HAVEit

Highly automated vehicles for intelligent transport

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The future of driving.

Deliverable D53.2
Temporary Auto-Pilot: Components installed, working and tested

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Executive summary

The overall objective of the HAVEit project is to develop technical systems and solutions that improve automotive safety and efficiency. Volkswagen Group Research contributes to the overall objective by developing the safety and comfort focused Temporary Auto Pilot application.

The Temporary Auto Pilot (TAP, WP5300 in the HAVEit project structure) is fundamentally intended to support the driver in monotonous traffic situations like traffic jams or monotonous long distance driving from A to B where the driver can experience work under load which can lead to a lack of focus and increased accident risk.

The TAP is a passenger car application which will support the driver on motorways and motorway similar roads with different levels of automation in longitudinal and lateral control of the vehicle at speeds between 0 and 120 km/h. The automation spectrum is as follows:

- Highly-Automated: hands-off driving, automated longitudinal and lateral control (Pilot)
- Semi-Automated: hands-on driving, automated longitudinal control (ACC)
- Assisted driving: hands-on driving, assisted lateral control (LKS)
- Intervening safety functions: driver initiated emergency braking

This guarantees that the driver gets the best possible support available and contributes to traffic safety.

The main objective of WP5300 during project periods M16 – M24 was to activate, interlink and test all installed components in the Volkswagen demonstrator vehicle. These components are e.g. sensors for environment perception and driver monitoring, Sensor Data Fusion module, Mode Selection Unit, Co-Pilot module, longitudinal and lateral controller, Human Machine Interface components like steering wheel, displays, switches, etc. The demonstrator vehicle is a Volkswagen Passat 2.0TDI passenger car. The VW Passat has been fully equipped to suit HAVEit purposes (see Figure 1):

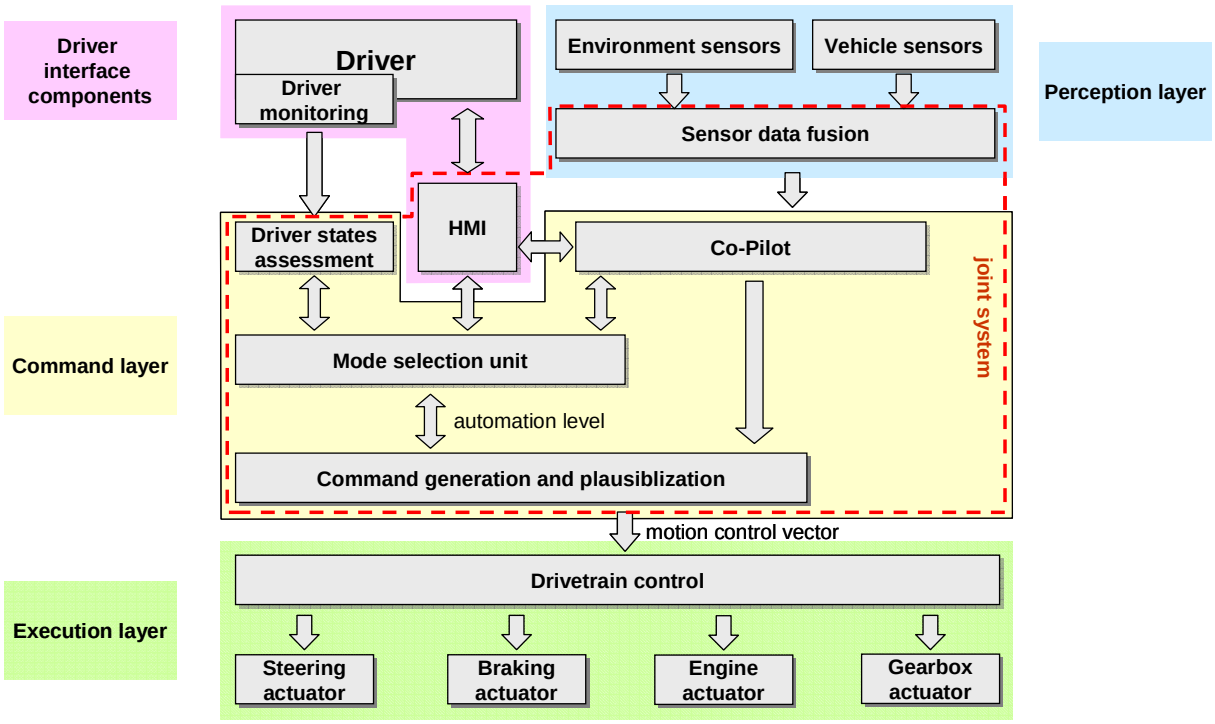

Figure 1: Architecture overview of the HAVEit system

According to Figure 1 the architecture can be split in 4 blocks:

- Perception layer components
  - Environment sensors (which were described in deliverable D53.1 [1])
  - Vehicle sensors
  - Sensor Data Fusion
- Command layer components
  - Co-Pilot module (see also deliverables D31.1 [2] and D31.2 [3])
  - Driver state assessment (see also deliverables D32.1 [4] and D32.2 [5])
  - Mode selection and arbitration unit (see also deliverable D33.2 [6], D33.3 [7] and D33.4 [8])
  - Command generation and plausibilization
- Execution layer components
  - Host vehicle model
  - Drivetrain controller
  - Steering actuator
  - Braking actuator
  - Engine actuator
  - Gearbox actuator
- Driver interface components
  - Primary driver interface (steering wheel sensors, direction indicator, acceleration and brake pedal position)
  - Driver interface switching components (buttons)
  - Driver interface display components (primary and secondary information displays)
  - Driver interface audio device
  - Driver monitoring system

The temporary auto-pilot demonstrator is built on the common HAVEit architecture which is described in deliverable D12.1 [9].

Based on the common HAVEit architecture, D53.2 describes the components of the TAP demonstrator vehicle in the perception layer, command layer, execution layer and the driver interface components which are necessary to successfully demonstrate the TAP functionalities. While the hardware components are implemented as serial or prototype devices, the software components are for the most part developed at Volkswagen Group Research and run in different operating systems like Windows and RT-Linux.

In summary, the installation, activation and integration work for all required components of the TAP demonstrator vehicle has been completed. All initial tests have been successfully passed.

The next steps will focus on the development, implementation and integration of the Temporary Auto-Pilot application functionalities, in particular the different automation levels including transitions.

References

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[4] D32.1 “Report on driver assessment methodology”, HAVEit deliverable, 2009

[5] D32.2 “Model of driver behaviour for the assessment of driver’s state“, HAVEit deliverable, 2009

[6] D33.2 “Preliminary concept task Repartition”, HAVEit deliverable, 2009

[7] D33.3 “Validation by simulation“, HAVEit deliverable, 2009

[8] D33.4 “Algorithm (C-code, 1st version) available for partners“, HAVEit deliverable, 2009

[9] D12.1 “Architecture document“, HAVEit deliverable, 2009

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[12] S. Steinmeyer, “Handling contradictory sensor data in environment maps for advanced driver assistance systems”, 4th German Workshop Sensor Data Fusion, Lübeck, 2009

[13] The European ADASIS Forum consists of currently 30 members from the automotive industry and is coordinated by ERTICO. Further information is available on the internet: http://www.ertico.com/en/subprojects/adasis_forum/objectives__approach/

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