Lane Accurate Position Sensing of Vehicles for Cooperative Driver Assistance Systems

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AMAA 2012, Berlin

30. – 31. Mai 2012

All Sensing Systems on: Taking the Pulse on Your Safety

Continental

Agenda

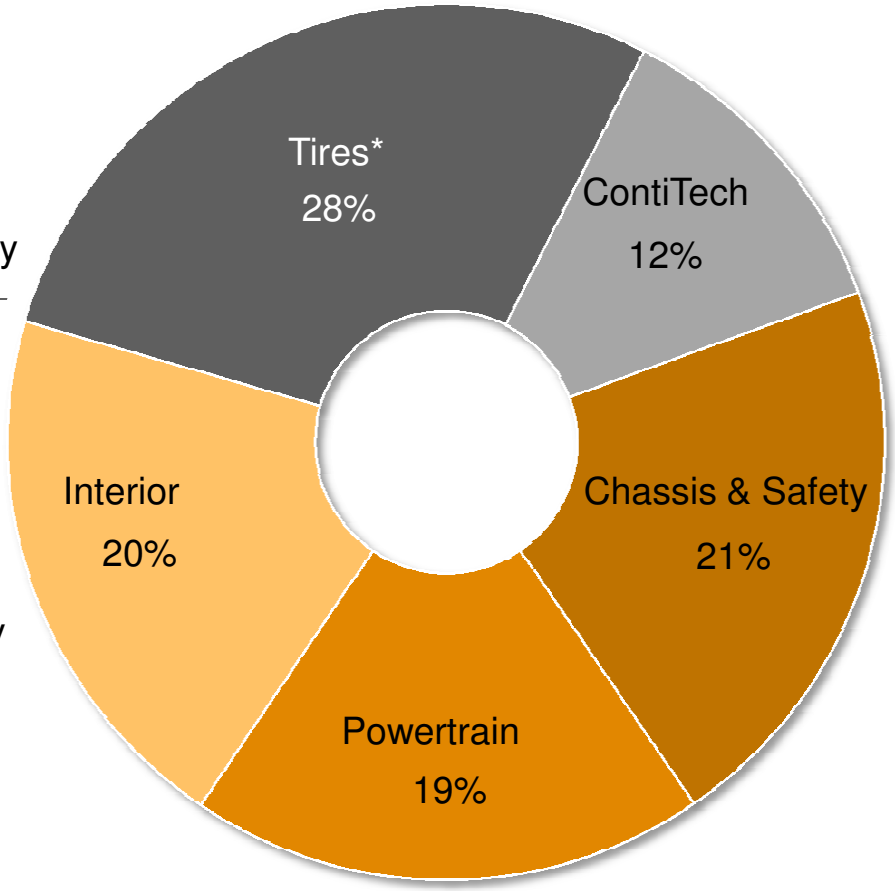
Topics

- Continental at a glance
- Automotive Industry Megatrends
- Use cases for lane accurate position sensing
- Concept of Sensor Fusion: M2XPro
- Test results and outlook
- System Architecture and Conclusion

Continental Corporation Overview 2011

- Since 1871 with headquarters in Hanover, Germany
- Sales of €30.5 billion
- 163,788 employees worldwide
- 269 locations in 46 countries
- One of the top 5 in the automotive supplier industry

Sales by division in %

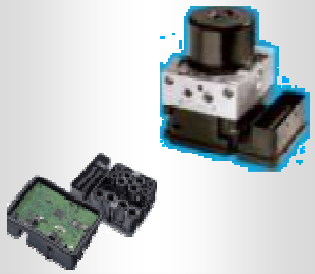


*pro forma
Status: December 31, 2011

Continental: Chassis & Safety Division – Business Units

Electronic Brake Systems

- Electronic brake systems, e.g. ABS and ESC
- Electric-hydraulic combi brake (EHC)
- Control units for motorcycle brakes
- ABS for motorcycles
- Regenerative brake systems
- Software for extended brake control functions and assistance systems
- Hydraulic valves

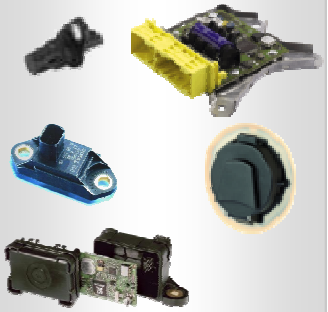


Hydraulic Brake Systems

- Brake disks
- Drum brakes
- Brake calipers
- Parking brakes
- Electric parking brakes
- Brake boosters
- Tandem master cylinders
- Mechanical, electronic and hydraulic brake assist devices
- Brake actuation modules
- Brake pressure regulators
- Brake hoses
- Duo-servo parking brake systems

