

When Will Vehicular Computing Become Pervasive?

Liviu Iftode

Department of Computer Science,
Rutgers University

PerTrans'07 Panel

White Plains, March 23, 2007

Vehicular Computing: Myth and/or Reality?

- **Myth**: a **real** application domain for mobile ad-hoc networking
- **Reality**: still a remote **dream**

- What are the killer applications?
- What are the solutions?
- Who are the players?
- What are the challenges?
- What are the barriers?

What are the Applications?

- **Safety**
- **Transportation**: route planning and congestion avoidance
- **Entertainment**
- Who takes the driving seat?

What are the Solutions?

- Autonomous
 - Car-to-Infrastructure
 - Car-to-Car
 - Car-to-Internet
-
- No single solution fits all application domains
 - Merit criteria: cost-effectiveness, robustness, security, deployment and maintenance cost

What are the Players?

- **Auto-makers** – focus on safety
 - **Government** – focus on transportation issues
 - **Cellular providers & Google** – focus on location-aware services and advertising
 - **Academia** – what is left?
-
- Does academic research really count?
 - Who sponsors whom?

What are the Challenges?

- Incremental deployment
- Real-time and reliability
- Security and privacy
 - Car viruses
- Driver-computer interface
- Evaluation methodologies
 - ns-2 simulations not enough
 - Realistic testbeds too expensive
- Maintenance
 - Who will train the auto mechanics to become software-literates?
 - Self-maintainable, self-healing software running on cars?
 - Huge hidden costs are likely
 - Next research challenge in VC?

What are the Barriers?

- Liability
- Competition among auto-makers
 - business model not clear
- Policy/Law makers: slow
- Current technology limitations: DSRC, GPS
- Limited funding
- Slow penetration of pervasive computing in general

History of Visual Signaling

- **Brake lights**: introduced in 1915
- **Reverse lights**: invented in 1921, mandated in the 1960s
- **Turn signals**: invented in 1907, introduced by Buick 1938
- **Central brake light**: invented by a psychologist (John Voevodsky) in 1974, mandated in 1986 (US, “Dole lights”), 1990 (Australia) and 1998 (Europe)

Outrageous Perceptions about Vehicular Computing?

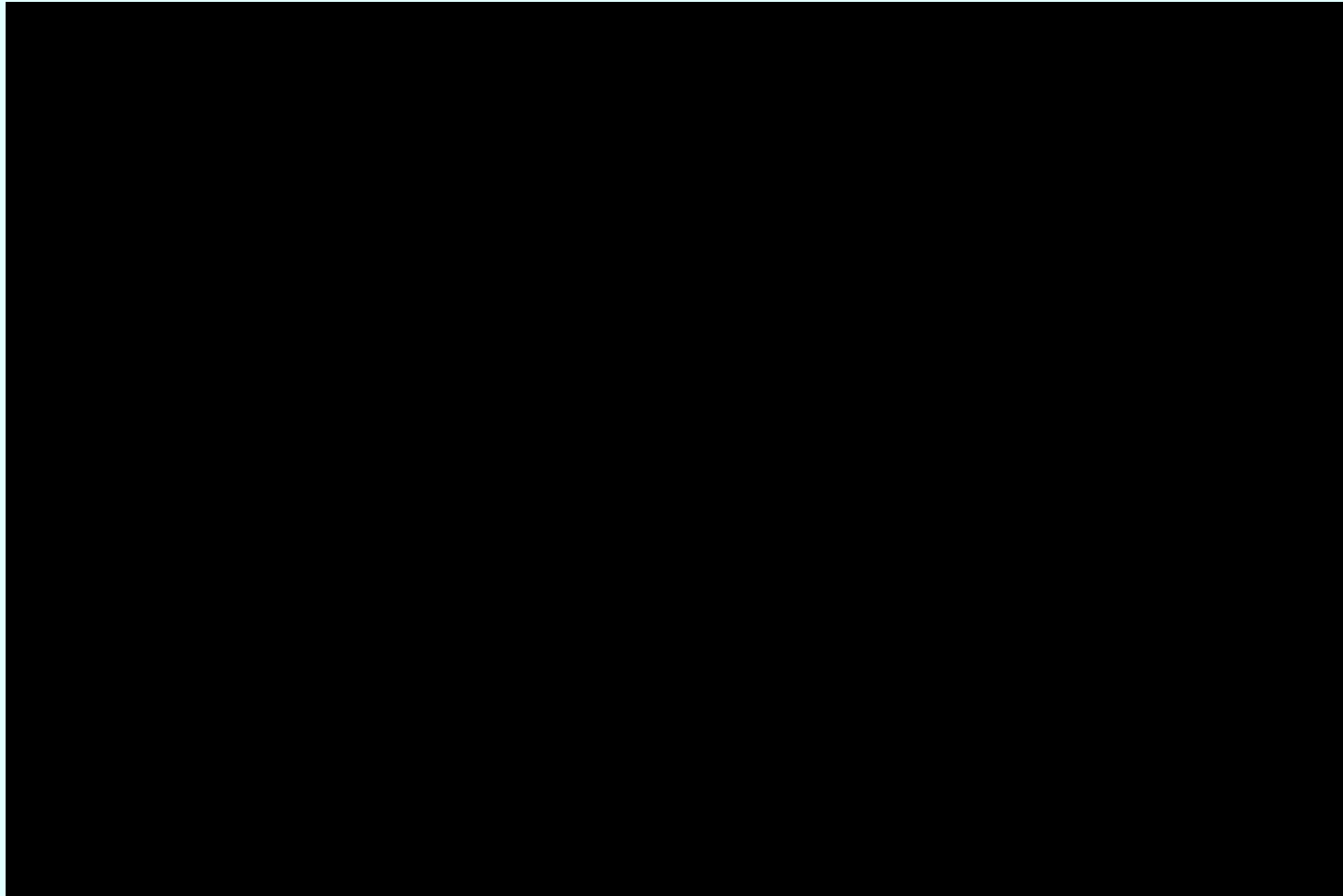
- **Too much research**: irrelevant, redundant and low quality
- **Too many conferences**: VTC, ITSS/ITSC, ITSS/IV, 2xVanet, V2VCom, ESCAR, PerTrans, Ubiroads, WiVEC, etc.
- **Little collaboration** between industry and academia
- **Three different regional approaches**: Asia, Europe and U.S.

Vehicular Computing Research in DisCo Lab at Rutgers

- Safety: **Trafficview** (MDM'04, ACM MC2R'04)
 - V2V multi-hop wireless communication, GPS, OBD, maps
 - Displays the traffic ahead and issues safety warnings
- Route Planning: **Vehicular Information Transfer Protocol (VITP)** (Vanet'05)
 - Application protocol for location-oriented services for vehicles on the road based on V2V communication
- Security: **Probabilistic Validation of Data Aggregation** (Vanet'06)
 - Use a tamper-proof service architecture, buffering and random checks to validate data aggregation between untrusted cars

<http://discolab.rutgers.edu/traffic>
Supported in part through NSF CNS-0520123

TrafficView Demo (3 mins)



Back to the Panel

- **Vinny Cahill**, Trinity College, Ireland
- **Marco Gruteser**, Rutgers University
- **Ken Laberteaux**, Toyota Technical Center
- **Tamer Nadeem**, Siemens Corporate Research
- **Chandra Narayanaswami**, IBM Watson

Questions

- What are the killer applications?
- What are the solutions?
- Who are the players?
- What are the challenges?
- What are the barriers?