RTMaps Embedded facilitating development and testing of complex HAD software on modern ADAS platforms

Nicolas du Lac
CEO, Intempora
Brief introduction about Intempora

- **Software editor company**
- **Created in 2000**
- **Over 15 years experience in ADAS/A.D. and embedded computing**
- **Strong partnership with dSPACE**
The RTMaps middleware
RTMaps - Real-Time Multisensor applications

**Sensors**
Vision, RADAR, LiDAR, GPS, Maps, IMU, V2X

**Actuators**
Motor, Wheel, Brake, Database, V2X

**DATA PROCESSING**

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Features

Graphical User interface

Large library of off-the-shelf components

Record & Playback

Optimized (multithread, pre-allocated buffers, copyless)

Preserves time coherency

Portability and Scalable
Develop your own RTMaps components

A cross platform / multi-language API
- C++
- Python
- Simulink
- QML

Collaborate and share your components with your team & partners

Applications

Positioning & Navigation
Machine Learning
SLAM
Data Fusion
2D/3D
Big Data / Cloud
Computer Vision
HMIs

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RTMaps as software integration and interoperability framework

Simulators (MotionDesk, ASM, PreScan, Pro-SiVIC..)

dSPACE ADAS toolchain (VEOS, ControlDesk, MicroAutoBox)

Advanced HMIs (Qt, QML)

Communication (DDS, TCP, UDP, LCM, RTSP...)

Applied Mathematics (Deep learning, machine learning algorithms...)

ROS Robotics (ROS bridge)

Signal processing & Control Actuators (Simulink, MathWorks)

Image processing (OpenCV, others libraries...)

Digital maps

Sensors / Actuators
History - A few RTMaps-based autonomous vehicles


NextTwo 2013 - VEDECOM 2015 - ARMA 2015

Link and Go 2013 - Drive 4U / Cruise4U 2015/2016
Model-based perception

Sensors

Perception

Data processing, Data fusion, tracking

Scene Interpretation

Environment Model

Applications

Actuators

\[ fcn_1_{(ECU_a)} \]

\[ fcn_2_{(ECU_b)} \]

\[ fcn_3_{(ECU_b)} \]

Model-based controller design

dSPACE

MATLAB/Simulink

High performance sensor data processing

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Challenges ADAS and AD

1. Time coherency in distributed / multi-core multisensor applications

2. Execution performance / Number crunching

3. Offline development

4. Ease of use / Ease for deployment

5. Development costs / Time to market

6. Test & validation
RTMaps Embedded
RTMaps architecture

PC

RTMaps SDK (incl. cross compiling for embedded targets)

RTMaps Components library
Numerous off-the-shelf components (filters, blocks whatever you call them)

RTMaps Core Engine
- Clocks management
- Components management
- Diagnostics

RTMaps Studio
- Threads & events management
- Buffers management
- Performance monitoring

OS
Arch: x86, x86_64

Embedded target

RTMaps Components library

RTMaps Studio Connector

RTMaps Core Engine

OS
Arch: x86, x86_64, ARM

Under dev:

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RTMaps available on embedded targets

Renesas Autonomy

HAD Solution KIT – R-Car H3

DRIVE™ PX2

NVIDIA

BlueBox

dSPACE

MicroAutoBox Embedded SPU (Upcoming)

...
Intensive computing taking advantage of hardware acceleration

- RTMaps Runtime engine runs on the ARM CPU
- Components (image processing for instance) can wrap intensive computing algorithms taking advantage of GPU
- Supported OS: Windows, Linux, Embedded Linux (Yocto/Poky)
- Upcoming on RTOS (QNX, VX Works, Integrity...)

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RTMaps Embedded

- **RTMaps Remote Studio** operating on separate laptop with **direct SSL connection with the runtime engine on the target**. Used for diagrams edition (design and configuration).

  - Work & Edit your algorithms from a PC

  - Easily deploy on board

  ![SSL](image)

- **RTMaps Runtime Engine and components compiled on chosen target**

- **RTMaps SDK for cross-compilation on a Linux PC, or available directly on the target**

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From R&D to production

1. Offline Simulation
2. In-vehicle Data Recording
3. Offline Data Playback
4. Embedded in prototype (PC/eSPU+ MABX)
5. Prototyping RTMaps apps to embedded targets
6. RTMaps applications to embedded ECU

From COTS solutions to custom developments
RTMaps Embedded - Demos
RTMaps & NVIDIA DriveWorks

NVIDIA. DriveWorks Components (C++ / CUDA)

RTMaps

NVIDIA.

DriveNet

LaneNet

Feature Tracker

eetc...

*Easily deploy on target with RTMaps Remote Studio (SSL)
DriveWorks on Nvidia Drive PX2 in RTMaps
Dibotics SLAM on Renesas R-Car H3

LIEN VIDEO YT RTMaps Dibotics
Camera + Radar + Lidar on NXP BlueBox
Thanks for your attention / Q&A?

www.intempora.com

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