The Audi Piloted driving philosophy

“When it’s fun to drive, I drive myself.”

“When I no longer want to drive, I leave it to Audi.”

— Ricky Hudi
Head of Electrics and Electronics
AUDI AG
Building blocks | Today’s driver assistance systems

- **Longitudinal**
  - Adaptive Cruise Control
  - Pre Sense Plus

- **Lateral**
  - Active Lane Assist
  - Side Assist

- **Parking**
  - Park Assist
CES 2014 | Audi Traffic Jam Pilot

Longitudinal
- Adaptive Cruise Control
- Pre Sense Plus

Lateral
- Active Lane Assist
- Side Assist

Parking
- Park Assist

Piloted Driving
- Traffic Jam Pilot
- CES 2014
CES 2014 | Audi Piloted parking

- Longitudinal: Adaptive Cruise Control, Pre Sense Plus
- Lateral: Active Lane Assist, Side Assist
- Parking: Park Assist

- Piloted driving: Traffic Jam Pilot, CES 2014
- Piloted parking: CES 2014
Research into Piloted driving

- **2005**
  - **ERL - Stanford**
    - “Stanley”
    - DARPA Grand Challenge
    - Desert driving
  - **ERL - Stanford**
    - “Shelley”
    - Pikes Peak Hill Climb
    - Mountain course at speed

- **2014**
  - **AUDI AG**
    - “Traffic Jam Pilot”
    - 2014 CES
    - Series production
History of Piloted driving

- Video Link
  - https://www.audi-mediaservices.com/publish/ms/content/en/public/webvideo/2014/01/24/Audi_-_zFAS.html
Pursuing parallel paths to the future

**Research**

ERL – Stanford – VW Group
Targets: Researching maneuvers at speed, city driving, HMI

**Series production**

AUDI AG
Targets: Piloted parking, Piloted driving in traffic jam freeway conditions
An evolution in sensing

Audi A7 Sportback
Driver assistance systems
09/10

Front camera
• Audi active lane assist
• ACC stop & go
• Speed limit display
• Audi pre sense / front / plus
• Audi adaptive light with variable
  headlight range control

Ultrasonic side sensors
• Parking assistant

Rear camera
• Parking system advanced with rear view camera
• Parking aid with rear view camera

Ultrasonic rear sensors
• Parking aid
• Parking assistant

Ultrasonic front sensors
• ACC stop & go
• Parking aid
• Parking assistant

Infrared camera
• Night vision assistant
• Pedestrian protection

Front radar sensors
• ACC stop & go
• Audi pre sense / front / plus

Front radar sensors

SARA sensor
• ESP
• Audi pre sense basic

Crash sensors
• Front protection adaptivity
• Side protection
• Rear impact protection
An evolution in computing

Traffic Jam Assist | CES 2013 → Traffic Jam Pilot | CES 2014
The pace of technology

“Piloted driving will become a reality this decade.”

— Rupert Stadler,
Chairman and CEO
AUDI AG
Traffic Jam Pilot | A system for convenience, that is safe

• How do we extend the push-to-activate functionality of Traffic Jam Pilot to more situations?

• How to extend an always-on safety system like Pre Sense Plus to more situations?
The Challenge is testing

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Simulators
Automated driving laws vary state-by-state

Current Status
- Passed
- Under Consideration
- Failed

- From Stanford Law Fellow Bryan Walker Smith
Japan | Uniform guidelines for testing
Sweden | Allowing user studies
Automated driving for Safety

“Human error is the critical reason for 93% of all U.S. accidents.”

— From NHTSA 2008 National Motor Vehicle Crash Causation Survey
Vision Zero

- ABS
- ESC
- Pre Sense Plus
- ... 

- Parking pilot
- Traffic jam pilot
- ... 

- Active Safety
- Passive Safety
- Automated Driving
- Advanced Driver Assistance Systems

- Air bag
- Seat belt
- Crumple zone
- Rigid passenger cabin
- ...

- Adaptive cruise control
- Lane departure warning
- Lane keeping assist
- Blind spot detection
- Forward collision warning
- Dynamic curve light
- High beam assistant
- Traffic sign recognition
- Pause recommendation
- Traffic jam assist
• 1st Gen Piloted systems are going into series production

• To make further inroads into Safety requires overcoming challenges in testing.

• Progress to Vision Zero has already started
Electronics Research Laboratory

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