Experimenter Perspective: Towards a Cloud-Assisted Smart Intersection

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WINLAB
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HUMAN DRIVER

~100 million miles / fatality

SELF-DRIVING CARs

Billions of miles / fatality
Connectivity Enables Foresight Through Road Data Sharing

Analysis of Near-Accidents / SW Updates

Live HD Maps and Point Clouds

Real-time Sharing
BigRoad

Mileage Goal
1,000,000,000

\[ \frac{\text{Mileage / Year}}{100,000} \times \frac{\text{Vehicle Num}}{100,000} = \text{Years} \]

100

Years
Connectivity Enables Foresight Through Road Data Sharing

- Real-time Sharing
- Live HD Maps and Point Clouds
- Analysis of Near-Accidents / SW Updates
Eliminating Blind Spots with Intersection Sensor Sharing
Sharing Rich Sensor Data over V2V

Leader Point Cloud

Blind Spot

Follower Point Cloud

Merged Point Cloud

Car Detected by Leader

w/ R. Govindan (USC)
Edge-assisted Intersection Model
Tethered design in high-quality VR systems

Can we cut the cord?

- Inconvenient
- Limited mobility
- Hazards
Contribution of our system

- We design an untethered VR system that is able to achieve both low-latency and high-quality requirements over a wireless link.

- Remote VSync Driven Rendering
Scalable Vehicle-2-Vehicle Communication Simulator (CAMP VSC3, USDOT)

400 DSRC Transmitters
Traffic Jam Scenario
Developing Model and Robust Protocols for Real Road Environments (CAMP VSC6, USDOT)
**COSMOS:** Sensor Sharing Experiments

**Vehicular Sensor Sharing** and automated driving
- Experiment involves multiple mobile nodes, high BW/low latency wireless access and multiple levels of cloud processing
- Real world traffic and network conditions
- Outcomes include evaluation of system performance and application demo

Automotive Research: Rich Sensor Sharing and Orchestration for Robust Automated Driving

- Collection and Analysis of Near-Accidents
- Live Merged Point Cloud and Guidance
- Cloud analytics
- Edge computing resources
- mmWave access network and direct communications