

VOLIERA: a multi-sensor localization framework for ERTMS applications

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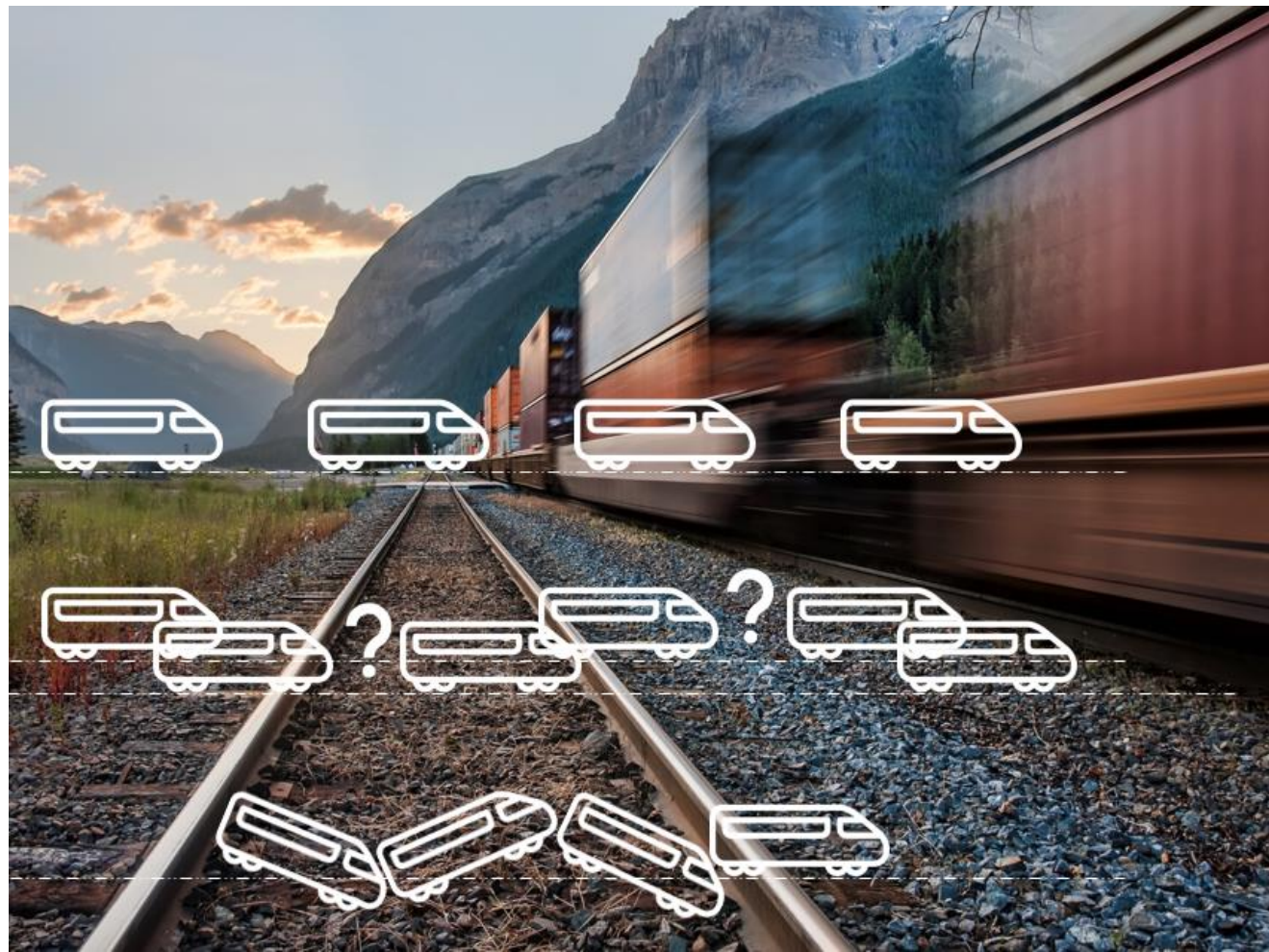
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Motivation

Accurate position information is needed for:

- ✓ Increasing rail capacity
- ✓ Discriminating rail track
- ✓ Increasing safety



ERTMS + EGNSS



LIDAR



INS/GNSS



The scope of VOLIERA

«VOLIERA - Video Odometry with LIDAR and EGNSS for ERTMS applications» main scope is to develop an innovative multi-sensor component aimed at providing relative and absolute position and odometry information suitable for the railway environment.