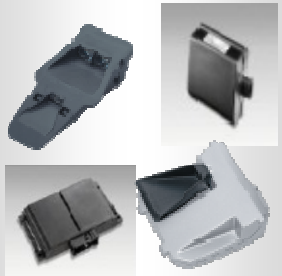
Passive Safety & Sensorics

- Inertial sensors for
  - ESC
  - Passive safety
- Satellite sensors for
  - Active chassis control
  - Side crash detection
- Steering angle and torque sensors
- Speed sensors for wheels, engines and transmission
- Passive safety control unit
- Occupant classification



ADAS

- Driver assistance systems
  - Adaptive Cruise Control
  - Emergency Braking Assist
  - Blind Spot Detection
  - Intelligent Headlamp Control
  - Lane Keeping Assist
  - Speed Limit Monitoring
  - Mono- / Stereo Camera
  - Radar / Lidar Systems

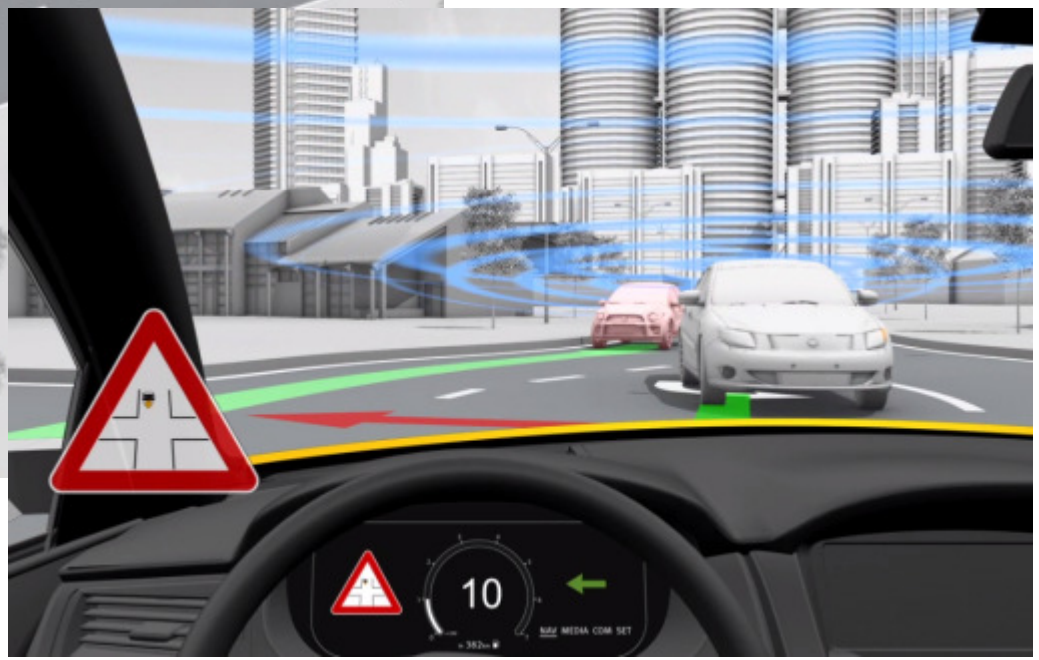


Chassis Components

- Steering systems
- Air suspension systems
- Chassis electronics
- Electronic components
- Windshield and headlamp cleaning systems

