

Mobility21:

USDOT National University Transportation Center on Mobility

Carnegie Mellon University



<http://mobility21.cmu.edu>

Mobility21

- USDOT National University Transportation Center for Mobility
 - Operational from 2017 with grant through 2021
 - A consortium of Carnegie Mellon, Penn, Ohio State University and the Community College of Allegheny County
- Mobility21 studies and deploys technologies, policies, incentives and training programs for **improving the mobility of people and goods** in the 21st century efficiently and safely.
- Thrusts:
 - connected and automated vehicle technologies,
 - smart city technologies like adaptive traffic signals,
 - real-time traveler information services,
 - preventive maintenance techniques,
 - predictive analytics and
 - alternative modes of transportation like bicycles.



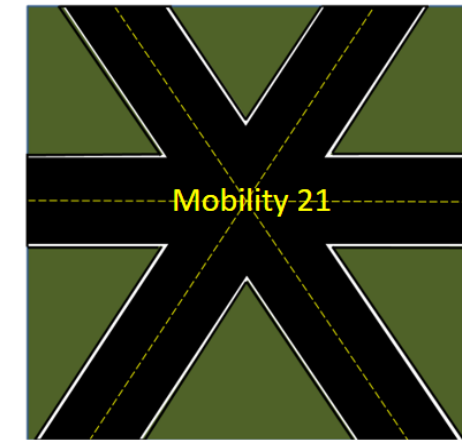
Smart City



Multi-Modal



Novel Transport



Assistive Technologies



Urban Planning



Access to Neighborhoods



Data Modeling

Mobility21 Projects (1 of 2)

Project Title	Lead	Thrust
Analysis of Effects of Tire Tread Deterioration on Safety Impacts from Analysis of Inspection Data	Matthews	Data Modeling and Analytical Tools
Up-to-date city maps for modeling, planning, and assistive technologies	Mertz	
Monitoring and Predicting Pedestrian Behavior Using Traffic Cameras	Navarro-Serment	
Non-Intrusive Driver Distraction Monitoring Using Vehicle Vibration Sensing	Noh	
High-Fidelity Simulation, Emulation and Safety Testing for Autonomous Vehicles	Rajkumar	
A Drive for Better Air Service: How connected and autonomous vehicles influence changes in intercity transportation flows and demands	Ryerson	
Evaluation of Road Monitoring System	Mertz	
Optimizing Snow Plowing Operations in Urban Road Networks	Smith	
Incorporating Uncertainty for Reinforcement Learning of Agent Policies	Lee	
Computer Aided Design for Safe Autonomous Vehicles	Mangharam	
The Intelligent Mobility Meter - Portable Fine-Grained Data Collection and Analysis of Pedestrian, Cyclist, and Motor Vehicle Traffic	Pires	
Intelligent Mobility Meter	Pires	
Estimating Changes in Parking Capacity and Urban Form from Vehicle Automation	Samaras	
Latency-Aware Cloud-Based Route Planning	Rajkumar	Multi-Modal Connections
Building an accessible, low-stress, safe, and sustainable, bicycle infrastructure network for the City of Pittsburgh	Qian	
Data-driven Network Models for Analyzing Multi-modal Transportation Systems	Qian	
User-centric interdependent urban systems: using energy use data and social media data to improve mobility	Qian	
Data-driven Network Models for Analyzing Multi-modal Transportation Systems	Qian	
User-centric interdependent urban systems	Qian	
Universal Transit Assistance	Steinfeld	Novel Modes of Transport
Autonomous Air Traffic Controller	Mangharam	
Transitioning Roadways to Accommodate Connected and Automated Vehicles: A Pennsylvania Case Study	Samaras	Regional Planning and Transportation Priorities
Influence maximization models for network interactions	Lee	

Mobility21 Projects (2 of 2)

