



Automatic Queue Assistance to Aid Under-loaded Drivers

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Outline

1. Project Background

2. Automated Queue Assistance (AQuA) Overview

- a. Addressed Problem
- b. Function Overview

3. Sensors

4. Sensor Fusion

5. Summary

Demonstration vehicle



Project Background

- Automated Queue Assistance (AQuA)
- A work package of HAVEit, an EU FP7 project
- Duration February 2008 – July 2011
- Project partners: OEMs, sensor suppliers, universities

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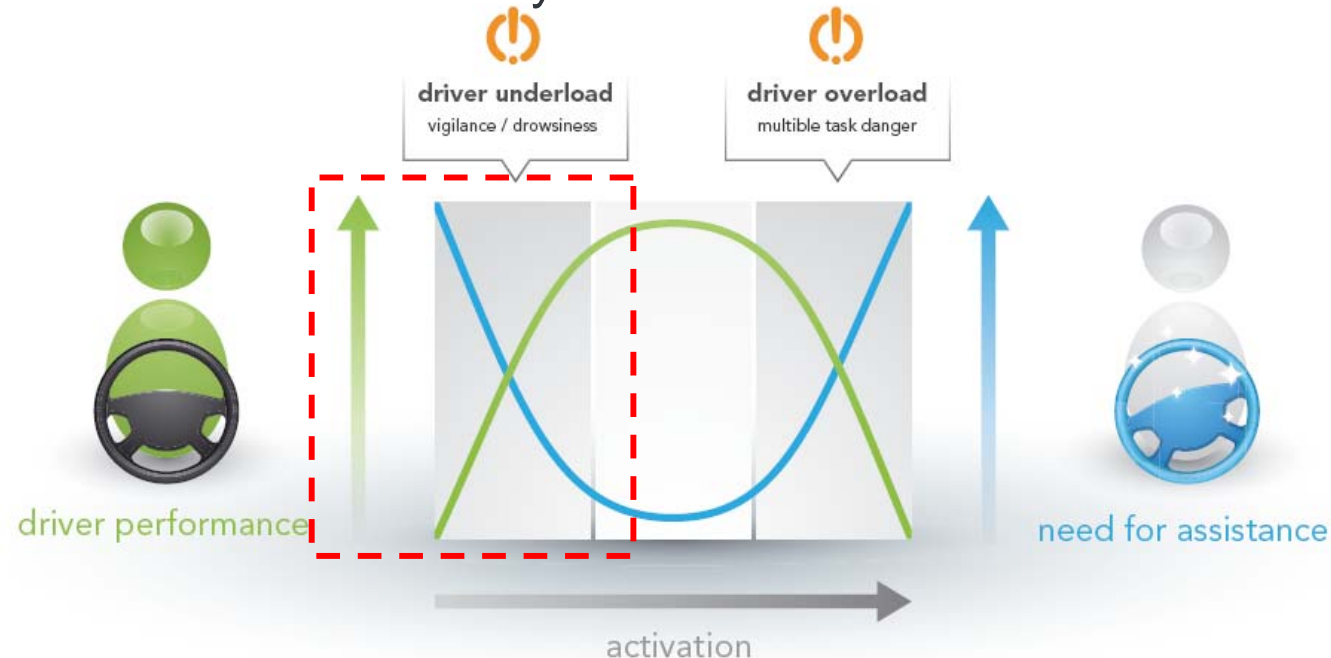


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- Volvo Technology are leading the AQuA workpackage
- Project will be demonstrated on a Volvo FH12 truck