HITACHI
Inspire the Next

Radiolabs

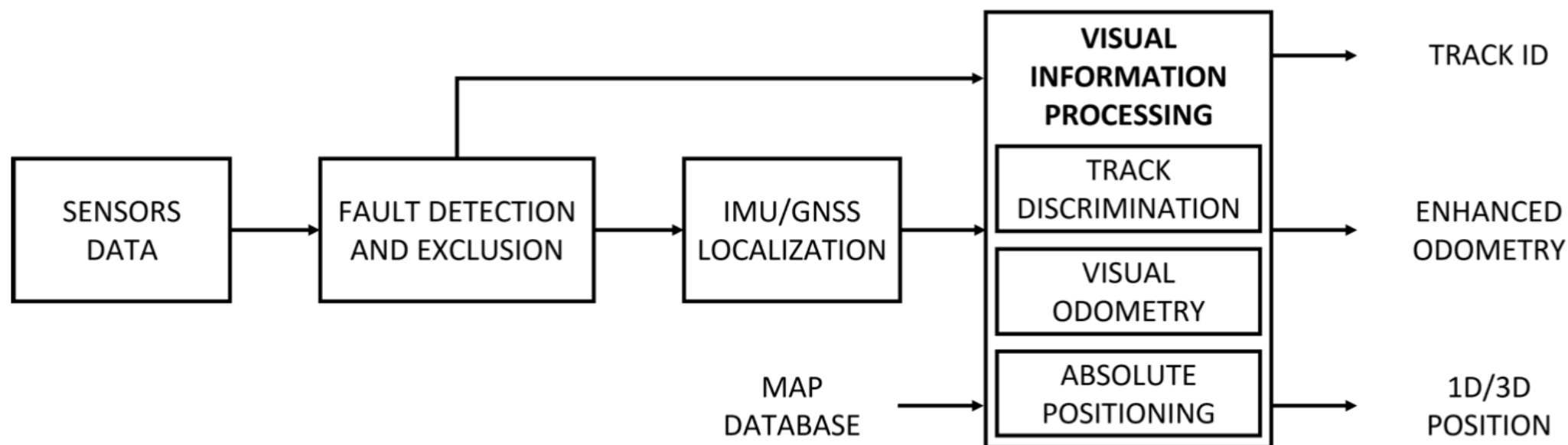
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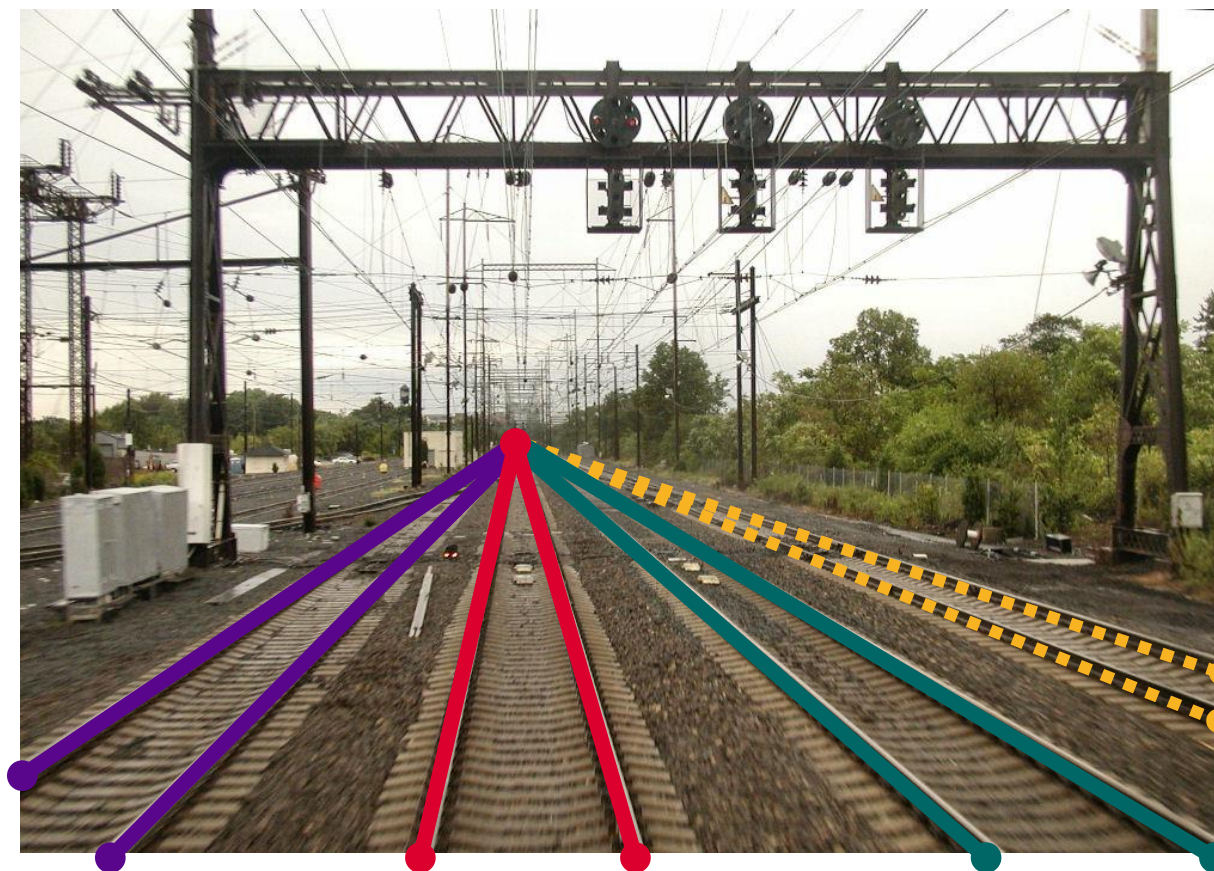
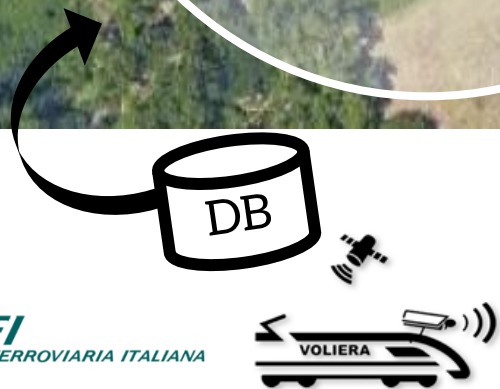
VOLIERA is co-founded by the European Space Agency under the NAVISP Element 2 programme (Ref. 4000128511/19/NL/MP).

