The 4th EU-Japan Satellite Positioning Public Private Roundtable

Agenda

1. Continental Corporation
2. GNSS usage for the product
3. Innovations for the precise position

Continental Corporation
Five Strong Divisions

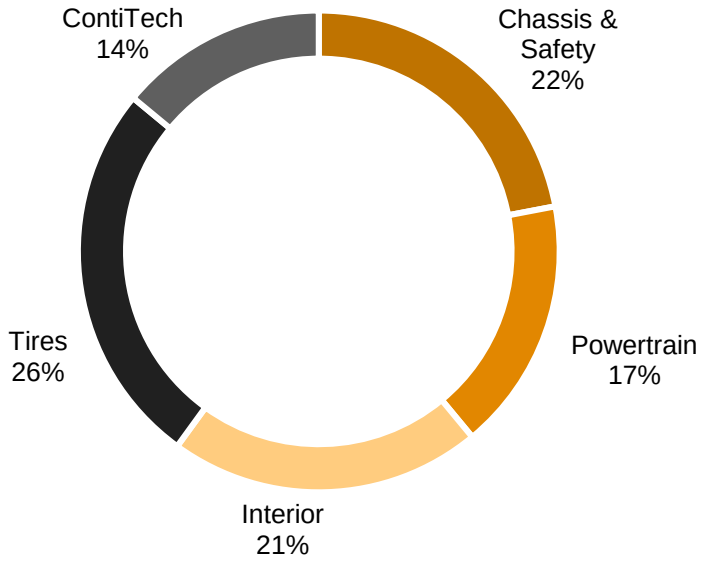
Chassis & Safety	Powertrain	Interior	Tires	ContiTech
Vehicle Dynamics	Engine & Drivetrain Systems	Instrumentation & Driver HMI	PLT, Original Equipment	Air Spring Systems
Hydraulic Brake Systems	Hybrid Electric Vehicle	Infotainment & Connectivity	PLT, Replacement Business, EMEA	Benecke-Hornschuch Surface Group
Passive Safety & Sensorics	Powertrain Components	Body & Security	PLT, Replacement Business, The Americas	Conveyor Belt Group
Advanced Driver Assistance Systems (ADAS)	Contract Manufacturing	Commercial Vehicles & Aftermarket / Intelligent Transportation Systems (ITS)	PLT, Replacement Business, APAC	Industrial Fluid Solutions
			Commercial Vehicle Tires	Mobile Fluid Systems
			Two Wheel Tires	Power Transmission Group
				Vibration Control

PLT – Passenger and Light Truck Tires

Continental Corporation
Overview 2017

- Since 1871 with headquarters in Hanover, Germany
- Sales of €44 billion
- 235,473 employees worldwide
- 554 locations in 61 countries