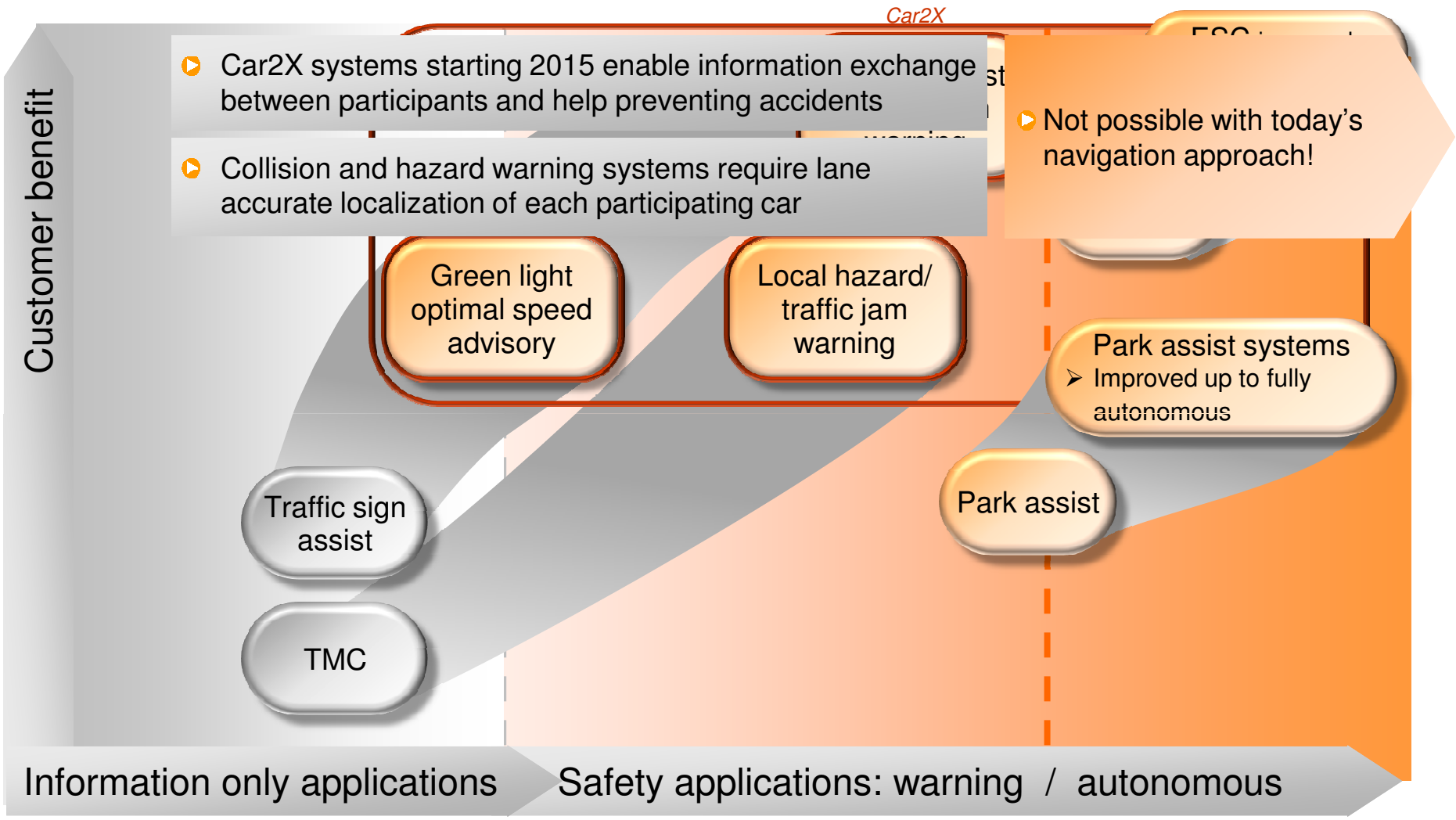
We Shape the Megatrends in the Automotive Industry

