GAMMS

ROBOTS MAPPING FOR ROBOTS

 This project has received funding from the European Union Agency for the Space Programme under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004255. The content of this presentation reflects only the author's view. Neither the European Commission nor the GSA is responsible for any use that may be made of the information it contains.

Overview

GAMMS: Galileo/GNSS Autonomous Mobile Mapping System

Start date: July 2021

Duration: 30 months

Funding: H2020 EUSPA

Consortium: 7 companies (from Spain, France, Finland and Portugal), and 1 University (from Switzerland)

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A Complementary Consortium

HD MAPS GEOSAT GROUPE

HD Maps
(Static Base Map)

PildoLabs move smart

Consultancy and services based
on safety analysis for AV applications

EPFL

Vehicle Dynamic Networks for Navigation,
Vehicle trajectories and path planning

geonumerics

NEXA, GENA Licensing
Development of early adopter network

enide

Business models, strategy and development

sensible4

Shuttle AV manufacturer

deimos elecnor group

Galileo/GPS receiver with new Galileo features
(OS-NMA, HAS)

SOLID POTATO

Solutions for road distress mapping using
Multispectral LiDAR for new HD Map layers

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GAMMS main offering

- **HD base maps** characterized by
- **high accuracy,**
- **high reliability,** and
- **certified** (if required).
- Inclusion of quasi real-time, **continuous online update of the non-base HDM.**

GAMMS secondary offerings [1]

- an **enhanced AV** (better navigation, better maps)
- **automated & AI-based HDM production**,
- a **new GNSS/Galileo receiver** including the recent and coming Galileo features and services,
- an **enhanced trajectory determination system** including vehicle dynamic models (VDMs), dynamic networks (DNs), Galileo-enabled features
- **a new road quality assessment method,** HW and/or SW, based on multispectral laser scanner (MLS)

AV @ Sensible4

HD map @ TomTom

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GAMMS value proposition

AMMS-made HD base maps for AV applications that, at comparable technical specifications, are 30% to 40% less expensive that current (manned MMS-made) options. The **unique benefits** stem from:

- the **elimination** or –country-dependent– **reduction of MMS crews** on account of the use of AVs,
- the **very large reduction of the number of field surveyed ground control points** (GCPs) thanks to the use of Galileo and new trajectory determination techniques like DNs and VDMs,
- the **shortened map production times** due to the use of AI -reduction of human image and cartographic interpretation-.

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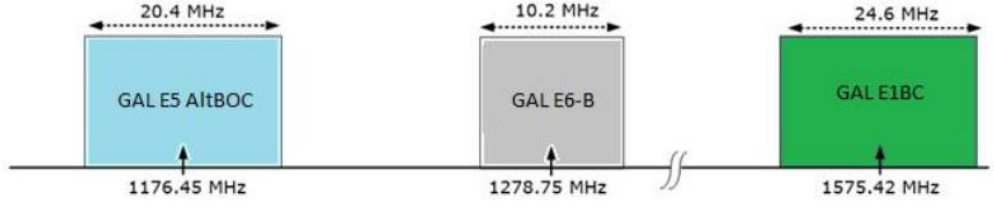
Provision of GNSS receiver with the following enhancements:

- Inclusion of Galileo Open-Service Navigation Message Authentication OS - NMA
- Implementation of Galileo High Accuracy Service HAS
- Assessment on how to implement CAS (Commercial Authentication Service)

- E1 Band (GNSS)
- E5 AltBOC Band(GNSS)
- E6B (HAS Data Link)



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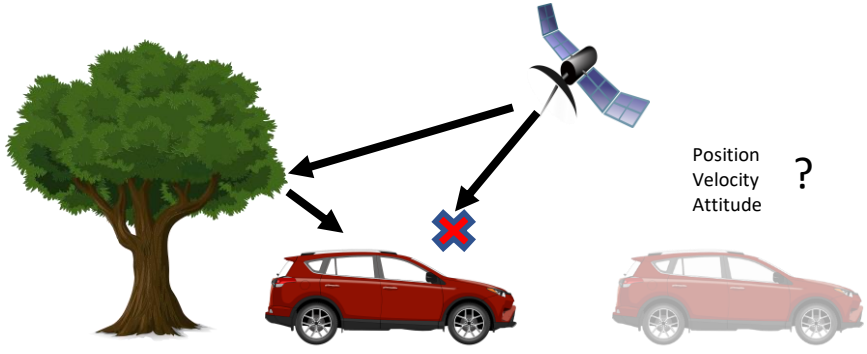
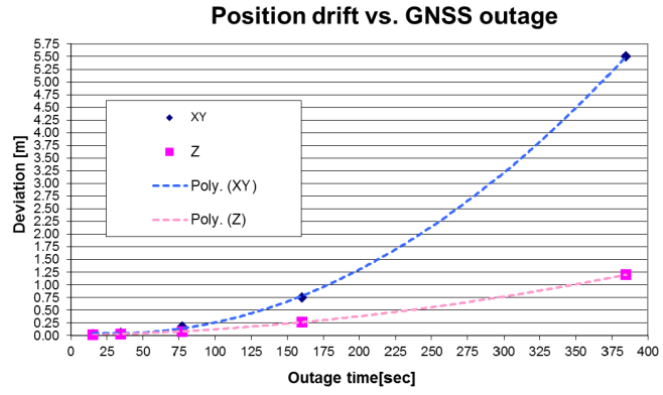
Vehicle Dynamic Model





