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Inter-Vehicular Communications: Quo Vadis?

Marco Gruteser
WINLAB, Electrical and Computer Engineering Department

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

2010

Multi-hop Ad Hoc Nets

Security & Privacy

Scalable Protocols (for High Density)

Channel & Mobility Models / Simulators

Academic Research

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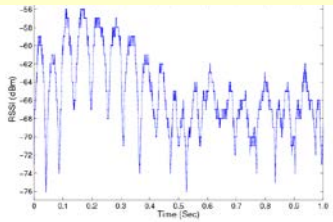
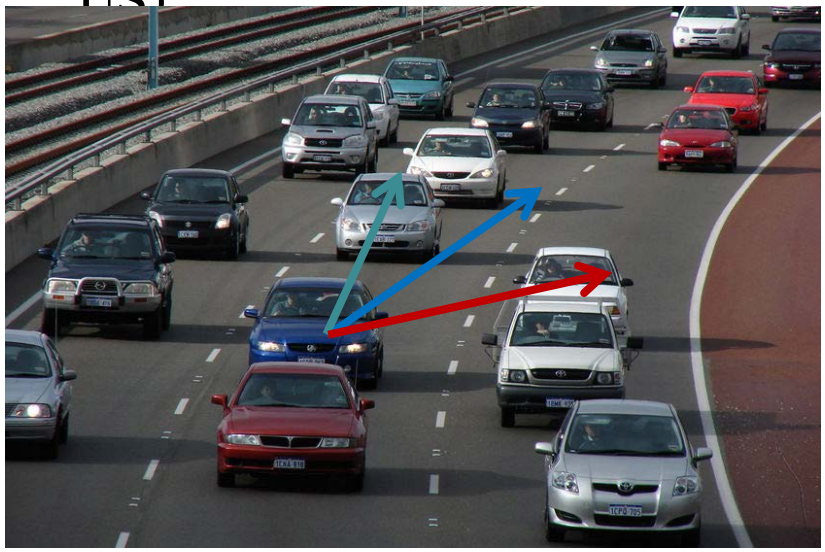


Intelligent Transportation System Applications

- 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

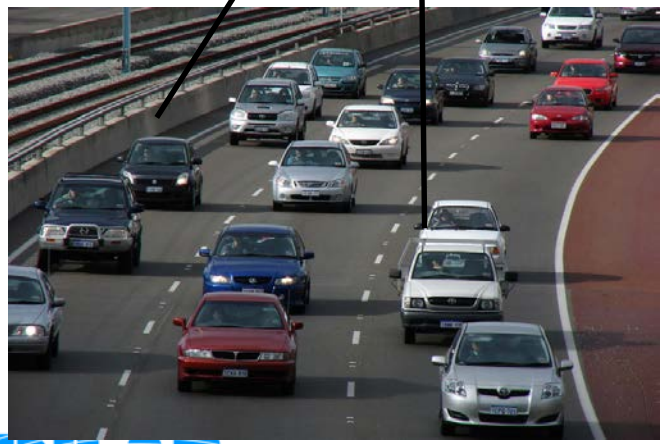
Add-on Applications

Traffic Monitoring with Probe Vehicles

GPS Positioning

Traffic Estimation Service

Cellular Service Provider



Traffic Information

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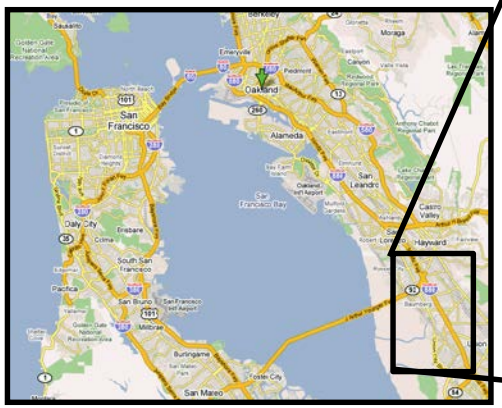
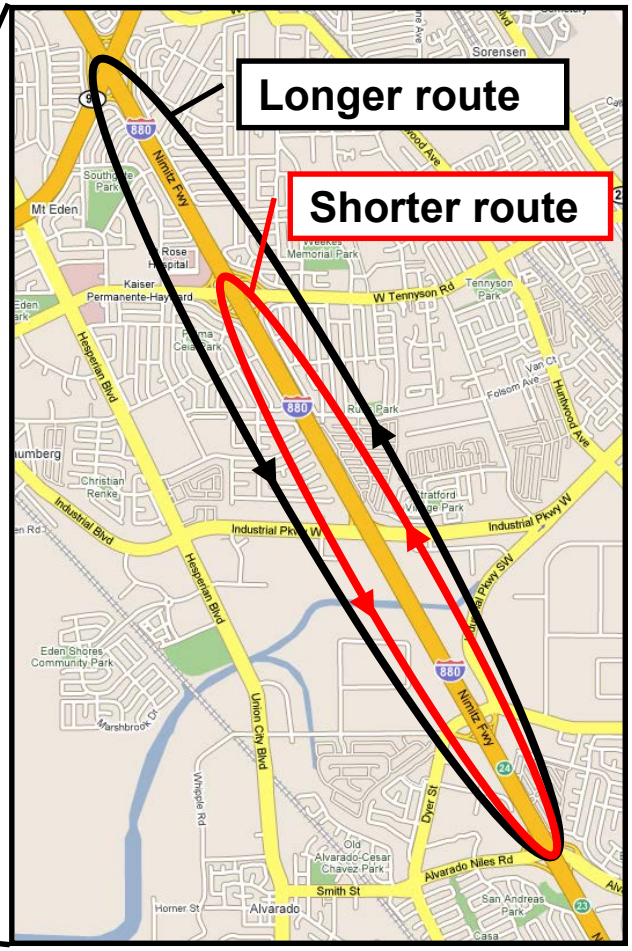
Berkeley Experiment (100 cars) with Mobile Phones