esa

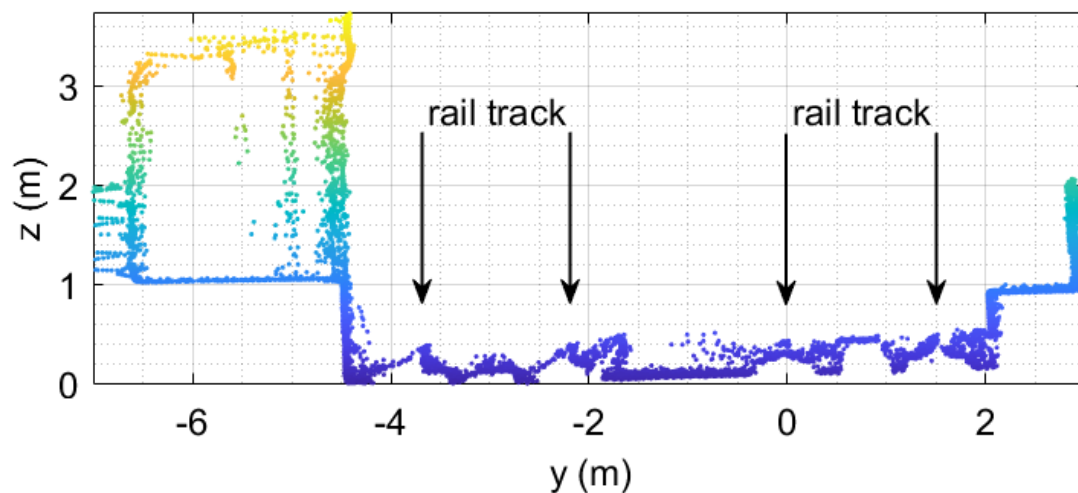
System architecture



Track discrimination



Track discrimination



POINTCLOUD

Avg. sliding
window

RANSAC

Track
identification

Track ID

Track DB

Absolute positioning

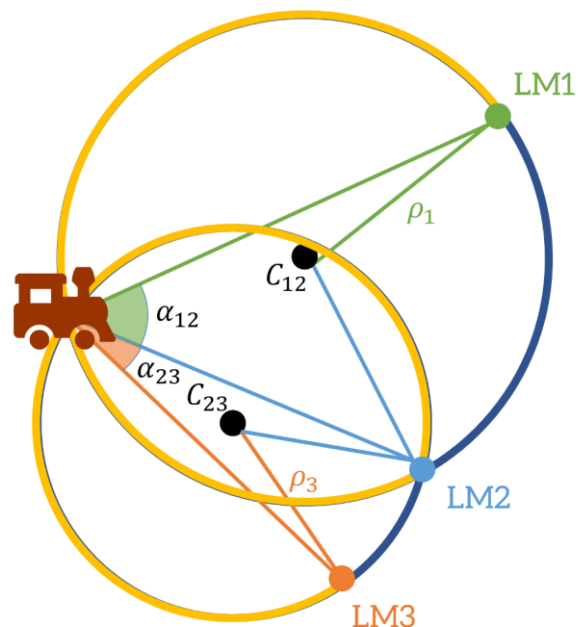