EPFL has already demonstrated how employing VDMs brings tremendous improvement in trajectory determination for aerial applications, especially during GNSS outages. **Higher fidelity VDMs will provide GAMMS a better navigation performance with a reliable support for outlier detection and improved integrity monitoring**

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geonumerics

Trajectory estimation SW platform, that delivers real-time and post-mission trajectories

multi-sensor navigation:

- GNSS navigation
- HAS Galileo
- multi-constellation & multi-frequency GNSS
- inertial measurement unit (IMU),
- odometer,
- chip-scale atomic clock (CSAC)
- vehicle dynamic models (VDM)
- visual features from camera images

improved navigation: precision, accuracy, resiliency, integrity

EUSPA European Union Agency for the Space Programme

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Surface fitting algorithm:

The algorithm fits a polynomial surface to the road surface and separates pavement points from those points that remain below the surface, classifying them as road damage points

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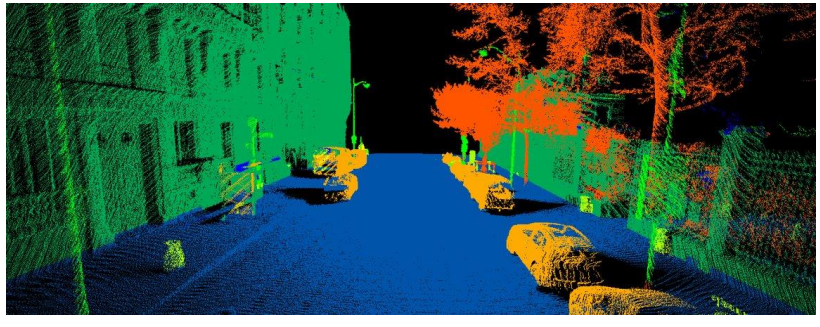
HD map generation



Data Collection
MMS

Trajectory
Consolidation and
Georeferencing

LiDAR
Processing

Images
Processing

Object
extraction
and
vectorisation

Import into Database

Transformation to
HD Map specification

HD MAPS

HD Maps Workflow

	Objects	Examples
Real objects	Lane Lines	 etc.
	Double Lane Lines	 etc.
	Road Edges	Walls, Road Edges, Guard Rails, Barricade Blocks etc.
	Road Markings	Directions, Safety-zones, Caution of road obstacles etc.
	Traffic Signs	 etc.
	Traffic Lights	 etc.
	Tunnel boundaries	Boundaries between Inside and outside tunnel
Virtual objects	Lane Linkage	Lane center line in each lanes
	Road Linkage	Linkage of each up and down lanes for linking external data
	Intersection	Polygon data which defines the area of intersection

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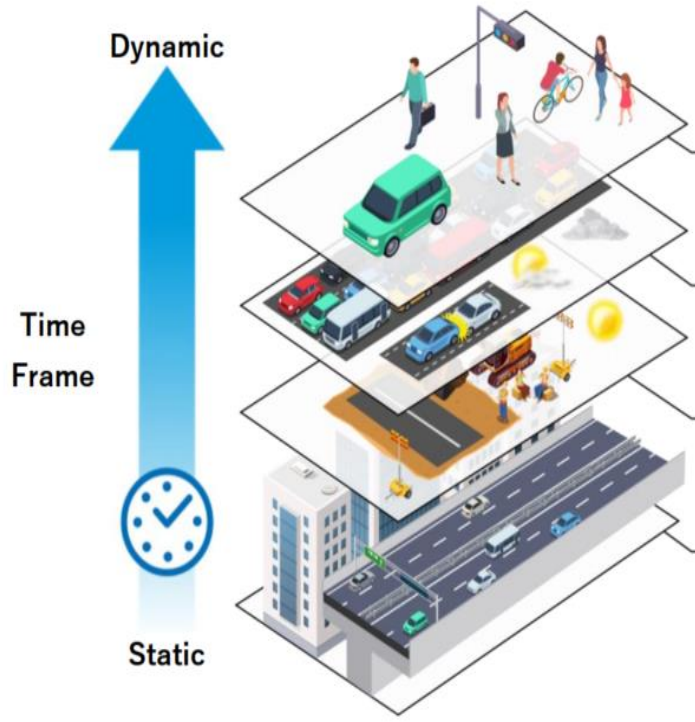

Dynamic information

Information on surrounding vehicles, pedestrians, traffic lights, etc.

Quasi-dynamic information

Traffic accident information, traffic regulation information, traffic congestion information, narrow area weather information, etc.

Quasi-static information

Traffic regulations, road construction schedules, wide-area weather forecast information, etc.

Static information (High-Precision 3D Map data (HD Map))

Information on the number of lanes, lot lines, roads, building locations, etc.

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Questions?

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