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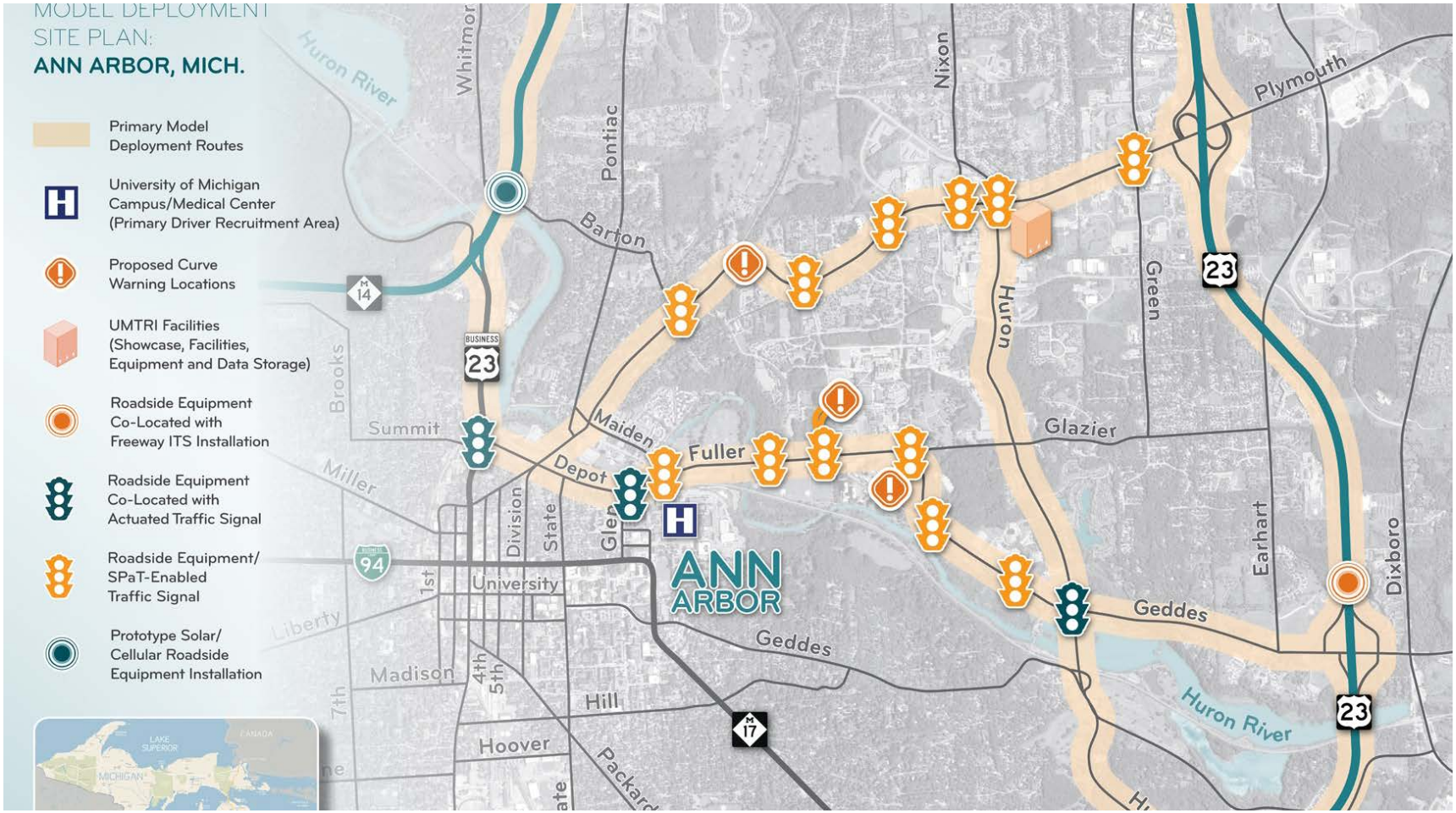
Michigan Safety Pilot and DOT Rulemaking