Lane Accurate Position Sensing
Motivation: Emerging Car2X Functions

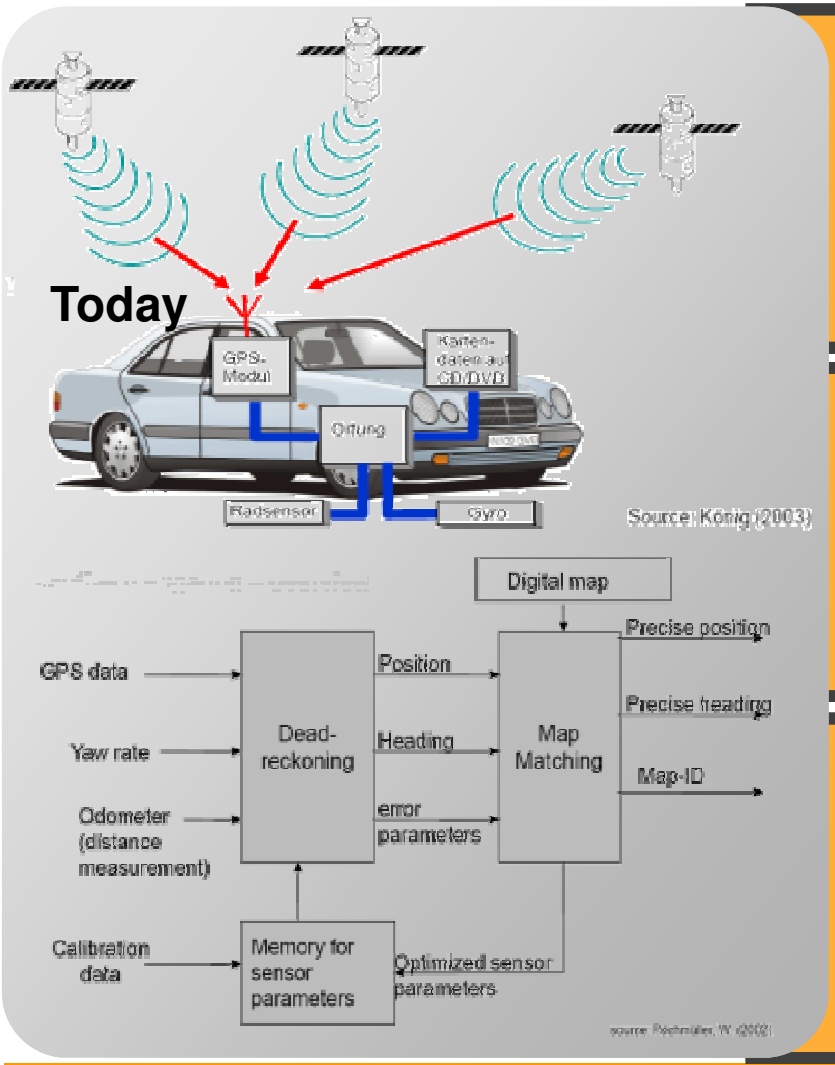


Film

System features / use cases Car2X, ESC and Park assist



Motivation: Lack of Performance in Existing Systems



Many standard sensors in today's vehicles are still operating independently

Redundancy of information is still not utilized

Positioning is optimized for navigation purpose

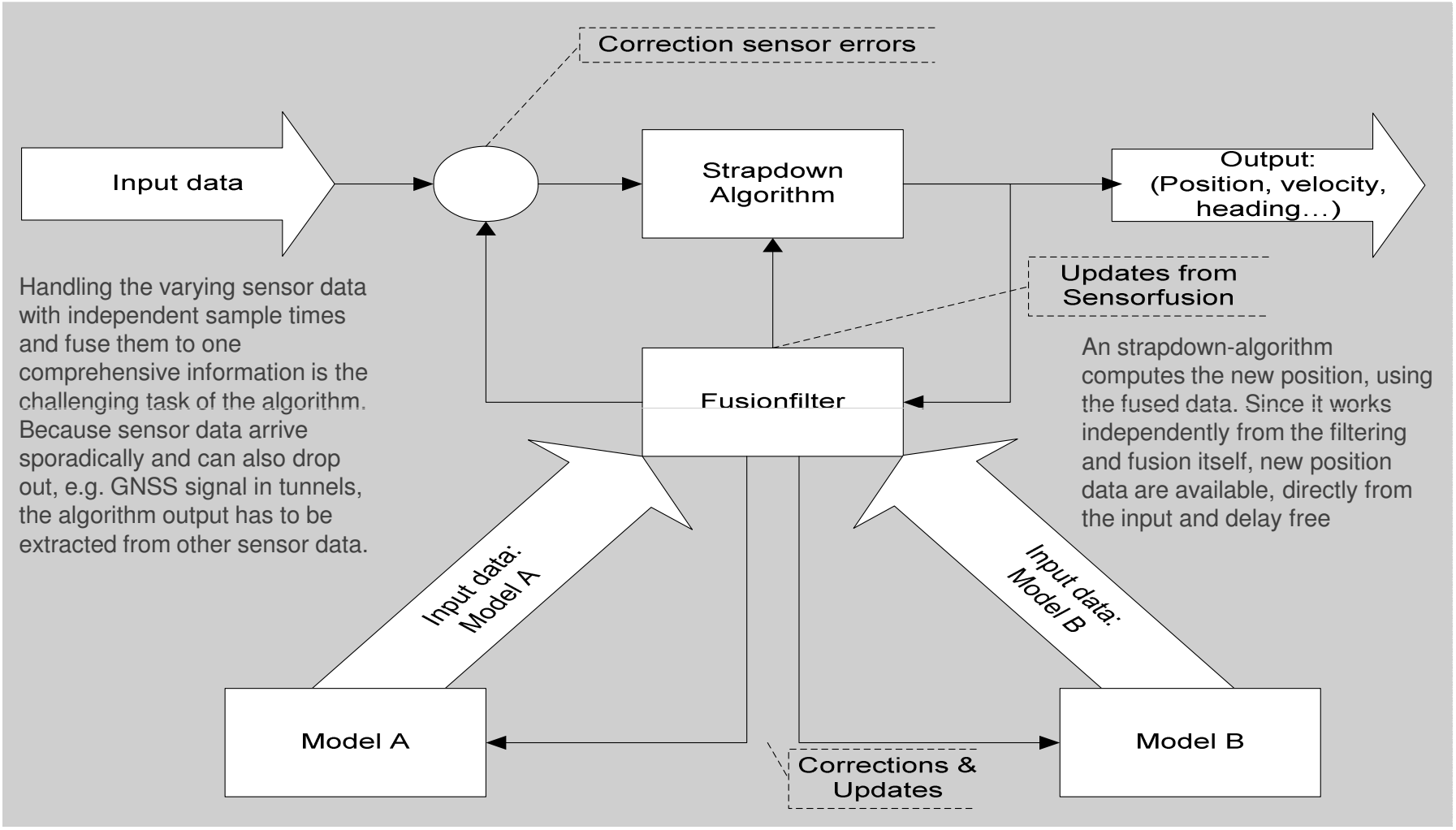
Fusion of these already available signals leads to a benefit of all involved systems with low extra effort:

- Driver assistance systems, Navigation
- Traffic guidance systems
- Cooperative vehicle communication

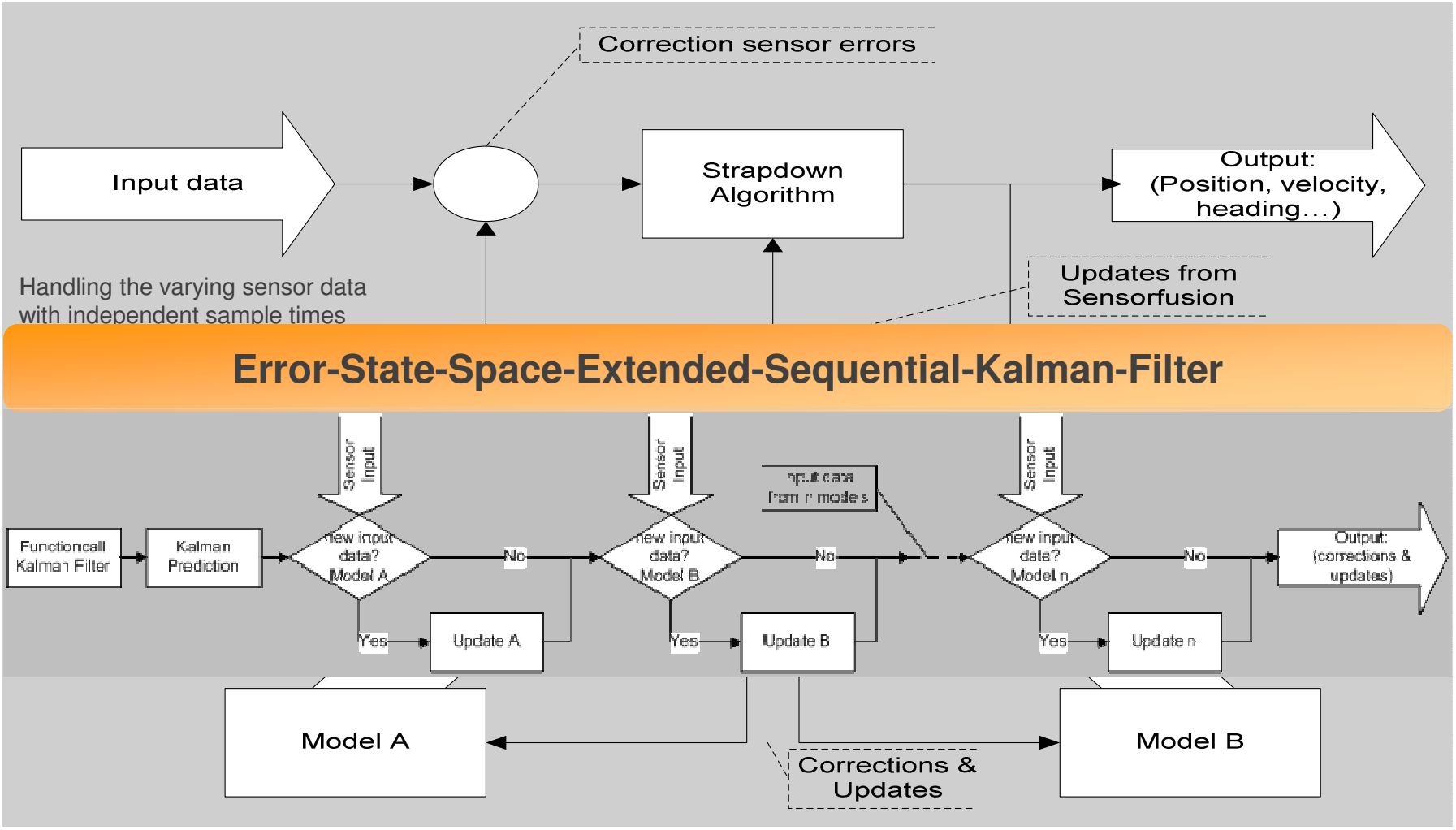
