Intuitive Driving:

Are We There Yet?

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Outline

- Motivation Towards Connected/Automated Driving
- Valeo’s Technologies and Perspective
  - Automated Driving
  - Connected Car
  - Intuitive Control
- Intuitive Driving
- Fostering Innovation
Active Safety and Automated Driving

Two faces of the same coin

Ability
to determine and understand the driving situation
and act accordingly

Active Safety
System takes over in case of emergency
Overriding the Driver
Aiming for safety increase
Limited to a short time period

Automated Driving
System takes over in case of delegation by the driver
Relieving the Driver
Aiming for enjoyment increase
Mid or long term time periods

Safety reached by automation
Automation leading to safety

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Valeo
Motivation: Accident Statistics

IIHS and NHTSA Reports – 2010

- Estimated **1.8M accidents** that occur annually could have been mitigated by active crash avoidance safety systems.

- **Driver Distractions** resulted in **17%** of all accidents. The risk of getting into a crash increases **3x** due to manual-visual tasks by the driver - 2012

- **Accidents at Intersections** resulted in **7,300 fatalities**.

Can these accidents be mitigated by connected / automated driving?
Motivation: Urban Mobility

- Texas A&M Transportation Institute Report - 2012

- **Driving delay** per auto in the US is on average **38 hrs/year**.
- **CO₂ emission** per auto during congestion is **380 lbs/year**.

Could these effects be alleviated using connected / automated driving?
Motivation: Consumer Ratings and Legislation

 **NCAP:**

   **US NCAP:** Since 2011, LDW and FCW will be identified for new vehicles when rated by NHTSA.

   **Euro NCAP:** Active safety features will be gradually added to the star rating starting in 2014.

   **Other Major Region NCAPs:** Similar activities under development.

 **NHTSA:**

   Issued voluntary driver distraction guidelines - 4/2013

   Issued guidelines for automated driving (5 levels) – 6/2013

   US DOT to move forward with V2V for Light Vehicles – 2/2014

“On the topic of V2V and driver distraction, NHTSA is positioned to be pro-active, not reactive; to provide stability not uncertainty”

*NHTSA Press Release at 2014 CES*
Understanding the Driving Environment

- Maneuvering
- Urban
- Cruising
Driving Environment

**Maneuvering Assistance**
- **Host Path:** Omnidirectional
- **Host Speed:** 6 km/h – Walking Pace
- **Range:** 6 m
- **Relevant Objects:** Mostly Stationary, Parked Cars, Trees, Curbs, Pedestrians

**Urban Assistance**
- **Host Path:** Forward & 90°Turns
- **Host Speed:** 50 – 120 km/h
- **Range:** 50 – 120 m
- **Relevant Objects:** Cars at all speeds (moving & parked), Pedestrians, Infrastructure, Traffic Signs & Lights

**Cruising Assistance**
- **Host Path:** Forward & Lane Change
- **Host Speed:** 120 – 200 km/h
- **Range:** 120 – 250 m
- **Relevant Objects:** Moving cars (same direction), Road border/Lines, Speed Signs

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Sensor Fusion Technologies: Where is Valeo Today?

- Necessity for **perception** and **ranging**.
  - Vision systems as reference to what the human perceives.
    - Also provide „every day value“ through enhanced visibility.
  - Radar, Lidar, IR and Ultrasonics to complement the human senses.

- Sensor fusion takes care of functional safety through redundancy.
  - Fusion map development utilizing odometry data from real case studies.
Sensor Technologies: Scalable Portfolio

Offering a complete and scalable portfolio for Safety & Automation
Sensor Fusion: Proposed Architecture

Fusion ECU as Core Element
<table>
<thead>
<tr>
<th>Year</th>
<th>Innovation</th>
<th>First in</th>
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<tbody>
<tr>
<td>1990</td>
<td>Ultrasonic Park Assist</td>
<td>1991</td>
</tr>
<tr>
<td>1995</td>
<td>Ultrasonic Park Assist</td>
<td>1991</td>
</tr>
<tr>
<td></td>
<td>Mirror-integrated Rain Sensor</td>
<td>1995</td>
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<td></td>
<td>Steering Angle Sensor for ESC</td>
<td>1995</td>
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<tr>
<td>2000</td>
<td>LaneVue®</td>
<td>2004</td>
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<tr>
<td>2005</td>
<td>5-Camera System</td>
<td>2009</td>
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<tr>
<td>2006</td>
<td>Multi-Beam Radar</td>
<td>2006</td>
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<tr>
<td>2009</td>
<td>Cross Traffic Alert</td>
<td>2009</td>
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<tr>
<td>2010</td>
<td>FlankGuard</td>
<td>2011</td>
</tr>
<tr>
<td>2013</td>
<td>Park4U® with comfort braking</td>
<td>2013</td>
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<tr>
<td></td>
<td>Park4U® 2.0 (braking)</td>
<td>2010</td>
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<tr>
<td></td>
<td>ParkVue®</td>
<td>2006</td>
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<tr>
<td></td>
<td>360Vue®</td>
<td>2010</td>
</tr>
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Automated Valet Parking
Connected Car:

Towards Connected Car

**CAR NETWORK**
- Remote Parking
- Hands-Free Trunk opening
- Remote Conditioning
- Tire Pressure Monitoring
- Passive Entry Passive Star
- Remote Keyless Entry
- Hands-Free Call
- Phonebook Synchronization
- Screen Replication

**OUTSIDE WORLD**
- Traffic Monitoring
- Local Danger Alert
- Toll Gates Paying
- Cloud-based Content & Apps
- In-Car Internet Access
- PAYD Insurances
- Remote Diagnostic
- Weather Forecasts &POIs
- Stolen Vehicle Services
- Emergency & Breaking Call

**USER NETWORK**
- Connectivity Hotspot
- Smartphone-Based Access
- Wireless Charging facilities
- Smartphone-Based Content

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Intuitive Controls: HMI

- Unique HMI solutions leading to Safe and Intuitive Interactions:
  - Gesture, Haptic, HUD/AR
  - Driver Monitoring:
    - Identification
    - Driver Distraction & Drowsiness
    - Advanced HMI
Intuitive Driving – The Three Pillars

1. Automated Car
   - Park4U® Remote
   - 360 Vue® 3D
   - Lane keeping
   - Driving, Parking and Access

2. Connected Car
   - Remote control and Access

3. Intuitive Controls
   - Display, control & connect

Intuitive Driving for safe and connected mobility, while reducing CO₂ emissions
Research & Development

North America
7 Research and Development Centers

South America
4 Research and Development Centers

Europe (incl. Africa)
16 Research Centers
19 Development Centers

Asia
4 Research Centers
12 Development Centers
Fostering Innovation

Valeo Innovation Challenge

- Contest open to students and academic institutions worldwide.
- More than 600 teams.
- U.S. Entries: 25

Prize:

- 1st Place: $135k
- Finalists receive two invitation to 2014 Paris Motor Show.
- Winners Announced at the show.

valeoinnovationchallenge.valeo.com