EB Assist ADTF
Automotive Data and Time Triggered Framework

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Dec 3, 2015
Agenda

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  – Features
  – Field of Application

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  – EB Assist Car Data Recorder Toolbox
  – Capture & Replay Solution
EB Assist ADTF – Automotive data and time-triggered framework

EB Assist ADTF
- is the most used development and test environment worldwide for advanced driver assistance systems (ADAS)
- is used in development and series projects
- is used by leading carmakers and suppliers that continue to invest in feature development

EB Assist ADTF covers various use cases and is already utilized for different applications i.e. measurement, sensor evaluation and software validation

Applications range from comfort features to safety systems including e.g.:
- Lane Change Assistance
- Adaptive Cruise Control
- Collision Mitigation
- Adaptive Light Control
- Lane Departure Warning
- Blind Spot Detection
- Traffic Sign Recognition
- Driver Drowsiness Detection
- Night Vision
- Pedestrian Recognition

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EB Assist ADTF – A Flexible Framework

Extensible to your needs
• Filters: Data processing units implemented in a C++-Class
• Direct integration of C/C++-Code
• Develop your own modules (filters)

Record & playback
• Recording multiple data streams (test drives)
• Playback
  – Office PC
  – To HiL
• On and offline processing and testing

Supports whole lifecycle
• (prototypical) algorithm development
• Developing/testing production ready algorithms
• Verifying ECU processing

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Visualization & Control via GUI

**Easy to use GUI**
- Flexible combination and parametrization of filters
- Various display capabilities
  - Signals (CAN, FlexRay, LIN, Most)
  - Arbitrary (DDL described) data
  - Scope displays and value display
    - Signal View, Scope Display
    - Table displays
  - Video data & overlays
  - 2D, 3D
- Profiling and debugging support
- Configure distributed processing

**Support for easy extension of GUI and display capabilities**
- Write your own control and visualization modules

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Support for data acquisition and connectivity

- Many devices already supported
  - Camera/Video
  - Audio
  - CAN, FlexRay, LIN, MOST
  - Ethernet
- Read and write from/to car-bus
- User configurable decoding/encoding of signals
  - Config Codec Filters for CAN, LIN, FlexRay
- Build-in support for signal descriptions
  - DBC for CAN
  - FIBEX for FlexRay
  - Open interface for extension

Support for easy integration of other devices

- Write your own device filter accessing the driver API of your device.
EB Assist ADTF – Field of application

• Research & Innovation

• Pre-development, development for mass production

• Test & Validation: SiL, HiL
Toolboxes – add-ons to EB Assist ADTF

**Standard toolboxes**
- EB Assist ADTF Device Toolbox
- EB Assist ADTF Display Toolbox
- EB Assist ADTF Compression Toolbox

**Optional toolboxes**
- EB Assist Car Data Recorder Toolbox
- Capture & Replay Solution
- EB Assist ADASISv2 Reconstructor Toolbox
- EB Assist ADASISv2 Map Information Toolbox
- EB Assist ADTF Calibration Toolbox (XCP)
- EB Assist ADTF Matlab/Simulink ® Blockset
EB Assist ADASISv2 Electronic Horizon Toolboxes

EB Assist development tools and software modules for predictive driving
Electronic horizon

**Electronic horizon** provides driver assistance systems with
- detailed map and GPS data about the route ahead
- e.g. intersections, speed limits, road curvatures, topographic information.

Useful for predictive driving features like, e.g.,
- Curve Speed Warning
- Predictive Curve Light
- Traffic Sign Recognition

Development support in EB Assist ADTF

- **EB Assist ADASISv2 Map Information Toolbox**
  - Complete navigation system in ADTF
  - Provides electronic horizon in ADASISv2 format
- **EB Assist ADASISv2 Reconstructor Toolbox**
  - Target ready reconstruction lib.
  - Visualization, inspection
Electronic horizon based ADAS

Electronic Horizon provides “roadway ahead” including data such as:

- Route and position, lanes
- Speed limits
- Geometry and curvature
- Street type (crossroad, motorway, ...)
- Most probable path

Map attributes are used as a “sensor” and available for several ECU
Development and test tool chain in EB Assist ADTF

**EB Assist ADASISv2 Map Information Toolbox**
- Integrated EB street director navigation
- Map rendering (incl. zoom and pan)
- Full access to route calculation options
- Generate electronic horizon data based on
  - GPS track (NMEA)
  - GPS + car sensor data
  - Simulated route
  - Route guidance
- Provides electronic horizon on CAN
- Batch mode for automated test