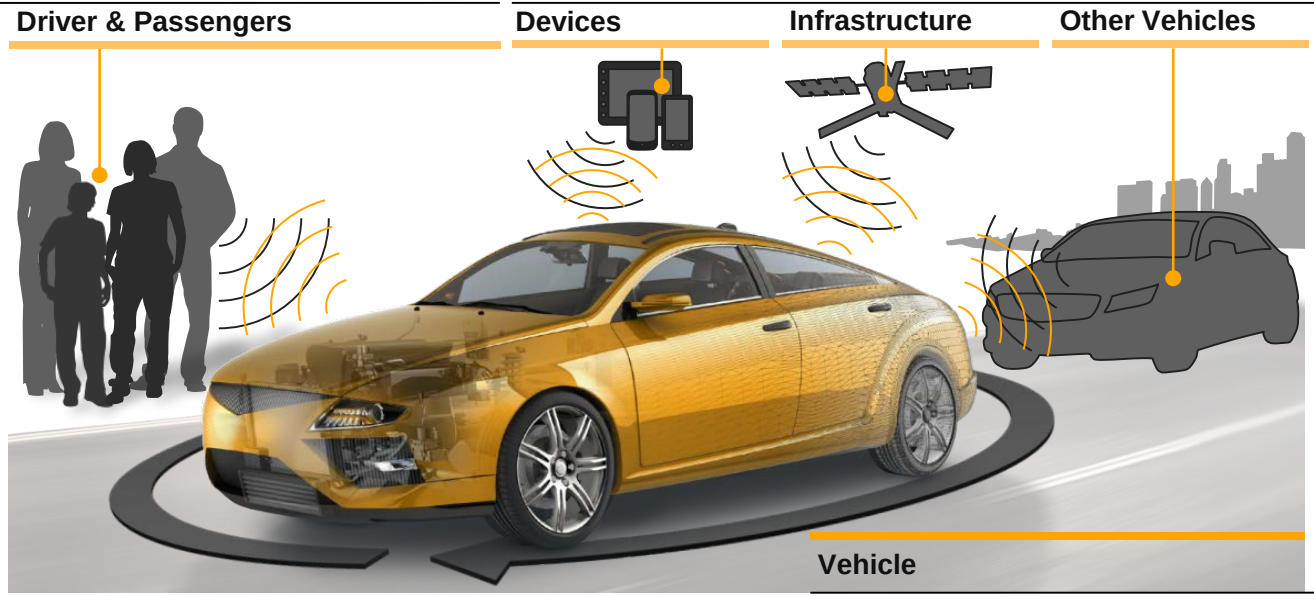
Sales by division



Status: December 31, 2017

Our Mission: Information management is a key to realize efficient mobility solutions and services

With our holistic, intuitive and ergonomic human-machine interface, we capture commands from drivers and passengers and prioritize and present information.



We add new functions as well as value-adding mobility services by providing a holistic connection to the outside world

We manage and optimize the information flow through cost competitive systems integration

Intelligent Transportation Systems (ITS)

Portfolio overview

Key as a Service

Remote Cloud Key
OTA keys

In-Car Data as a Service

vAnalytics
TrackSynq

Map Data as a Service

eHorizon Maps & Events
RoadDB
On/Off-Street Parking

City Data as a Service

Quantum Inventions
City Fleet Mgmt / Smart Parking / Intermodal / Shuttle Service

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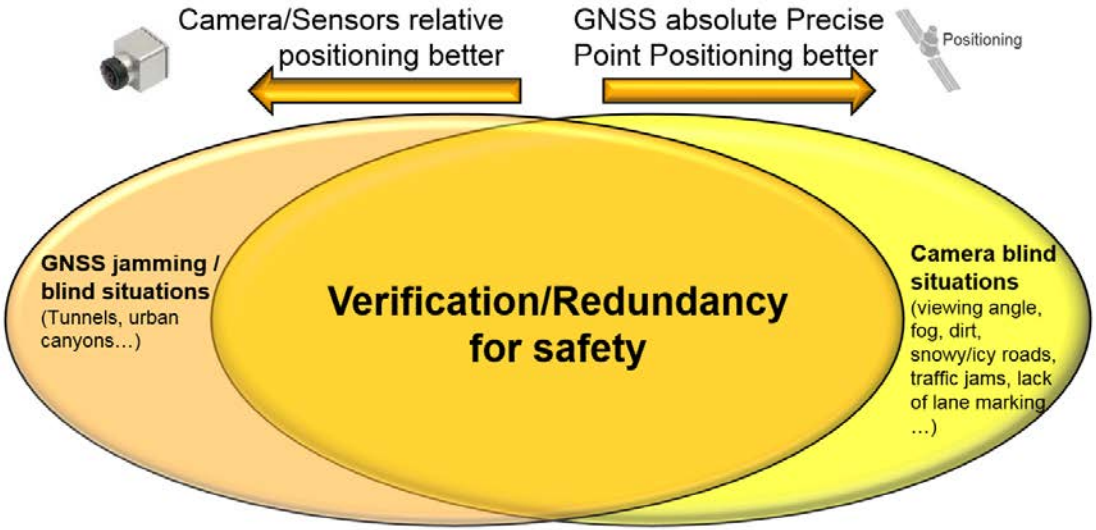
Knowing Where You Are

Relative Sensor-/GNSS- Positioning are complementary

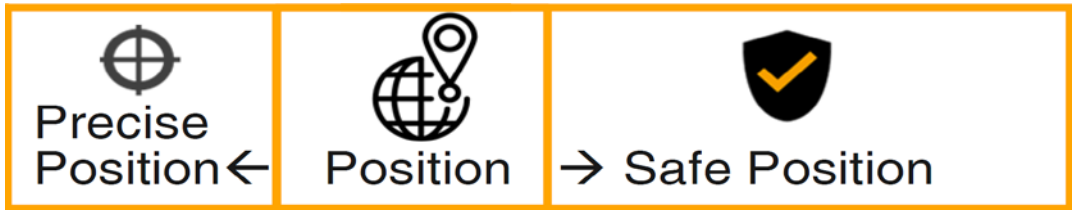


For automated driving level 3/4, having both systems on board will enable a safer experience in all driving conditions