3D landmark
detection



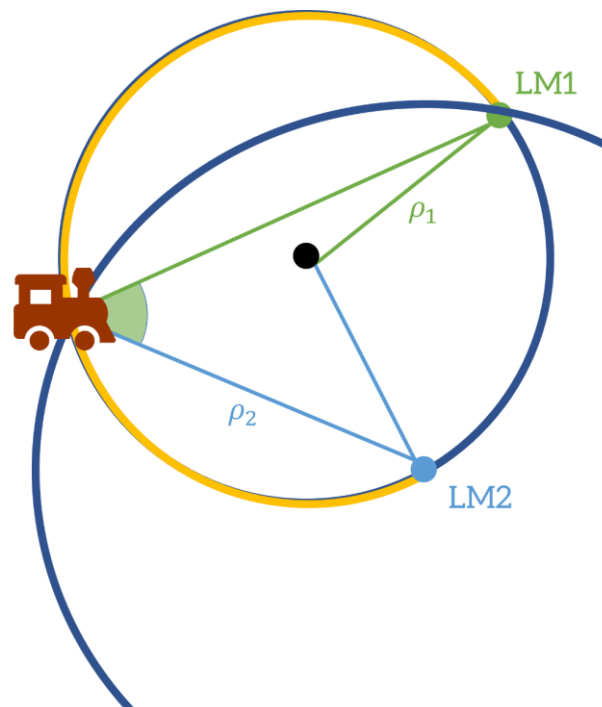
Absolute
positioning

Absolute positioning



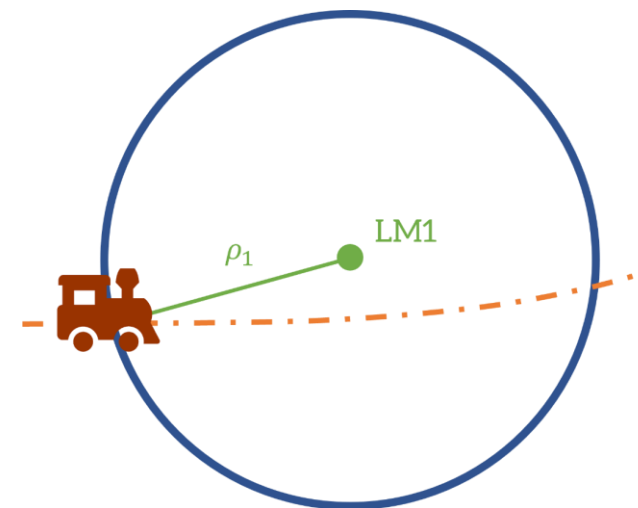
Workflow #1:

>3 landmarks



Workflow #2:

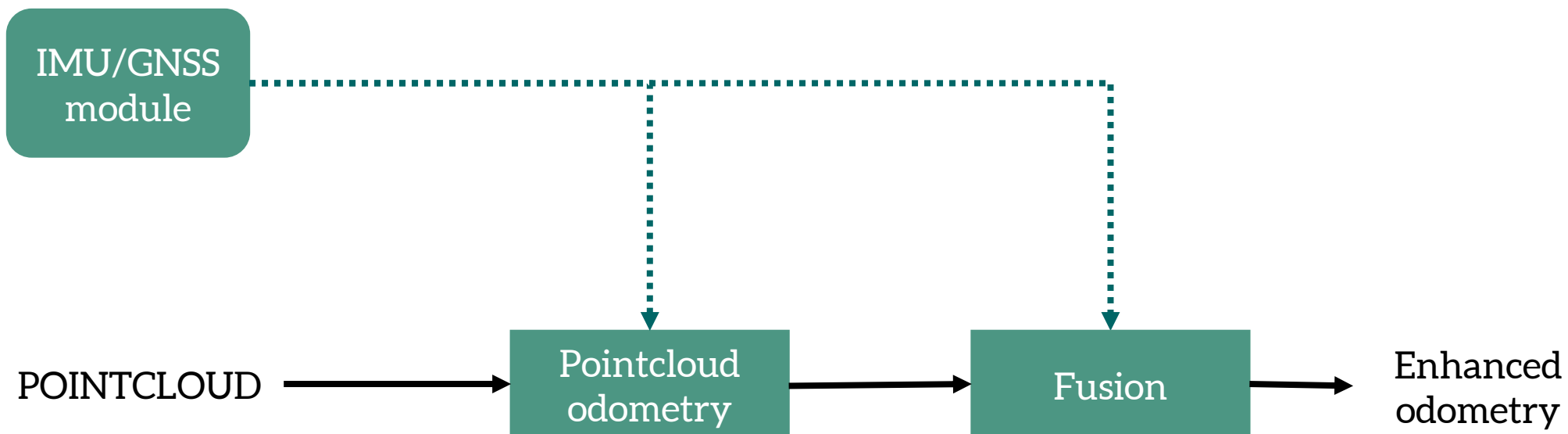
2 landmarks



Workflow #3:

1 landmark

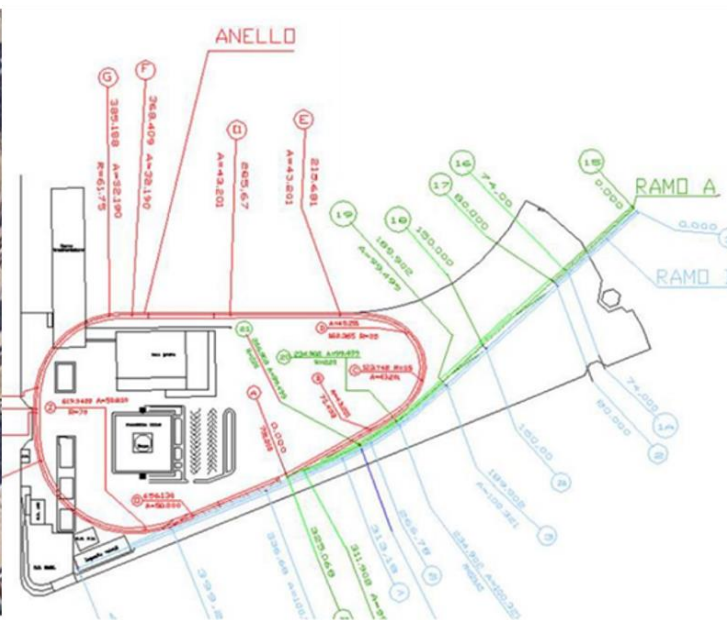
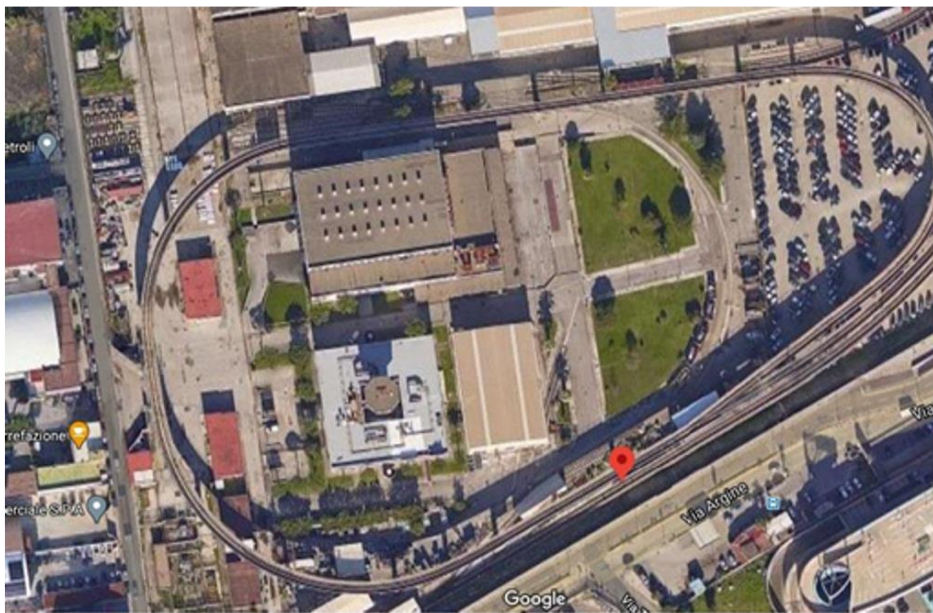
Visual Odometry