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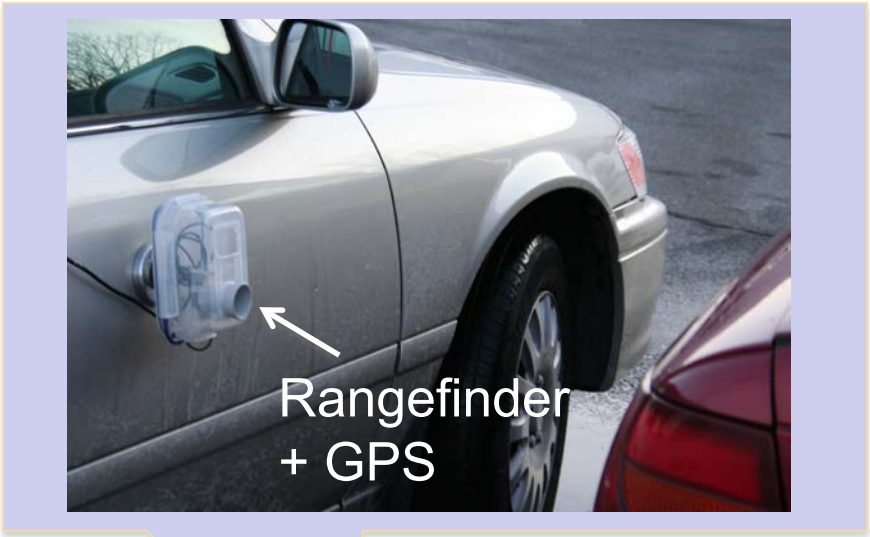
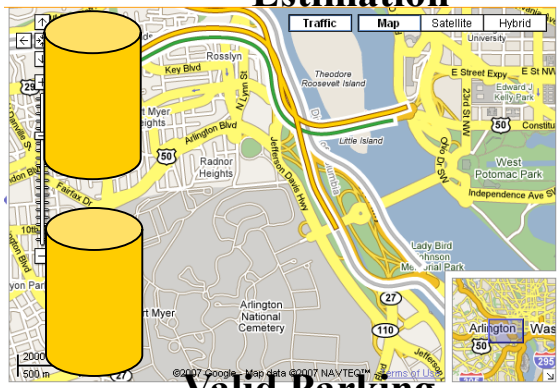
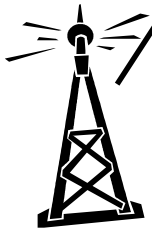
Short-term apps: Parking Information and Payment?



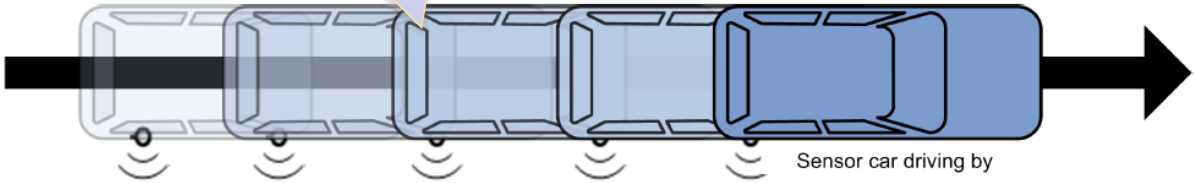
Parking Availability Estimation

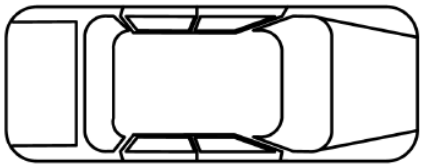


Valid Parking Spot Map

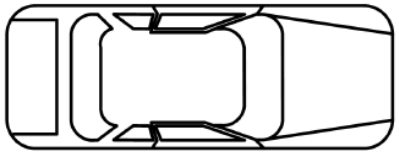


Wireless Service





Vacant spot



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

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Thank you