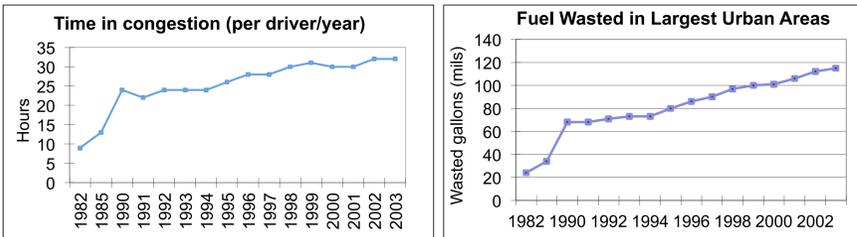


Motivating Problems

Traffic mitigation



Closed-loop design of next-generation vehicles, smart transportation systems, and safe vehicular technologies

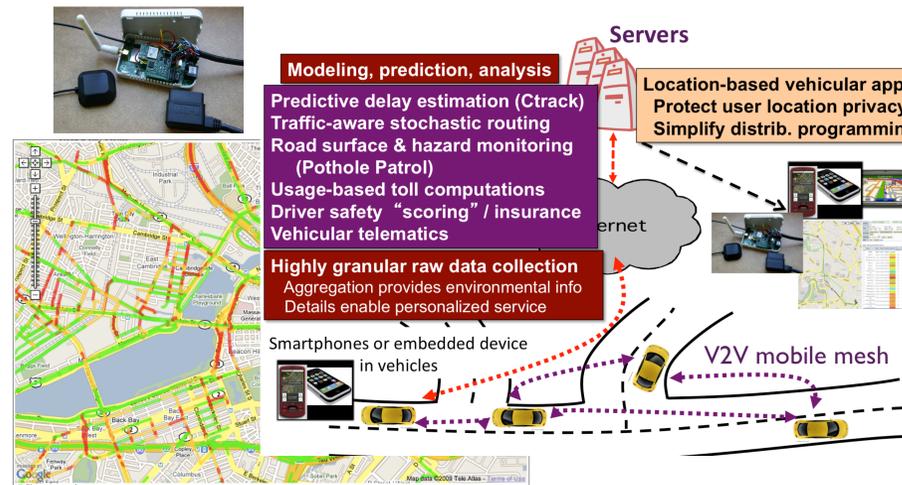
Low-cost vehicular telematics & monitoring of road and civil infrastructure

Privacy-preserving vehicular services: tolling, personalized insurance, law enforcement



Approach

- Capture data from in-car smartphones and OBD-II & CAN-capable embedded devices
- Deliver to server for processing & analysis
- Variety of processing algorithms over data
- Users/apps get anonymized results of processing via Web and mobile phone interfaces



Potential Impact

- Dramatically reduce time spent by drivers in traffic
- Accurate map matching and delay modeling
- Identify the best route and time to travel
- Provide accurate travel-time estimates
- Assess environmental impact by providing accurate fuel and emissions tracking
- Detect potholes and other road anomalies to notify drivers and municipalities of road hazards
- Relay intelligible telematics information to various parties (drivers, insurance companies, etc.)
- Develop mobile tolling protocols
- Reduce bar to developing secure vehicular CPS apps

Overview

- CarTel is a mobile cyber-physical system for collecting and processing data from vehicular devices
- Goals: 1) reduce time spent in traffic, 2) improve road safety, and 3) develop driver behavior and road safety models using mobile telematics
- Enabled by new advances in wireless, sensing, embedded/mobile computing, and actuation technologies
- Key applications:
 - Traffic measurement, prediction, and reporting
 - Personalized commute analysis, route planning
 - Telematics and fleet management
 - Usage-based Insurance (UBI)

Key Technologies

- Algorithms for analyzing data from individual cars to produce:
 - Accurate traffic delay estimates using mobile crowdsourcing & delay predictions
 - Traffic-aware stochastic and dynamic routing to *minimize risk* of being late
 - Locations and magnitudes of potholes, road anomalies, and models of safe driving behavior
- Privacy-preserving protocols for data collection and aggregate computations (tolling, insurance)
- Vehicular wireless networking protocols
- Secure and safe mobile/embedded software using *MacroUpdate* service, *Code In The Air*, and *LifeJoin* frameworks for distributed programming

Results

Real-world Deployment

- On green taxi fleet in Boston
- Small in-car computer
- iCartel (iPhone application)

Partnerships

- Ford, PlanetTran, insurance co.

