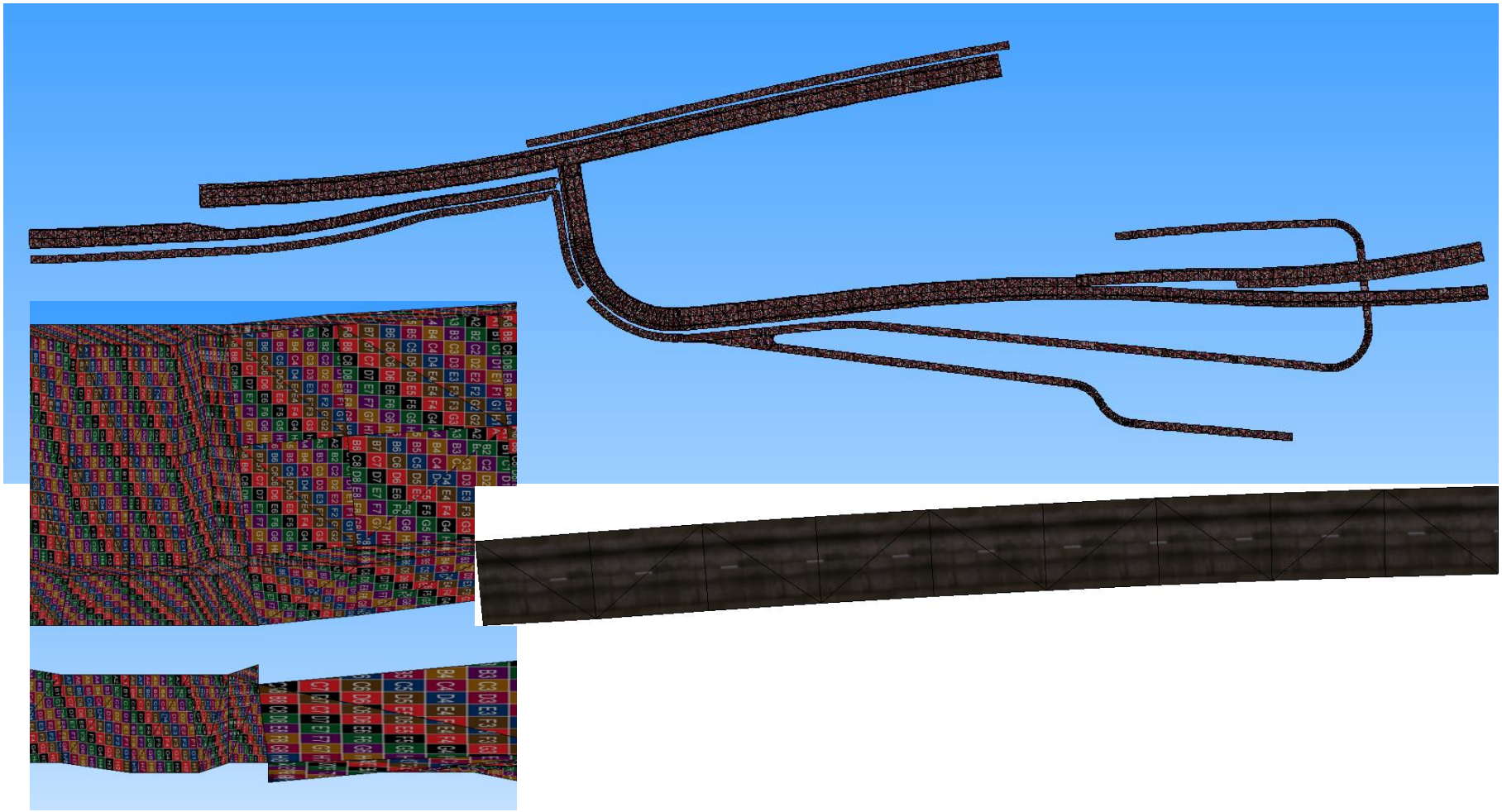


Use SHRP-2 Data to Construct Tile Model



Model Integrated into MiniSim

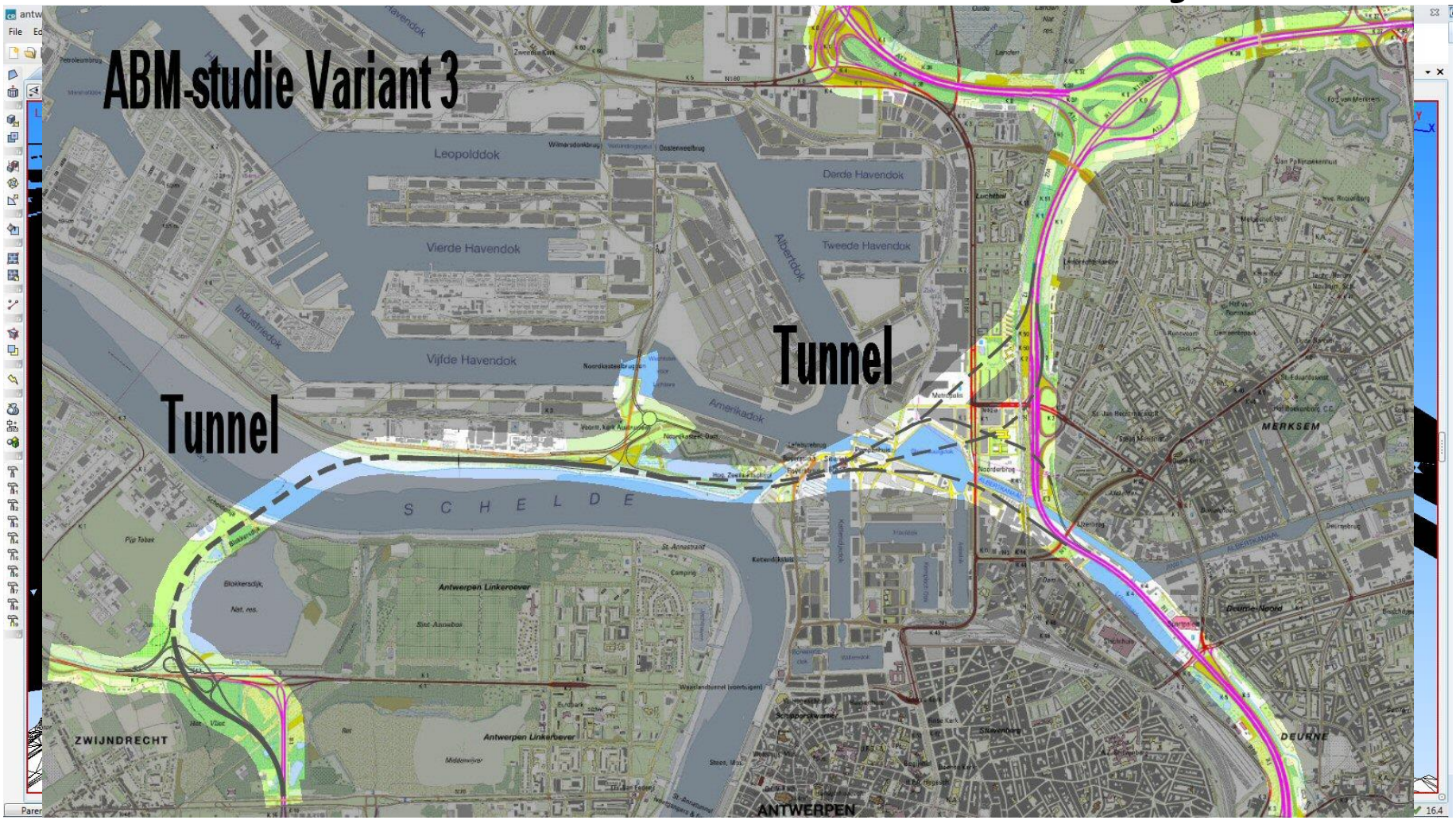
Texture Mapping Arbitrary Geometry



Data Collection – Fall 2015

- Data from 50-100 drivers over same curves
  - Distribution of behavior to compare with naturalistic driving data
- Leverage other data collection to offset cost

Future Tile Automation Project



Workforce Development

- Near-term needs
- Long-term needs
- Issues
- Opportunities

Sharing your thoughts would help improve and direct our education and outreach efforts.

Questions

Dawn Marshall
319-335-4774
dawn-marshall@uiowa.edu

Shawn Allen
319-335-4598
Shawn-allen@uiowa.edu

National Advanced Driving Simulator
contacts@nads-sc.uiowa.edu