GNSS one key enabler for autonomous driving

The 2nd EU-Japan Satellite Positioning Public-Private Roundtable

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8 sectors for ITS deployment

Working together to develop and deploy ITS

- Mobile Network Operators
- Vehicle Manufacturers
- Public Authorities
- Users
- Research
- Traffic & Transport Industry
- Service Providers
- Suppliers
GNSS and ITS application

- Positioning modules provide:
  - Position
  - Velocity
  - Time
  - Heading
ITS applications needing GNSS

• Vehicle position:
  – Emergency call
  – Electric Vehicle charging spot management
  – Navigation – traveller information
  – Traffic management / Transport and logistic
  – ADAS /Automated driving

• User & vehicle position
  – Mobility as a Service (MaaS)
GNSS for Automated Driving
GNSS for Automated Driving

• The suitability of GNSS is pending on the performances:
  – **Accuracy**: difference between the estimated and the true position
    • Where, Which road, which lane, where in the lane?
  – **Integrity**: trust in the correctness of the position
    • Is the position information usable or not?
  – **Availability**: time when the positioning service is usable
    • When and where is the Is the position available?
EU actions for GNSS performance

• ERTICO has supported several actions to define performance requirements for ITS:
  – eCall regulation (type approval)
  – Performance requirement standardisation at CEN and ETSI
    • eCall as a particular ITS use case for preparing the EU regulation (Vehicle Type Approval)
  – GSA EU funded actions (e.g. Inlane for lane level navigation)
ERTICO support to GSA Actions

- **JUPITER:** Raising Awareness of EU-GNSS for ITS applications
  - GNSS trainings for developers and decision makers
  - Best practices handbook and searchable web
  - Worldwide excellent outreach at the ITS Congresses 2015-16 with Automated Driving demos

- **Inlane:** GNSS and Computer Vision Fusion for Lane Level Navigation
  - Foster exploitation of GNSS + sensor fusion and lane level navigation
  - Fruitful dissemination at the Asia Pacific World Congress in Melbourne
Objectives

- Develop a new generation, low-cost, lane-level, precise turn-by-turn navigation application through the fusion of EGNSS and Computer Vision technology
- Enable a new generation of enhanced mapping information with real-time updating based on crowdsourcing techniques – Local Dynamic Map generation
- Bring navigation to a new level of detail and effectiveness

Only based on GNSS and actual cartography: not lane level accuracy, only road level

Severe simplification of road description

Information not based on vehicle’s real position

Cartography Update Problem
Precise positioning & scene understanding

- Lanes
- Relative Position
- Road Geometry
- Lane Marking
- Traffic Signs
- Preceding Vehicle
Camera to Map Alignment

Dynamic Map

Aim: to represent the vehicle’s surroundings with all static and dynamic safety-relevant elements.

- Vehicles in queue
- Signaling phases
- Own Vehicle – position, direction, speed, status, etc.
- Slippery road surface (ice)
- Tall Tree
- Fog bank
- Accident (just occurred)

Legacy vehicle

Output of cooperative sensing/processing

Temporary regional info

Landmarks for referencing

Map from provider
Appropriate management of positioning performance standards for ITS requires:

• Establishment of a common language for their measurement (metrics)
• Definition of performance at system/application level
• Definition of performance at positioning level
• Engineering procedure to link the two above
• Establishment of procedures for testing (measurement of performance metrics)
Conclusion

• ITS applications and in particular Automated Driving require well evaluated high levels of performance
• ERTICO has contributed to develop a suitable ITS performance requirement framework for the EU-GNSS
• The ERTICO partnership supports continuously EU and international actions to ensure seamless integration of EU-GNSS solution for ITS and Automated Driving
• Inlane is expected to bring navigation and autonomous driving to a new level of effectiveness