Project Title	Lead	Thrust
Low-Cost 3D model Acquisition for Rapid Accident Investigation	Mertz	Smart Cities - Congestion
Safe Intersections and Interactions using Connected Autonomous Vehicles	Rajkumar	Smart Cities - Automation
Bystander Interactions with Failing Vehicle Autonomy	Steinfeld	
Prediction and Behaviors for Driver Assistance and Socially Cooperative Autonomous Driving	Dolan	
SmartShuttle: Model Based Design and Evaluation of Automated On-Demand Shuttles for Solving the First-Mile and Last-Mile Problem in a Smart City	Ozguner	
Busload Detection via Autonomous Sensing	Tomasic	
Proactive Management of Mobility Impact of Interdependent Subsurface	Akinci	
Wearable DSRC Devices for Workers	Akinci	
Analyzing and Defending Cyberattacks on Electric, Hybrid, and AV Battery Systems	Viswanathan	Smart Cities - Electrification
Infrastructure Monitoring for Gradual Damage Detection From an Inservice Light Rail Vehicle	Bielak	Smart Cities - Infrastructure
Integration transit signal priority with adaptive signal control in a connected vehicle environment (2)	Smith	Smart Cities - Mobility
Sensors Know When to, What to, and How to Interact With Human in Vehicles	Dey	
Crowdsourced Traffic Calming	Iannucci	
F1/10 Autonomous Racing Course and Competition	Mangharam	
Understanding and Guiding Pedestrian and Crowd Motion	Ozguner	
Using municipal vehicles as sensor platforms to monitor the health and performance of the traffic control system	Ozguner	
Real Time Traffic Congestion Prediction and Mitigation at the City Scale	Shen	
Risk, Liability and Insurance framework for Autonomous Vehicles	Mangharam	Smart Cities - Policy & Planning
Safer Roads in Snow Storms and for Pedestrians and Bicyclists	Narasimhan	Smart Cities - Safety
Sharing Connected Vehicle Infrastructure for Safety Applications, Smart City and Internet Access	Peha	
Speed Gun App - Increasing Awareness of Urban Speeding	Pires	
Low-distraction Interaction	Shen	
Multimodal Detection of Driver Distraction	Eskenazi	
The built environment and pedestrian safety in the Philadelphia region	Guerra	

Community College of Allegheny County: Transportation Workforce Development

Current Limitations

- Lack of necessary broad hand skills
- Lack of interested young talent
- Competition with other labor markets
- Current secondary career & technology students
- Unfamiliarity with potential job opportunities
- Current community college training programs lack industry direction (advisory boards)

Solutions and Activities

- Incorporated add'l sensor information into advanced electronics courses for automotive technicians
- Included add'l “Verification & Calibration” repair techniques into curriculum
- Added a “Data Analytics Technology” transfer program
- Looking to create an alternative Transportation career track within Mechatronics Program”
- Looking to create an “Intelligent Transportation” degree or certificate

Mobility21 Partners on CAV Technology

- **General Motors:** the GM-CMU relationship is 18-years old
- **USDOT and NSF:** federal sponsors of the research including Federal Highway Administration (FHWA), R&D, Intelligent Transportation Systems (ITS) and NHTSA
- **PennDOT:** CMU influences both policy and pending AV legislation in the state.
 - CMU's premier status in the domain is keenly recognized by PennDOT
- **City of Pittsburgh, County of Allegheny and Pittsburgh Int'l Airport:** Policy and deployment.
- **Smart Infrastructure for CAVs:** testbeds in Pittsburgh, Cranberry, DC and Harrisburg.
- **Smart Belt Coalition:** consortium of Michigan, Ohio and Pennsylvania originally proposed by CMU.

Smart Belt Coalition

A Tri-State Initiative to facilitate and test technologies and policies to facilitate CAV usage in the real world.

Initiated in 2015 by CMU with

- PennDOT, PA Turnpike Commission,
- Ohio DOT, Ohio Turnpike Commission and OSU
- Michigan DOT and the University of Michigan



Attributes:

4 Distinct Seasons

Urban & Rural Roadways

Multi-jurisdictions

Priorities:

Freight

Work Zones

Traffic Incident Mgmt.

2017 Smart Mobility Challenge

- Inspired by the US Smart City Challenge and Adapted to Suburban and Rural Communities
- Themes:
 - Connecting community neighborhoods
 - Peer-to-peer platforms for ride-sharing
 - Enhanced parking services
 - Automated Vehicle, Bicycle and Pedestrian Counting
 - Real-time traffic monitoring and prediction
 - Traffic Impact of Intermodal Rail Terminal
- 26 proposals from 8 neighboring counties
- Awarded over \$400,000 for Research Pilots with 8 Municipalities in 4 counties
- Partners:
 - PennDOT, Pennsylvania DCED, Southwestern PA Commission (Regional MPO), Allegheny Conference on Community Development, and Hillman Foundation

Our Approach: R & D & D

- Research
- Development
- Deployment through partnerships

Tech Transfer



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Rapid
Flow



RoadBotics