Automated Queue Assistance - AQuA Addressed Problem

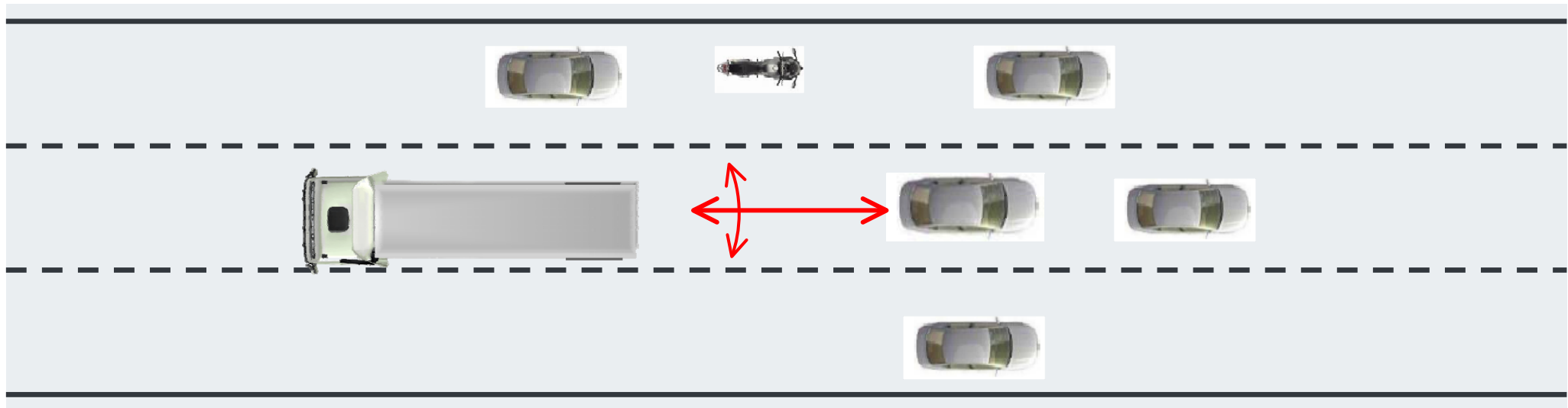
- Nearly 80% of vehicle crashes involve driver inattention
- Driver inattention can be caused by work **over-load** or **under-load**



- AQuA addresses one common under-load scenario: driving in congested traffic conditions on motorways. A **queue**.
 - repeated stop-go
 - slow speeds

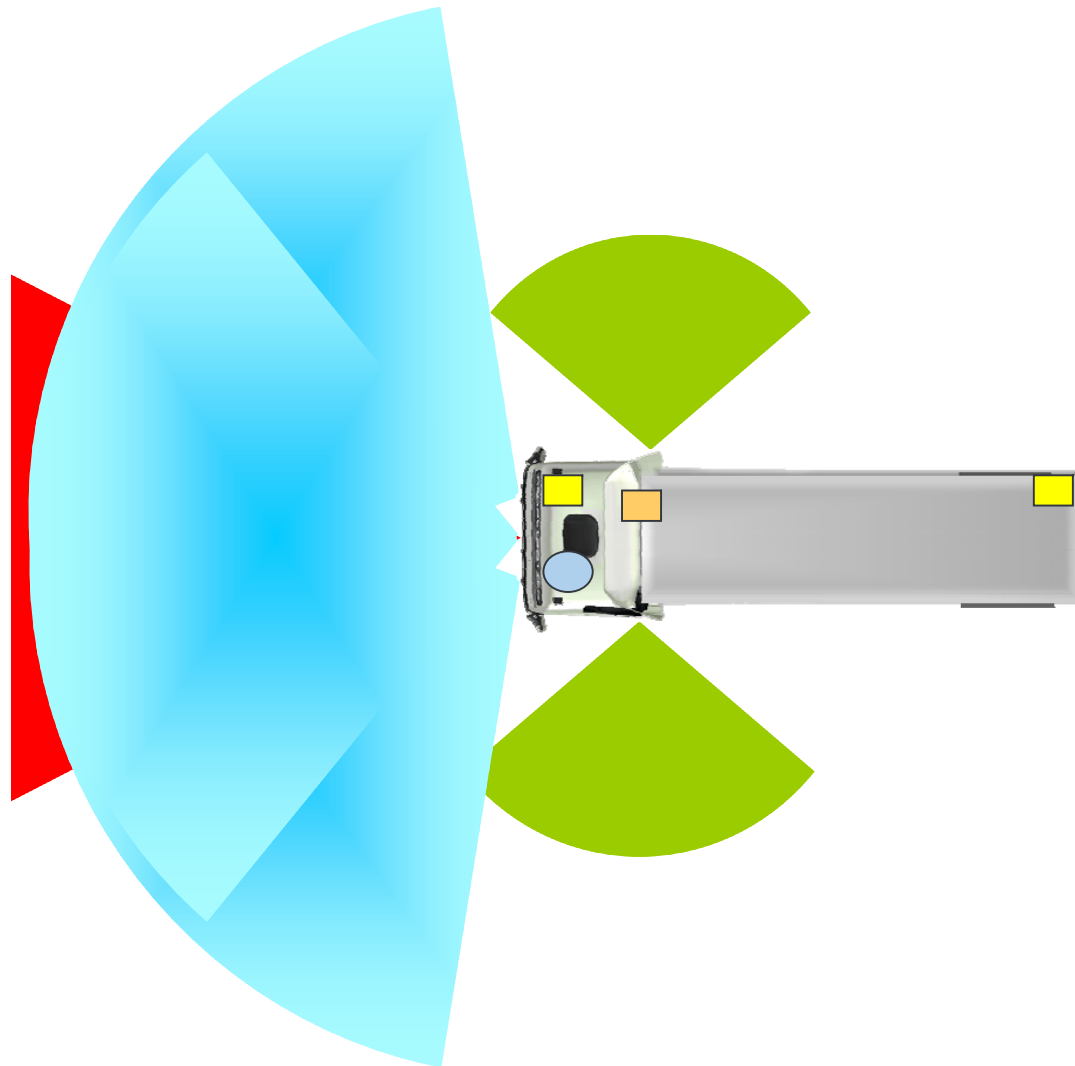
Automated Queue Assistance - AQuA Function Overview

