Introduction to Collective Perception: how V2X is setting the scene for autonomous driving

Presented by:

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Agenda

• Introduction
• State of the Art
• The Plan
• Collective Perception
• Trust
• Future V2X enablers

“Building the foundations of a cooperative system is a collaborative effort and our mission is to take the lead and get involved.”
About Commsignia

Commsignia is a global automotive TIER2 V2X solution provider with HQ in Santa Clara, CA, USA and development office in Budapest, Hungary. Commsignia is also a supplier of V2X roadside units worldwide. We have 8+ years experience in delivering market leading products for vehicular communication stack, security stack, fusion and safety application solutions.
What is V2X?

• Dedicated
  • “Short” range
  • Low latency
  • Cooperative
• Safety relevant
V2X generations
• Agreed set of services
• Minimum requirement
• Set of standards and profile(s)

Cross-industry agreement
The “common language”: secure protocol messages defined by standards to enable sensor data sharing among multiple brands of vehicles

• Basic state and dynamic information (e.g. CAM)
• Event or area-based notifications (e.g. DENM)
• Infrastructure services, including intersection state

The Application: Defining the end user experience
The “common language”: secure protocol messages defined by standards to enable sensor data sharing among multiple brands of vehicles

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The Application: Defining the end user experience
Euro NCAP

ROADMAP 2020

- AEB VRU cyclist
- Far-side protection
- Mobile progressive deformable barrier

ROADMAP 2025 – SAFETY RATING

- Driver monitoring
- AEB VRU pedestrian - Back-over
- AEB - Junction & Crossing
- AEB - Head-on
- Automatic Emergency Steering
- V2X
- Whiplash/Rear-end Crash Protection
- Revised subsystem for pedestrian & cyclist
- Rescue, extrication and safety
- Child presence detection

ROADMAP 2025 – AD

- Grading of AD functions

How do we get there?

- Static Navigation
- Status Data Sharing
- Sensor Data Sharing
- Real-time Navigation
- Real-time Local Cooperative Perception
- Intention Data Sharing
- Coordination Data Sharing

- Connected
- Cooperative
- Automated
- Collective

- Driver Assistance
- Partial Automation
- Conditional Automation
- High Automation
- Full Automation
- Connected Automation Evolution
- Standalone Automation Evolution
- Connectivity Evolution

Navigation Evolution
The plan

- PENETRATION
- MORE SERVICES
- DEPLOYMENT
- HIGHER QUALITY OF SERVICE
  - SAFETY
  - RELIABILITY
  - FUNCTIONAL SAFETY
The plan

- Deployment
- Penetration
- More services
- Higher quality (of service)
  - Security
  - Reliability
  - (functional) safety

Volkswagen Safety Technology Rewarded by Euro NCAP

Today, Euro NCAP rewards Volkswagen’s ‘Local Hazard Warning’ system with an ‘Advanced’ award.

Volkswagen’s car-to-x communication system becomes the first technology to be rewarded by Euro NCAP in nearly six years. The technology, fitted as standard to the Golf 8 and to future ID models, allows cars to communicate with each other and with properly equipped road infrastructure and emergency vehicles to give the driver advanced warning of local safety hazards. Using ITS-G5 technology, cars equipped with the system can transmit a signal to others if they have broken down or have stopped suddenly and present a safety risk. Other manufacturers are also considering equipping their vehicles with ITS-G5 technology and, in time, it may be possible for drivers to receive advance warning of motorcycles and tractors.

The plan

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Check out our animated explanation: https://youtu.be/1YrGpXyLhnY?t=114
Collective perception
– not just for vehicles

Commsignia dual-mode roadside unit
The PRoPART project has received funding from the European GNSS Agency under the European Union’s Horizon 2020 innovation programme under grant agreement No 776307.