Safety

Car2x

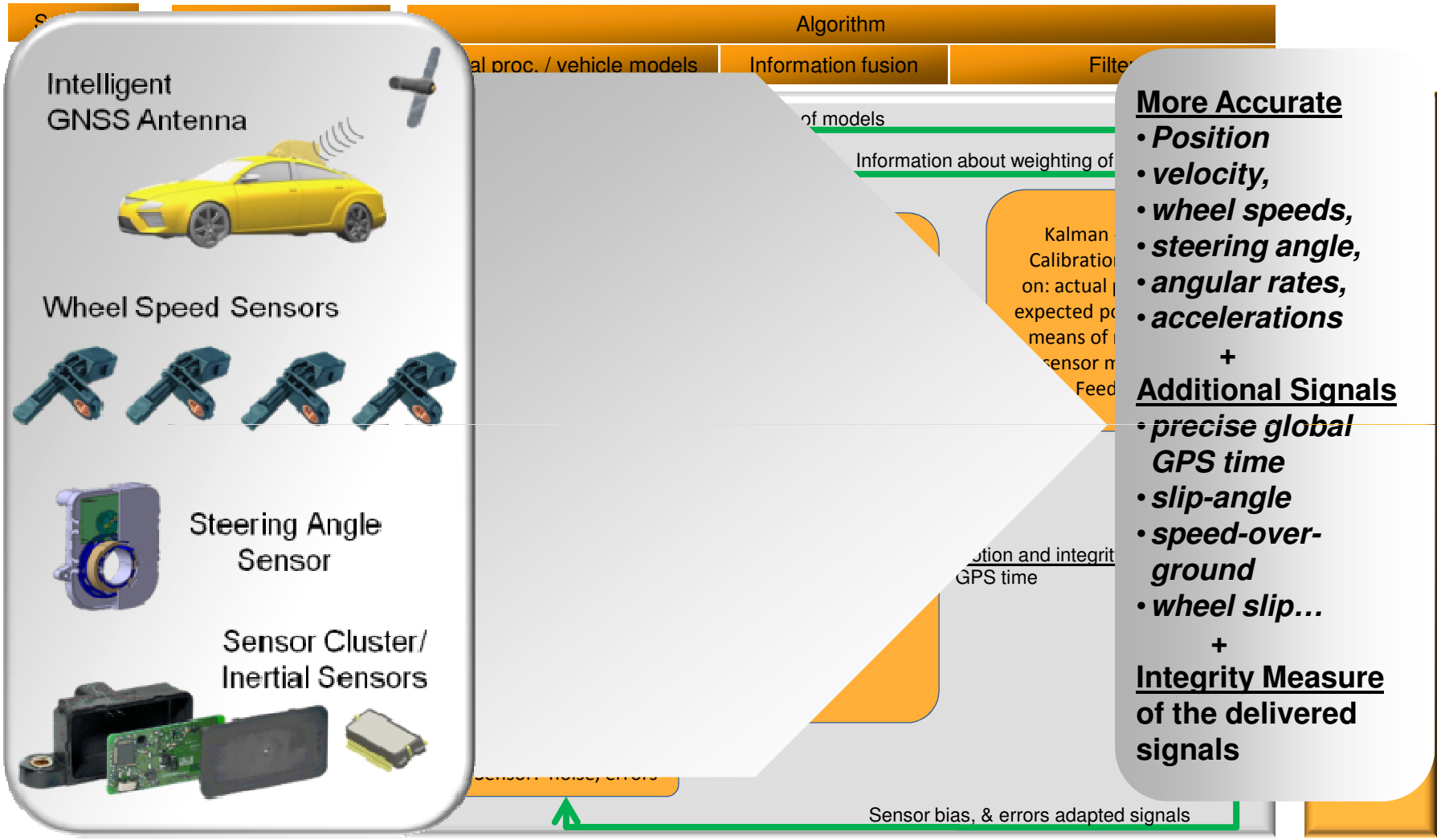
Lane Accurate Position Sensing
Algorithm – Scematic Architecture



