

Living Laboratories and Experiments for Connected Vehicles

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Our students lead the collaboration



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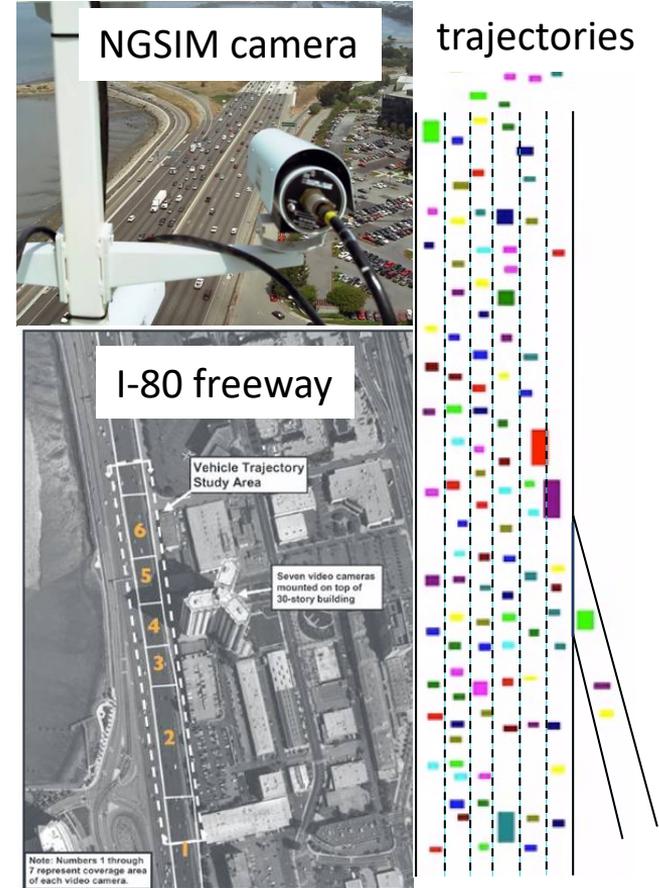
Motivation: Adaptive Cruise Control Testing



- **Challenge:** recreating realistic traffic on closed course proving grounds is difficult

Next gen mobility needs open road testbeds

- FHWA sponsored project to support next generation traffic simulation (NGSIM)
- **Enabling idea:** extract detailed trajectories of all vehicles on the roadway
- Features
 - Seven cameras on 1600' of roadway
 - Generated three 15 minute datasets on I-80 (and others)
 - 3,500 data citations
- **NGSIM wish list:** Longer
 - In duration -> 24/7 video
 - In length -> multiple miles



World leading testbed: Lower Saxony Testbed

- Cameras on 5 miles of A39
- Open road testbed
- Enables next generation connected & autonomous vehicle testing

DLR BUILDS TEST FIELD FOR AUTOMATED AND CONNECTED MOBILITY

Jan 9, 2020 | From Our Partners



I-24 MOTION (Partnership with TN DOT)

i24motion.org

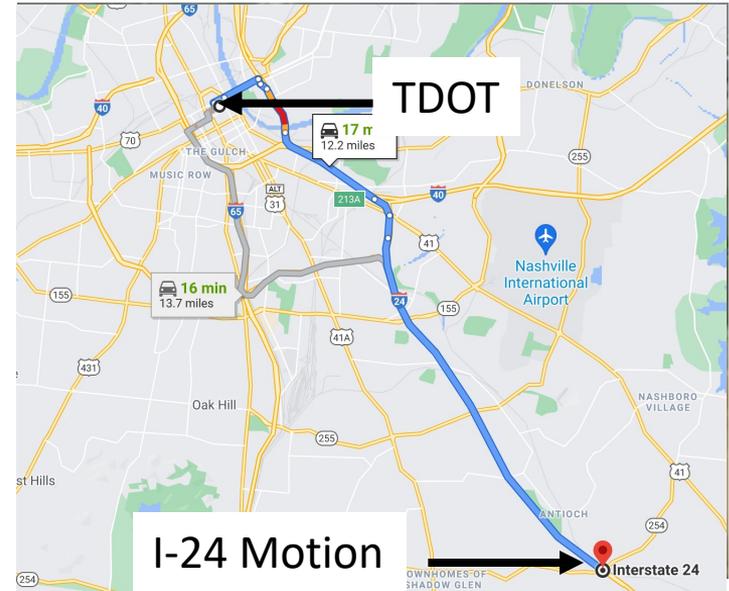


An open road testbed on I-24 for

- active traffic management technologies
- reliability, safety, and mobility initiatives
- connected and automated vehicle technologies

