Automated Driving development in France: 2015 update

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Past and future projects

What has changed

• A few key labs were involved
  – Inria, IFSTTAR, MINES ParisTech, UTC, LASMEA…
  – European projects: Cybercars (1 & 2), CityMobil (1 &2)…
  – French projects: MobiVIP, CityVIP, ABV…
  – Techno-driven or Transportation driven

• Car manufacturers and OEM mainly outside

• Now this has changed
  – Industry heavily implied
  – Government and research agencies pushing for coordination

• Labs have adjusted
Current picture in France

• Funding shift
  – More industrial money and less public funding

• Research themes closer to the industry
  – Proof of concepts (e.g. cybercars) is not needed anymore
  – Performance is key and metrics are discussed
  – Validation matters: large scale experiments or simulations
  – Architecture, component standardization…

• Leading to a different research approach
  – Trend to re-use platforms or soft from previous research
    • Start-ups are popping up (simulation, communication…)
  – More cooperation for advanced research
  – Academic networks better organized with the industry
Research

• Restructuring:
  – Those with real vehicles and the others
  – Funding changes
  – Alliances

• VeDeCom Institute
  – PPP: 60 M€ public funding + 60 M€ private funding
  – Peugeot, Renault, Valeo, Safran, etc. partners
  – Inria, IFSTTAR, MINES ParisTech, UTC, etc. partners
  – ITS WC Demonstrations
Industry

• Private plans expending
  – PSA experimenting automated cars on public roads
  – Renault working with Nissan
  – Valeo demonstrations (CES2015)
  – Other players: AKKA, Ligier…
  – Start-ups companies (YoGoKo…)

• Collaborations
  – VeDeCoM
  – Partnerships (e.g. PSA+Valeo+Safran)
  – Support from government
Governement

- Research support
  - Basic research (ANR)
  - Applied research (BPI)
  - PPP incentives (e.g. VeDeCoM)

- NFI (Nouvelle France Industrielle)
  - Testing and deployment support (funding)
  - Legal changes
  - High-level support (Carlos Ghosn leads it)

- Delayed Competitions
  - Announced last year: ("défi") Viviane for Automated Driving
Chairs

2 examples at MINES ParisTech

• Chair Drive for You
  – Open research, international, dissemination
  – PSA + Valeo + Safran (3.7 M€)
  – MINES ParisTech + UC Berkeley/PATH + EPFL + SJTU
  – Europe + America + Asia testing
  – Focus on urban autonomous driving (getting social)
  – Research themes:
    • Maps, pedestrian, robust control, cooperative planning

• Chair for Urban Logistics
### Drive for You

#### Criteria that have to be balanced vs. Related properties of the system

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<thead>
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- **Safety**
  - Efficiency (traffic)

- **Planning**
  - Reactivity
  - Resilience

- **Centralized**
  - Distributed
  - Scaling, autonomy, short reaction time

- **Homogeneous**
  - Heterogeneous
  - Scaling, standardization

- **Cooperative**
  - Self-optimized (egoistic)
  - Social behavior, fairness, autonomy

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Paper ITS-2794: *Autonomous driving at intersections: combining theoretical and practical approaches*
Research (continued)

Trends in the funding and organization

• European and French funding still continue:
  – For standardization, validation (FoT)…
  – For hard research problems

• Direct industry contracts (as usual)
  – no information

• A diversifying industry also for public transport
  – E.g. Navia shuttle, BestMile services…
  – It is going global
AutoNet 2030

Facts and figures

• **Full title:** Networked Automated Driving by 2030

• **Partners:** SCANIA, CRF, Hitachi, BaseLabs, EPFL, ICCS, TU-Dresden, Armines/MINES ParisTech/Inria, *BroadBit*

• **Starting Date:** November 1, 2013
• **Ending Date:** October 31, 2016

• **Budget Total/Funding:** 4.6 MEUR / 3.3 MEUR
• **Type of project:** European project, STREP
AutoNet 2030 Objectives

• Motivation: Convergence between sensor-based vehicle automation and cooperative V2X communications

• Objectives:
  – Maneuvering control algorithms for cooperative automation
  – Specifications of V2V messages for automated driving
    To be contributed into ETSI ITS standardization
  – Development of an architecture for complex cooperative control
    Experiments and demonstration on test sites.
Expected impact

• Measurable improvements on
  – safety: maneuvering control algorithms
  – energy efficiency: cooperative speed planning (less traffic flow fluctuations)

• by demonstrations in several test sites (Björkvikring, Versailles, Turin) and simulations
AutoNet 2030 Assumptions

• V2X Communication is widespread
  – so that there will be cooperative vehicles (and infrastructure)
  – Other vehicles are called *legacy vehicles*

• There will be good sensing and data sharing
  – Accurate maps are assumed (LDM)

• Vehichles *can* be automated:
  – There are cooperative automated vehicles
  – And cooperative manually driven vehicles
  – You can drive your (potentially automated) vehicle
Hybrid coordination approach

A hierarchical system

- Partially distributed
  - Short reaction times, scalability
- Partially centralized
  - Coordination, global functions (e.g. navigation)

- Several level of coordination in automation
  - Fully in platoons: very tight control, strict requirements
  - More independence in Control Areas
  - Independence if alone

- Information distribution reflects these levels
Structures

Structures for Coordination Levels and Information Exchanges

• Local and global cooperative areas:
  – Platoon, Convoy: tight coordination and data synchronization
  – Control area (dynamic/static): control recommendation
  – Different in cities (junctions, static) and highways (dynamic)
Challenges

• What is the hierarchy of tasks?
  – Specific role of each structure
    • In distributed data fusion
    • In control and maneuver coordination
  – Is the system distributed within a structure?
  – Is it distributed among structures?

• A research effort is ongoing to understand
  – How information should be distributed
  – How to combine distributed and centralized control

• Definition of what is cooperative maneuvering
  – And what are the messages to be exchanged (standardized)
Conclusion

• Driving automation (Cybercars, Self-driving cars…) is starting
• When massive, this will lead to coordination problems
• AutoNet 2030 is a European effort to better understand
  – How to coordinate maneuvers
  – In a hybrid, scalable approach
• AutoNet 2030 will contribute
  – To increase our understanding of cooperative maneuvering
  – Help define the necessary structures
  – Contribute to standardization by proposing terms and coordination mechanisms
Thank you

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