GNSS Localization

Safe & Precise

- Two major challenges: Precise & Safe GNSS Positioning
- High accuracy required, e.g. for accurate trajectory planning
- Safe positioning needed, e.g. when steering based on GNSS information
- Continental is addressing both aspects



GNSS Localization & Dead Reckoning

Example: M2XPro

M2XPro Positioning

Overview | Benefits | Contact Us

M2XPro Positioning

The Motion Information to X Provider (M2XPro) is an intelligent positioning sensor which merges GNSS (Global Navigation Satellite System) information with the driving dynamics sensors (steering angle, inertial and wheel speed sensors). It delivers a robust, extremely precise calculation of the current vehicle position – independent of driving situation and infrastructure.

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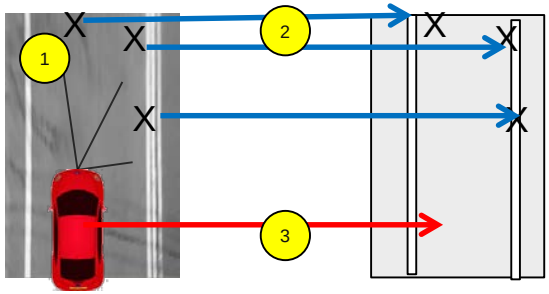
Knowing Where You Are

Landmark-Based Localization

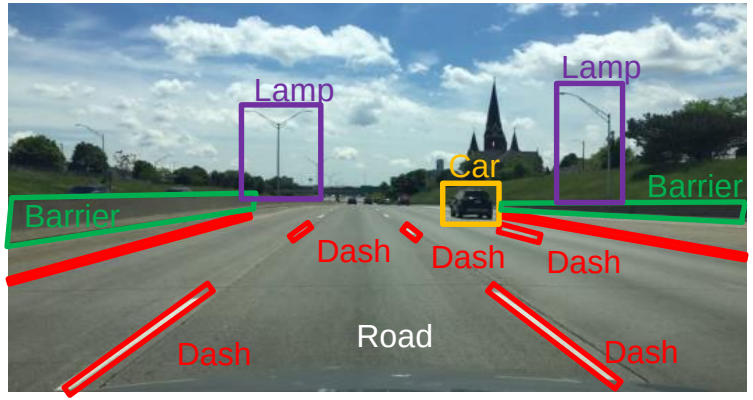
- Three steps
  - 1. find landmarks in real-world
  - 2. match with landmarks in map
  - 3. compute coordinates within map



- **Has to be real-time!**

Knowing Where You Are

Object landmarks and feature point landmarks



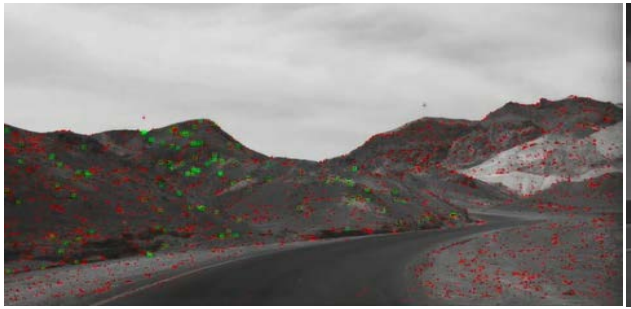
- Traditional approach for vehicle localization
- Analysis of the objects in a scene
- Number of objects is limited

- Analysis of 2D images
- Filtering for characteristic groups of pixels
- Analysis of salient points (= feature points)
- High number of reference points identified per image

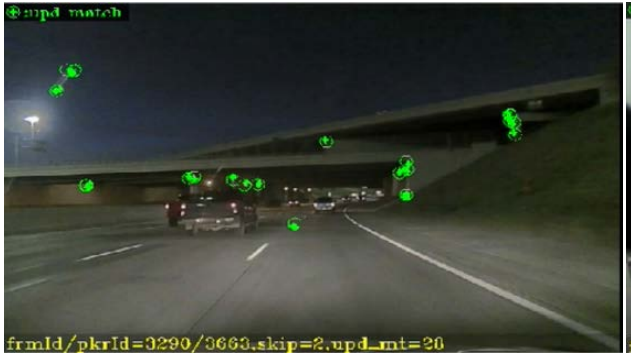
Knowing Where You Are

Feature Points

Few objects, but many feature points



Long tunnels (no GPS)



At night

Bad weather (rain)

Knowing Where You Are

Prototype supports good weather, rain, light snow conditions

Road Database feature point based localization in Detroit

Thank you
for your attention!