Symbiotic Evolution of Application and Networks of Connected and Automated Vehicles: A Case Study of Transportation and Public Safety

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Symbiotic Evolution of CAV Applications and Networks

Vehicle paradigm shift

Individual, human-driven vehicles

Connected, automated vehicles (CAV)

Driving safety

Networked fuel economy optimization

Eliminate up to 90% accidents

8-16% fuel consumption by simple strategies

Continuous evolution of applications & networks

Enabler #1: software-defined platform virtualization

Physical platform

Virtualized platform

Enabler #2: open platform for vehicular sensing

OpenXC-based internal sensing: fuel consumption, emission etc

Camera-based external sensing: surrounding vehicles, pedestrians etc

CAV Application in Public Safety: 3D Mapping

Surveillance

Wayne State University deployment

Driving safety in emergency response

In US alone, >1 fatality per day; 1 officer killed every six weeks; 6 killed being innocent bystanders

3D mapping

CAV network emulation

Vehicle state sensing

Glimpse into future: networks

- From infrastructure networks to infrastructure-less/hybrid networks
- Vehicular sensing and control networks
- Mesh networks for community safety surveillance
- 5G
- Seamless evolution of CAV control networks
- Predictability, security etc
- Research, development, deployment

Glimpse into future: applications

- From 3D mapping to real-time collaborative 3D vision
- From 3D vision to CAV control

3D mapping

CAV network emulation

Vehicle state sensing

Detroit police radio car, 1921