**EB Assist ADASISv2 Reconstructor Toolbox**
- ADTF Filter available
- Target ready ADASISv2 Reconstructor
  - Full ADASISv2 Reconstructor datastore & Event API
  - EB extended API
  - Use it for your own development
- Easy configurable
  - Electronic horizon history length
  - Number of car positions, number of paths
- CAN message filter
Complete Development Toolbox Setup

- Record and replay of sensor data
- Providing of ADASISv2 data on CAN
- Map display

- ADASISv2 elec. horizon data reconstruction
- Elec. horizon geometry visualization
- ADASISv2 data for driver assistance function
EB Assist ADASISv2 Map Information Toolbox (MIT) - last enhancements (version 1.3.25)

- 2D and 3D map rendering
- NDS and PSF map format Support
- Configurable timestamp offset
- Intermediate targets
- Importing routes
- Velocity input from recorded drive
- Proposals for destinations
- New destination resolving by NVC (Next Valid Character)
- Changes and optimizations of the GUI
- Preview of upcoming maneuver
EB Assist ADASISv2 Reconstructor Toolbox for ADTF

EB Assist ADASISv2 Reconstructor
EB Assist ADASISv2 Reconstructor Target Code wrapped into a filter. Additional statistics output pin, e.g. memory usage

ADASISv2 Viewer
Graphical view of the electronic horizon in the 3D scene viewer.

ADASISv2 Explorer
Textual representation of the electronic horizon in “Windows-Explorer” style

ADASISv2 XML Dumper
Writes complete eHorizon in XML representation at every change

ADASISv2 Signal Provider
Provides selected elec. horizon attributes (e.g. effective speed limit, curvature) as signal. The signals can be viewed in the Signal viewer or even put on a physical CAN bus.

ADASISv2 Trace View
Shows all ADASISv2 CAN messages human readable. Allows single stepping through ADASISv2 messages
EB Assist ADASISv2 Reconstructor Toolbox for ADTF
EB Assist ADASISv2 Reconstructor for Matlab/Simulink® Blockset

**EB Assist ADASISv2HR Reconstructor for MATLAB**
- is an add-on to the MathWorks development environment
- reads CAN data and generates an elec. horizon data structure
- is compliant with the ADASISv2 specification
- uses EB’s target-ready ADASISv2 Reconstructor
- is a turn-key solution letting the developer focus on the application
- reads ADASISv2 data from
  - CAN bus (e.g. from head unit)
  - recorded CAN (.asc file)
  - Navteq ADAS RP (via TCP/IP)
  - EB Assist ADASISv2 Map Information Toolbox for ADTF
- any other ADASISv2 provider

**Data access via ADASISv2 standard API and EB extension API**
Use cases – electronic horizon in EB Assist ADTF

1. Generating ADASISv2 on CAN

2. Developing and testing ADAS functions

3. Modeling and simulating ADAS functions

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EB Assist Car Data Recorder (CDR)

Measurement technology for simplified and efficient test drive recordings in combination with EB Assist ADTF
Test environment: EB Assist ADTF in test cars

Typical recording setup
- Notebook mounted on passenger side
- Cables to interface to car busses and sensors
- Driver or passenger controls EB Assist ADTF via touchpad or mouse

- Bad usability in a moving car (small Windows UI elements + touchpad)
- Not all information is visible or is simply too small
- Controlling the recording process is hideous
- Lots of cables in the car front
- Not presentable to customers or management

Many "home-brew", special tailored, incompatible solutions exist
EB Assist Car Data Recorder (CDR)
EB Assist Car Data Recorder – benefits at a glance

**Usability**
- Intuitive and easy control
- Clear visualization of signals
- Immediate feedback during test drive
- Low distraction during test drive
- Tidy hardware setup in the car
- Standardized hardware and easy installation

**Based on standard tools**
- High reliability and flexibility
- Easy data exchange due to ADTF format
- Reuse of existing configurations, modules and filters
- Good availability and low costs of hardware
- Well-known handling

**Extensibility and flexibility**
- Setup can be easily extended by the customer
- Different stages of expansion available
- Easy adaption to different use-cases and test scenarios
EB Assist Car Data Recorder

Today:

• Live Demo by Ian
• Register at the registration desk
EB Assist Capture and EB Assist Replay

Embedded modular system to capture and replay sensor data highly time synchronized and precisely
EB Assist Capture & EB Assist Replay

**Dedicated hardware**
- Flexible I/O configuration using adapter boards, Video, CAN, FlexRay, LIN, Ethernet, GPS
- Precision timestamping @ 25 ns resolution
- Precise synchronization with one clock
- High transfer rate
- Automotive power supply
- Ready to use with easy access to connectors

ADTF filters and configuration for recording and replaying
Thank you!

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