CPM advanced features
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Introduction

State of the Art

The Plan

Collective perception

Trust

Future enablers

Watch the video on Youtube or visit propart-project.eu

https://youtu.be/IzWrsLr-4
The plan

- Deployment
- Penetration
- More services
- **Higher quality (of service)**
  - Security
  - Reliability
  - (functional) safety
Let's talk about:

TRUST
The plan

- Deployment
- Penetration
- More services
- Higher quality (of service)
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  - Reliability
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SAFERtec has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no 732319
The plan

- Deployment
- Penetration
- More services
  
  - Higher quality (of service)
    - Security
    - Reliability
    - (functional) safety

Misbehavior detection

- Proximity Plausibility
  - Algorithms check consistency between RSSI and CAM/BSM based location information (optionally fused with sensor data).

- Motion Validation
  - Path prediction based on location information, consistency checking (no jumps, unrealistic speed, etc.)

- Content and Message Verification
  - Check that message sending and contents are in accordance with the standard (e.g., CAM frequency v. speed).
  
  etc.
Industrial cooperation

https://secredas.eu/
Next services on the roadmap:

Platooning and Maneuver Coordination Service
Platooning and Maneuver Coordination Service

- Introduction of encryption
Looking into the future: time critical Multi-access Edge Computing (MEC) services

- Distributed computing approach
- Processing and analyzing of data closest to the point of its collection
- Dynamic and scalable
Other alternative futures for V2X: New markets

- Aerial freight transport
- Railway

Source: ETSI.org

Watch the video on Youtube or visit http://safer-lc.eu/
Final thoughts, invitation to collaborate

- Communication stack expertise for your project
- Take responsibility from challenge to technical specification
- Listen and support system design
- Being fast and ahead with solutions to trial
- Provide resources, offload partners
Backup Slides
OUTLINE

The objective of the SCANIA driven project PRoPART is the development and demonstration of a high availability positioning solution for connected automated driving applications. The project’s RTK (Real Time Kinematic) software solution exploit the distinguished features of Galileo signals as well as combining it with other positioning and sensor technologies.

ROLE

Advanced Commsignia Roadside units are used for various Day1 and Day 2 services: RTK based GNSS correction data, Collective Perception Service, UWB ranging. Radars provide roadside object and freespace detection capabilities and the low latency environmental perception is sent to an automated Scania truck via V2X where highly accurate and fused V2X data is used to support a lane change maneuver. Freespace distribution was introduced and standardized at ETSI by Commsignia during the project.
OUTLINE

The main objective of SAFER-LC is to improve traffic safety and minimize risks of transportation at and around rail-road level crossings (LCs) by developing a fully integrated cross-modal set of innovative solutions and tools for the proactive management and design of level-crossing infrastructure. Partners include SNCF and DLR.

ROLE

Commsignia deploys V2X communication enhanced for V2I and V2R – Vehicle-to-Rail use, extending the scope of V2X to support Railway infrastructure.
SAFERtec proposes to define a flexible and efficient assurance framework for security and trustworthiness of ‘Connected Vehicles’ & Vehicle-to-Infrastructure (V2I) communications seeking to improve the cyber-physical security ecosystem of Connected Vehicles in Europe. Main partners include CRF, Airbus, Swarco and Autotalks.

ROLE

Commsignia is providing solutions for V2X communication and related application within the projects secured connected vehicle.

Website: https://www.safertec-project.eu/
Started in January, 2017
Duration: 36 months
Budget: 3.8 mEUR
OUTLINE

The high-level goal of SECREDAS is to propose a significant and innovative solution for Safety, Security and Privacy dedicated for automated systems. This solution will include a reference architecture, powerful components and common approaches regarding integration and verification for the sectors of automotive, health and rail for which the automation is major challenge regarding the safety of operation, the security of persons and the privacy of citizens.

ROLE

Commsignia joins key providers of the automotive supply chain, including NXP, Ficosa and Canon to fully integrate all V2X components into the novel connected vehicle ecosystem. Activities include the definition of a secured Collective Perception Service and low latency Misbehavior Detection.