Inter-Vehicular Communications: Quo Vadis?

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Inter-Vehicular Networking – Past Decade

Industry

- FCC Spectrum Allocation for DSRC
- Demos
- SAE J2735 Message Set
- IEEE 802.11p
- IEEE 1609.4 Channel Switching
- IEEE 1609.2 Security v2
- SAE J2945.1 Minimum Op Req

2004

- Multi-hop Ad Hoc Nets
- Security & Privacy
- Scalable Protocols (for High Density)

2010

- Channel & Mobility Models / Simulators

Academic Research

WINLAB
Intelligent Transportation System Applications

- Key application for deployment of mobile wireless ad hoc networks
- Compelling application: Vehicular accidents account for ~30,000 fatalities/yr (in US)

- Automotive safety
  - Extended Electronic Brake Light
  - Blind Spot Warning
  - Intersection Collision Avoidance

- Efficient Pricing and Payment
  - “Pay-as-you-drive” insurance
  - Highway tolls
  - Gas station payments

- Entertainment
  - Video, Web, Gaming

- Congestion Management
  - Real-time traffic information
  - Improved information for traffic engineering

- Point-of-Interest Queries
  - Finding nearby hotels, gas stations; travel guides, local entertainment

- Fleet management
  - Tracking fleet of company vehicles

Key Applications

Add-on Applications
Traffic Monitoring with Probe Vehicles

Traffic Estimation Service

Cellular Service Provider

GPS Positioning

Traffic Information
Berkeley Experiment (100 cars) with Mobile Phones
Michigan Safety Pilot and DOT Rulemaking

MODEL DEPLOYMENT SITE PLAN: ANN ARBOR, MICH.

- Primary Model Deployment Routes
- University of Michigan Campus/Medical Center (Primary Driver Recruitment Area)
- Proposed Curve Warning Locations
- UMTRI Facilities (Showcase, Facilities, Equipment and Data Storage)
- Roadside Equipment Co-Located with Freeway ITS Installation
- Roadside Equipment Co-Located with Actuated Traffic Signal
- Roadside Equipment/SPaT-Enabled Traffic Signal
- Prototype Solar/Cellular Roadside Equipment Installation

WINLAB WIRELESS INFORMATION NETWORK LABORATORY
Short-term apps: Parking Information and Payment?

- Parking Availability
- Estimation
- Wireless Service
- Valid Parking Spot Map

- Rangefinder + GPS

Sensor car driving by
Vacant spot
Parked car
Parked car

ACM MobiSys 2010
Towards Supervisory Driving

• Vehicles and mobile devices increasingly use cameras as sensors
• Opportunities for enhanced vehicular networking services
  • Alternate communication channel
  • Enhanced Localization – augmented reality
Summary

Short-term goals
- Rally around requirements of a compelling day-0 application
- Make DSRC part of a compelling in-car app platform

Longer-term goals
- Scaling beyond vehicles (communication with pedestrians?)
- Localization and communication to support supervisory driving
Thank you