THERE IS A LONG HISTORY OF AUTONOMOUS DRIVING AT OHIO STATE
SOME HISTORY
1997 Highway Mixed Traffic
2007 (ACT) AUTONOMOUS CITY TRANSPORT

2007 Urban Mixed Traffic
A LONG HISTORY OF AUTONOMOUS DRIVING

2004 TerraMax, off-road mission

2011 Accord, semi-autonomous networked vehicle

2005 ION, off-road mission

- Lane tracking
- Car following
- Intersections, traffic circles
- Passing
- Obstacle avoidance
- Parking
- Dynamic route planning
GCDC Holland cooperative convoys
Intersection safety systems

Mixed intersection convoying
• Control and Intelligent Transportation Research Laboratory at The Ohio State University, part of the Center for Automotive Research

• Columbus, Ohio, USA

• Autonomous and semi-autonomous vehicles, indoor and outdoor testbeds, mobile robots, benchtop and full-scale simulators

• Four faculty members, one full-time researcher, two postdocs ten graduate students, three visiting scientists
We need to understand the potential human behavior patterns in traffic:

- To develop driver assistance systems, so we can reduce accidents
- To help autonomous vehicles make sense of human drivers, so we can have autonomy in mixed traffic
- To improve the traffic models, so we can have better traffic control
AN EXAMPLE PROJECT

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AN EXAMPLE PROJECT

- Not realizing other drivers are missing stop signs: 21% of fatal traffic accidents at intersections
- Failing to yield to crossing main-road traffic (another 23%)
- Help drivers detect dangerous scenarios better → decrease fatalities
- Detect the other vehicle, estimate the intention, predict the outcome, warn the driver
• Combine the predicted intentions of multiple vehicles
• Utilize map/network information for checking relevancy of each vehicle
• Use intentions, geometry and timing to formulate the estimated safety
The specific application context driving our research is autonomous vehicles operating safely in mixed-traffic urban environments (e.g., in a city, such as Columbus, New York or Istanbul). A car will be in a world where it interacts with cars, humans, other external effects and internal and external software modules. This is a prototypical cyber physical systems example.
A small number of collaborating vehicles provide data to AV
AV fuses to obtain dynamic map
AV tries to understand “intent” of human drivers
A TESTING APPROACH:
SIMULATE AND THEN VERIFY IN THE LABORATORY
SIMILARITY OF LABORATORY AND FULL SCALE LAYOUT
“You may have heard of the Google Car, you may have heard of Nevada. But a lot of development is happening in Ohio too!”

Umit Ozguner
The Ohio State University
CONCLUSION

• Yes, we do have the technology to drive a car/some cars with lots of sensors and compute-power and an alert “safety driver” into some situations with human drivers.

• There is still a long way to go in understanding and appreciating how the other/human drivers are behaving and providing an affordable and reliable autonomous car for integrated traffic with them.
The intelligent vehicle fleet at the Center for Automotive Research
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