Lane Accurate Position Sensing
Algorithm – Scematic Architecture



Lane Accurate Position Sensing
Algorithm – Detailed Architecture



Lane Accurate Position Sensing

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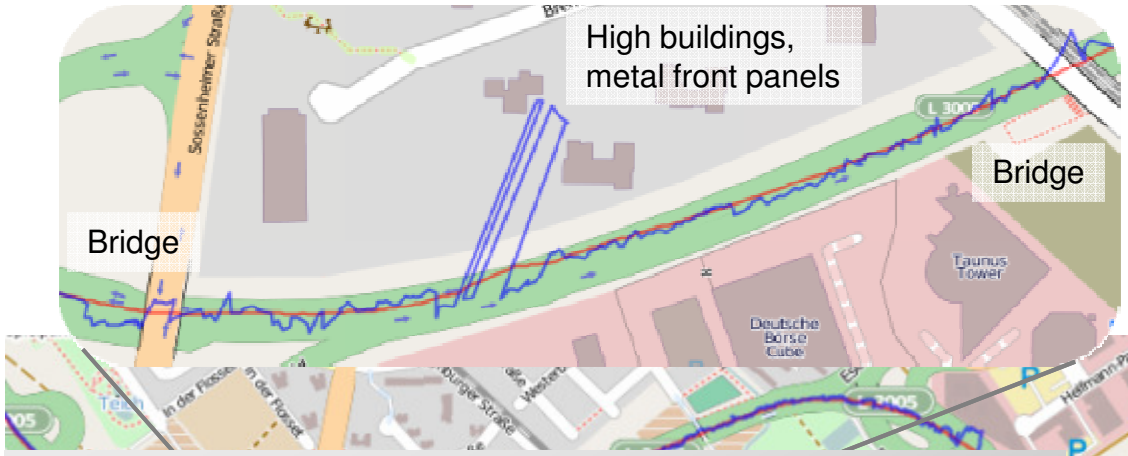
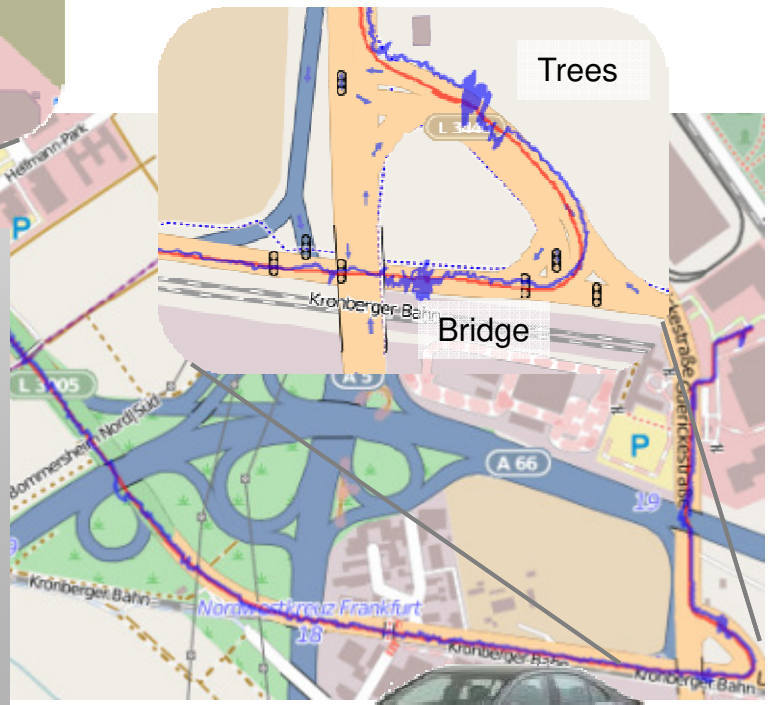
Status Demonstration of Realtime Algorithm Functionality



