

OVERVIEW

The CITR group, affiliated with the Center for Automotive Research and the Department of Electrical and Computer Engineering, provides basic research in addition to a range of experimental, testing and validation, and demonstration capabilities applicable to Intelligent Transportation Systems (ITS). These include pure simulations, experiments in a laboratory setting with scale-model robotic platforms, and full-scale demonstrations involving multiple vehicles. These capabilities allow for designing, implementing, and testing sensing, control or behavioral strategies. This is done using a modular, stepped approach beginning with simulated vehicles in a purely simulated environment and ending with a mixture of real and virtual full-scale vehicles operating in a real-world, outdoor or on-road environment.

PROJECT EXAMPLES

ITS-Aware Fuel Economy Improvements

Using detailed fuel consumption and vehicle dynamics models, map databases including road grade, infrastructure information such as traffic and inter-vehicle dynamics, significant fuel savings and environmental impact reduction are achieved. Advance Driver Assistance Systems focusing on the solutions to vehicular optimization problems using ITS technologies are developed and tested to generate drive guidance or direct integration with semi-autonomous systems.

Active Safety Systems for Lane Departure Scenarios

As Lane Departure Warning and Lane Departure Prevention (LDW/LDP) systems become available for consumer use, better methods of testing and evaluating these active safety systems need to be developed. Ohio State CITR researchers are identifying highest-impact departure scenarios and simulating various methods of departure detection and prevention. They are also developing test methods and performance metrics for actual on-vehicle LDW/LDP systems.

Collaborative Driving

Extensive research has been done to investigate collaborative driving possibilities with traffic containing a mixture of human driven and partially and fully automated vehicles. This NSF supported research (under the CPS Program) continues with key concepts now being investigated within the DoT sponsored Crash Imminent Safety University Transportation Center.



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FACILITIES

The indoor testbed

- Housed in the Department of Electrical and Computer Engineering
- 700 square feet of space (with a vertical clearance of 24 feet)
- Space for computers, operators, workbenches and repair facilities
- Two ActivMedia Pioneer 3-AT Mobile Robots
- Ten iRobot Create Mobile Robot Platforms
- Several locally constructed robots and Quadrotor aerial vehicles

The outdoor testbed

Five instrumented test automobiles:

- Fully autonomous 2006 Toyota Highlander Hybrid SUV
- Longitudinally automated 2009 Honda Accord
- Longitudinally automated Toyota Prius
- Fully automated six-wheeled Polaris Ranger off-road vehicle
- Fully instrumented Honda Odyssey with 360-degrees sensing and video capabilities

Vehicle sensors and other equipment:

- LIDAR, RADAR and image processing sensors and systems
- High-accuracy localization using Novatel RTK GPS receivers and 6-DOF vertical gyroscopes
- Wireless communications capabilities
- Onboard computing and power systems

V2X Communication and Embedded Systems Lab

- A total of 17 802.11p/WAVE wireless DSRC radios for vehicle to vehicle and vehicle to infrastructure communications
- Commercial off-the shelf wireless modems for long range communication and cellular 3G/4G wireless internet access
- RTK wireless basestation
- Multi-channel test tools and computers for analysis, development and debugging

Driving Simulation Lab

- Three-screen driving simulator
- Completely configurable in terms of viewpoint for each screen, vehicle model, 3D terrain and objects and multiple other vehicles operating in the world

CAR West Garage

- Part of the ongoing expansion of Center for Automotive Research
- 1,320 square feet (with 10 feet interior clearance)
- Parking area for secure storage and lanes with a T-intersection for low speed initial testing of experimental vehicles and algorithms

The Mechatronics Lab

- Provides electrical and mechanical tools, supplies, components, and facilities to prototype, fabricate, test and debug, deploy custom electronics and electromechanical components and systems such as sensors, actuators, robots, data acquisition and controllers.