- **Longitudinal control**, Adaptive Cruise Control (ACC) combined with stop-and-go
- **Lateral control**, automated steering
- **Driver's state** is monitored to ensure they remain "in the loop"
- Functions provided in a progressive manner
Manual controlFully automated



Sensing System

High level of automation places strong demands on sensing system

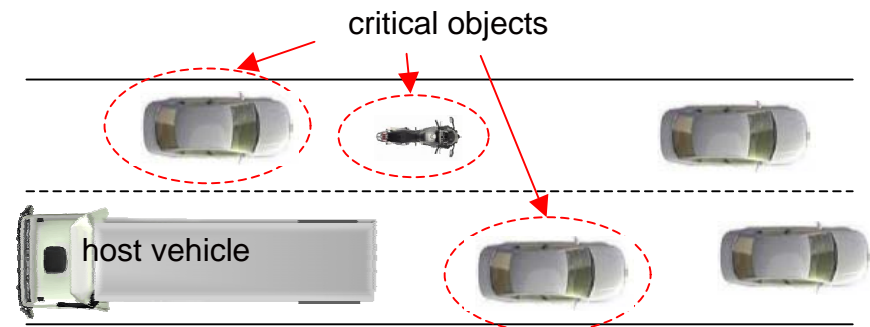


- Laser Scanners
- Object/Lane Camera
- Short Range Radars
- Driver Monitoring Camera
- e-Horizon
- V2V Communication
- OEM Vehicle State Sensors

Sensing System: object detection and tracking

- Need to sense the following objects near the host vehicle:
 - vehicles
 - road infrastructure
 - vulnerable road users
- In a queue scenario, need to detect **critical** objects for vehicle control:

- Preceding vehicle for longitudinal control
- Side vehicles for lateral control



- Sensors used:

Sensor	Usage	Range	FOV
Laser Scanners (x3)	Frontal objects	upto 200 m	150°-160°
Camera	Frontal objects	6-60m	54°
SRR (x2)	Side objects	8m	110°
V2V	Preceding vehicle	60m	10°

Sensing System: road awareness

- Need to determine the following road attributes:

- Lane curvature
- Road barrier positioning
- Host vehicle lane position

- Road information used for:

- Lateral control
- Tracked vehicle lane assignment

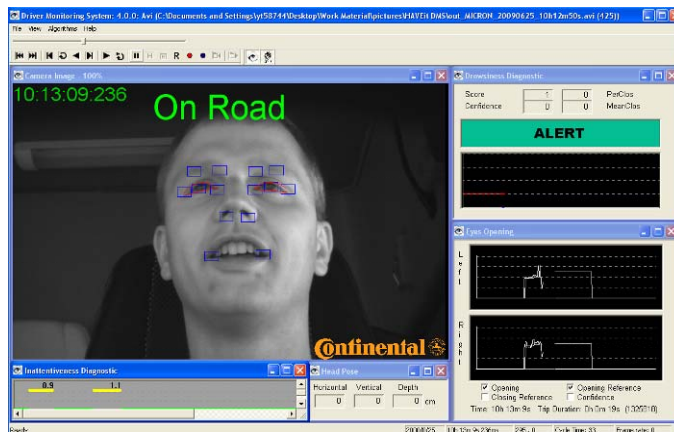
- Sensors used:

Sensor	Usage
Camera	Near and far estimates of lane curvature, lane position
Laser Scanners (x3)	Near estimate of lane curvature, lane position
Map Data	Expected lane numbers, begin/end motorway conditions

Sensing System: driver monitoring

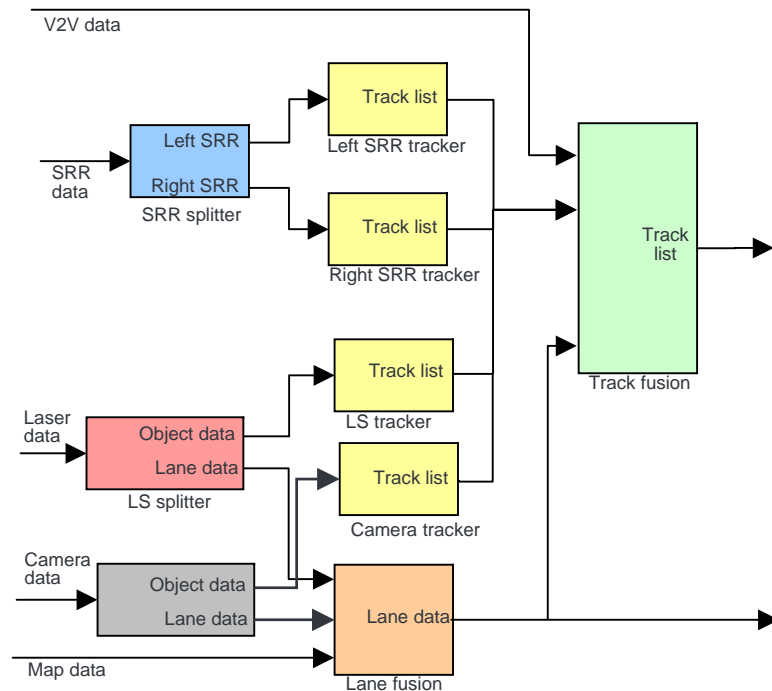
- The driver needs to be monitored for conditions causing lack of vehicle control (not in-the-loop)
 - Drowsiness
 - Inattentiveness
- Sensors used:

Sensor	Usage
Camera	Direct monitoring of driver from head and eye movement
Vehicle sensors	Indirect monitoring of driver from vehicle controls



Sensor System: data fusion

- Sensor data fusion to provide a single representation of the environment
- Simulink architecture defined
- Visualisation of results



Laser scanner
Camera
Left SRR
Right SRR

Summary

- AQuA (Automated Queue Assistance) focusing on assisting drivers when driving in congested traffic on motorways
- Project began in February 2008, alot of work in progress
- This presentation has focused on the sensor system, the first subsystem to near completion
- Status:
 - Most sensors have been installed and tested on development vehicle
 - Initial version of the sensor fusion has been implemented
- Aim to complete sensor installation and data fusion by January 2010



Thank you. Questions?