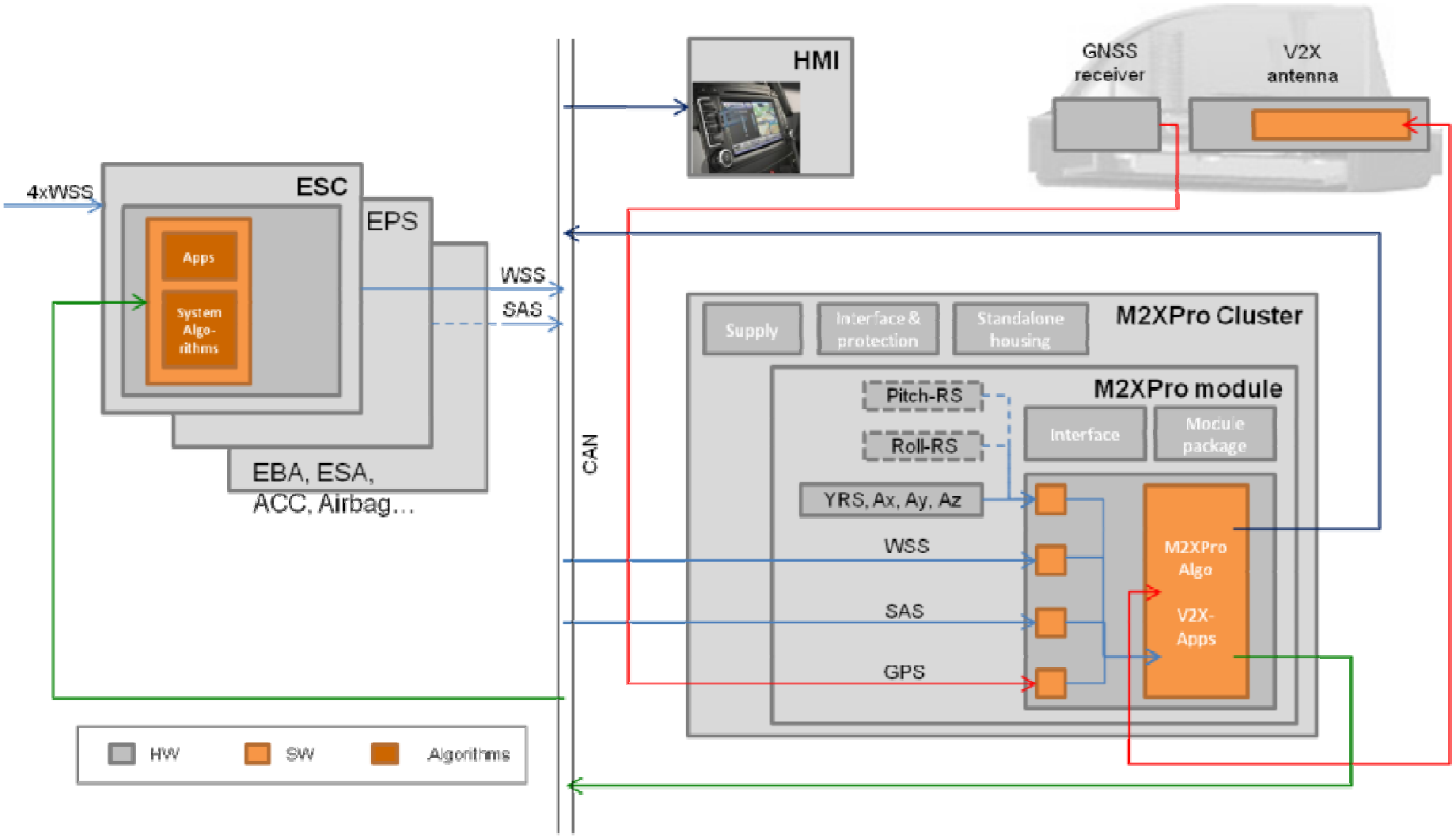
Blue = GPS position data
Red = M2XPro position data
→ No map matching applied!



Status and outlook:

- All basic models and filters implemented
- Demo-vehicle set-up with reference system, performance demonstrated
- Optimizing performance of algorithm in some driving situations, start up by fusion parameter studies
- Integrate self monitoring, restart functions, plausibility checks & integrity level

Lane Accurate Position Sensing
M2XPro System Architecture



Lane Accurate Position Sensing
Conclusion

M2XPro is Continental s reliable answer to lane accurate positioning of cars based on sensor fusion of in-vehicle sensor signals with GNSS

- Improved accuracy and robustness of relative and absolute position information
- Supply of signal integrity and performance measure
- Use of standard inertial, steering and wheel speed sensors
- Faster and reliable vehicle dynamics signals (even with less satellite contact)
- Fitting into today‘s vehicle system architecture
- Enabling cooperative vehicle communication

M2XPro design study

> **Nowadays innovation happens so fast that, when somebody declares a thing absolutely impracticable, he gets interrupted by somebody who has already realized it.***
>
> *Albert Einstein*

*Translation BS

Thank Your for Your Attention

☺ B. Schmid

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