NSF EAGER UNIFY: UNIFIED AND SCALABLE ARCHITECTURE FOR LOW SPEED AUTOMATED SHUTTLE DEPLOYMENT IN A SMART CITY

THE OHIO STATE UNIVERSITY
CENTER FOR AUTOMOTIVE RESEARCH

KEY INNOVATIVE CONTRIBUTIONS

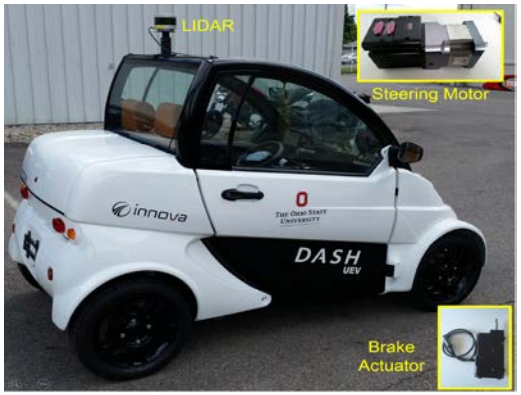
- Development of a unified software, hardware, control and decision making architecture using a model based design approach,
- Development of a scalable and replicable solution for parameterized longitudinal and lateral direction control systems based on the parameter space approach with parametric vehicle models and that are robust to environmental conditions beyond our control like the road friction coefficient,
- An evaluation and rating system to evaluate different control systems utilizing the unified and scalable architecture of this project,
- Proof-of-concept deployment in a typical outdoor shopping area typical of low speed automated driving in a smart city.

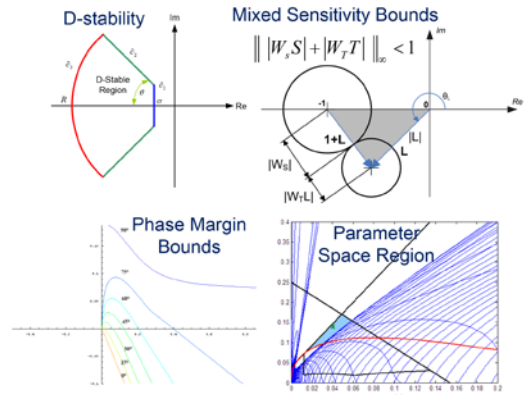
WHAT ARE THE RISKS?

- Automotive OEMs do not share their automated driving architecture,
- Smaller, innovative companies that develop automated shuttle solutions for urban smart city use do not benefit from a scalable and unified approach, jeopardizing the very important safety and dependability requirements of their solutions,
- While solving the abovementioned problems, this project also introduces high risk as the proposed architecture may not be widely adapted by others.

WHAT ARE THE REWARDS IF SUCCESSFUL?

The rewards are a unified, scalable and replicable solution architecture that will be accepted widely with expanding levels of user defined contributions, avoidance of unnecessary duplication, a safe and reliable approach, the introduction of more vendors and more widespread application due to replicability of results.





GCTC SmartShuttle: A Unified and Scalable Architecture

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HOW DOES THE PROPOSED RESEARCH FIT IN GCTC?

The aim of the NIST GCTC action cluster SmartShuttle is to develop a scalable and replicable architecture for low speed automated shuttles in smart cities. SmartShuttle also supports the USDOT Smart City Challenge proposal concept of Columbus. The results will be demonstrated in a proof-of-concept demo in the Easton Town Center outdoor shopping area in Columbus. The proposed NSF EAGER project UNIFY will build the architecture for SmartShuttle and demonstrate scalability from a small vehicle platform to a passenger car. The NSF EAGER project UNIFY will also be useful for the GCTC action cluster SMOOTH II.