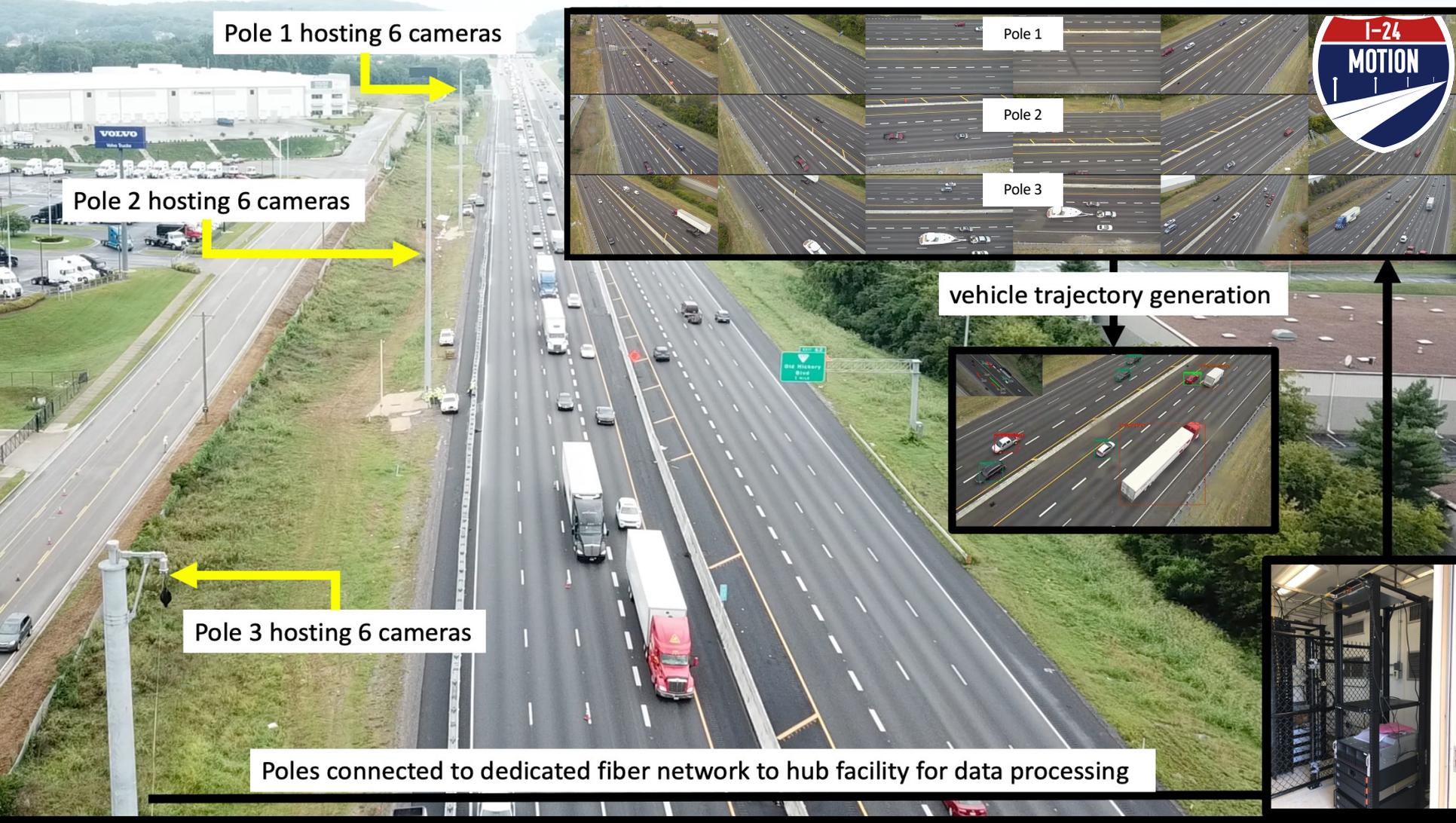
Innovation: Dense installation of 4K resolution video cameras and modern computer vision algorithms on 4 miles of I-24.

I-24E: Evening commute



I-24 Motion Validation system, Fall 2020





Pole 1 hosting 6 cameras

Pole 2 hosting 6 cameras

Pole 3 hosting 6 cameras

Poles connected to dedicated fiber network to hub facility for data processing

Pole 1

Pole 2

Pole 3



vehicle trajectory generation



I-24 MOTION: next steps

- System design completed summer 2021
- Construction begins Q4 2021
 - \$11.5M project to build out 4 miles of I-24 MOTION, led by TDOT.

Opportunities for information exchange with Lower Saxony Testbed on:

- Business Plan, operations, and maintenance
- Data Model and data management

Cooperation

- Partners: Raphael Stern, Alexander Pretschner
- Stern/Work: Ghost jams because of uneven acceleration/deceleration; understanding that and why today's ACCs lead to ghost jams (no string stability)
- Pretschner: Generation of „good“ tests for autonomously operating vehicles as extreme instances of scenarios
- Combination: Use optimization technology for test case generation to derive string-stable ACC parameters

[F. Hauer, R. Stern and A. Pretschner, "Selecting Flow Optimal System Parameters for Automated Driving Systems," *2019 IEEE Intelligent Transportation Systems Conference (ITSC)*, 2019, pp. 3776-3781]