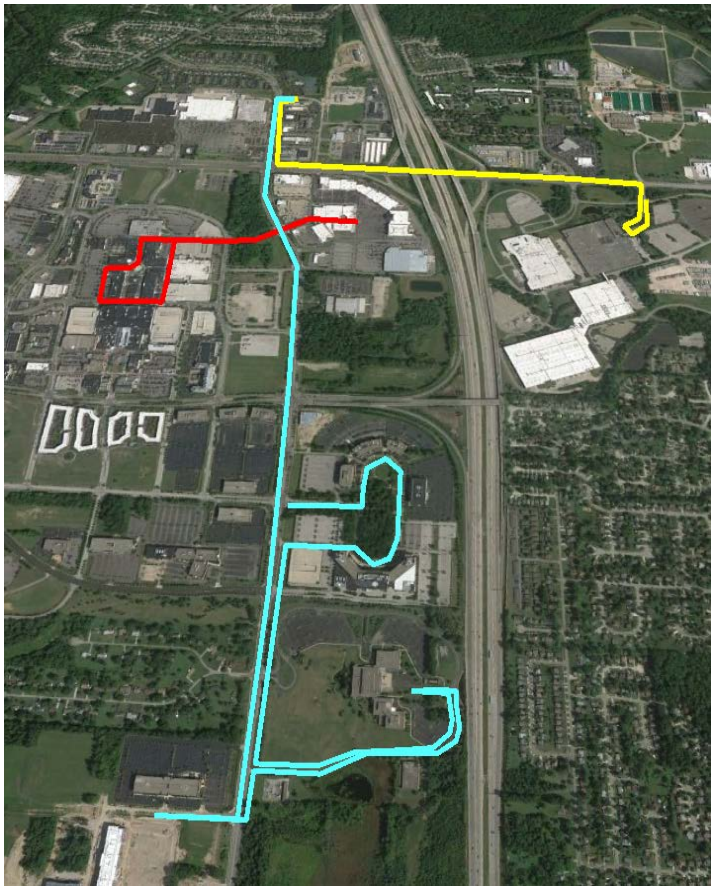
MAIN PARTNERS AND THEIR CONTRIBUTIONS

Ohio State University – Automated Driving Lab at the Center for Automotive Research: research and development of the scalable and replicable architecture, proof-of-concept demo, preparation of the autonomous shuttle, contributor of the two automated driving vehicle platforms and sensors

Easton Town Center: proof-of concept demo site, help with planning and logistics of the demo, in-kind staff support during the demo
City of Columbus: demonstration city for GCTC, results to be replicated at other parts of the city
Innova UEV: manufacturer of neighborhood electric vehicles (in-kind donation) used in demo and project, provides technical support for vehicle automation, provides tracking and on-demand ordering using Verizon 4G/LTE, commercialization partner
Other Cities: developed architecture and solution will be replicated in Portland, Washington D.C., Boston, Greenville (SC) and Madison (WI)

PATHWAY TO TRANSITION

The proposed EAGER project UNIFY will use the GCTC SmartShuttle technical cluster as the pathway to transition from research to real world implementation. The research results of the EAGER project UNIFY will be demonstrated in Columbus first and will then be extended to the other partner cities.



SMART CITY THE CITY OF COLUMBUS ANDREW J. GINTHER, MAYOR

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CURRENT STATE OF THE PROJECT

The GCTC project SmartShuttle has started. Five cities in addition to Columbus are partners with more cities expected to join. We already have a fully automated vehicle (2015 Ford Fusion Hybrid) and are working on the automation of our main vehicle platform (Dash EV). Easton Town Center has agreed to help with the proof-of-concept demos. The Ohio State University, the City of Columbus, the local community and all the other cities involved have shown a high level of support.

ROLE OF NSF FUNDING

Research work on the fundamental problems of the unified architecture, the replicable and scalable automated driving control system, the rating and evaluation system and the demo are needed for the success of the NIST GCTC project SmartShuttle.

The NSF EAGER project UNIFY fills this important gap by concentrating on these fundamental research problems.

NSF SUPPORTED DEMONSTRATIONS AND RELATION WITH GCTC DEMONSTRATIONS

Our two automated vehicles (the Ford Fusion Hybrid and Dash EV) will be used to demonstrate the easy replication of a unified and scalable architecture in two different vehicle platforms of different size. These vehicles will then be used in the Easton Town Center shopping area in a proof-of-concept demo. Further GCTC SmartShuttle demonstrations are planned to follow.

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RESEARCH/DEMONSTRATIONS AFTER THE CHALLENGE

- The proposed NSF EAGER project UNIFY has a duration of two years.
- Its results will be used in later work on the NIST GCTC SmartShuttle project that is expected to continue until 2020.
- All partners of the GCTC SmartShuttle project will continue their involvement in the project after the GCTC.
- While not being a necessary condition, the success of the City of Columbus USDOT Smart City Challenge proposal will help broaden the impact of NSF EAGER UNIFY and GCTC SmartShuttle projects.

GCTC SmartShuttle: A Unified and Scalable Architecture