The testbed

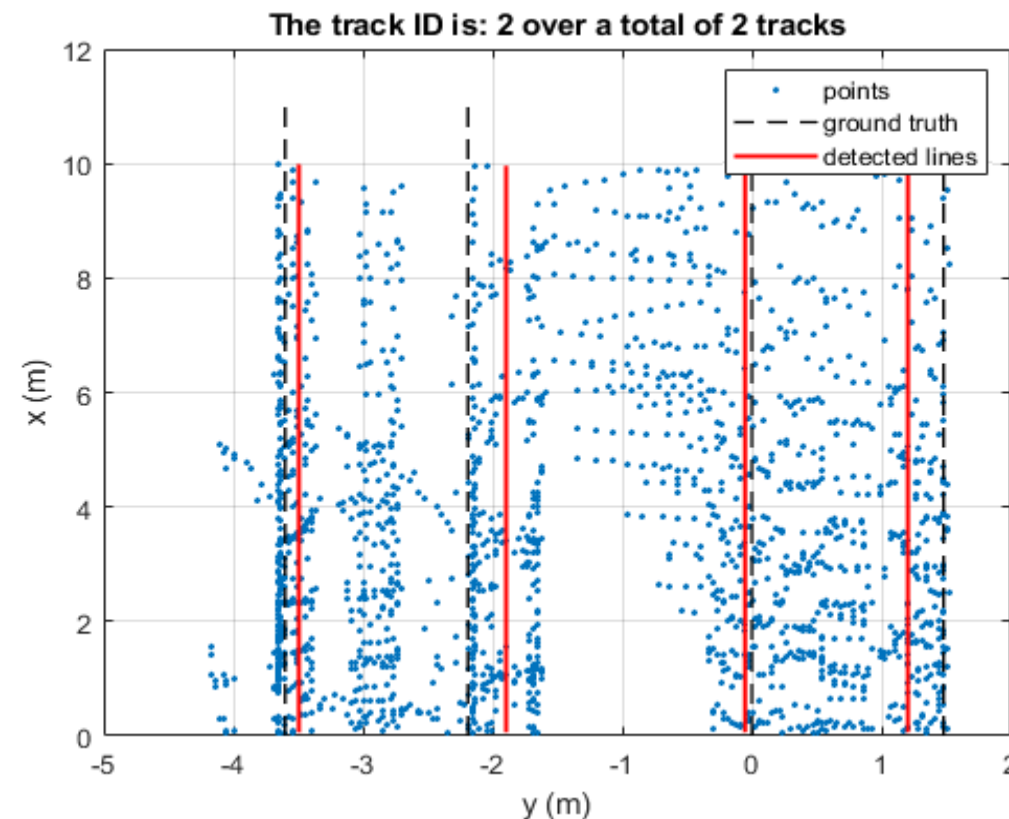
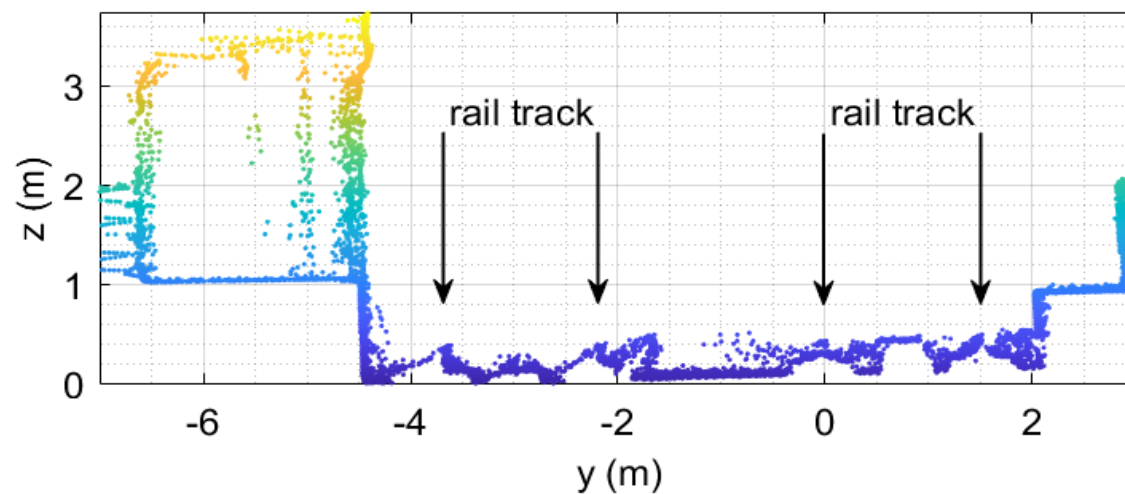
The testbed is located in the Hitachi premises in Naples, is composed by three parts:

- Branch A of length 325,07 m
- Branch B of length 494,24 m
- Ring of length 731 m.

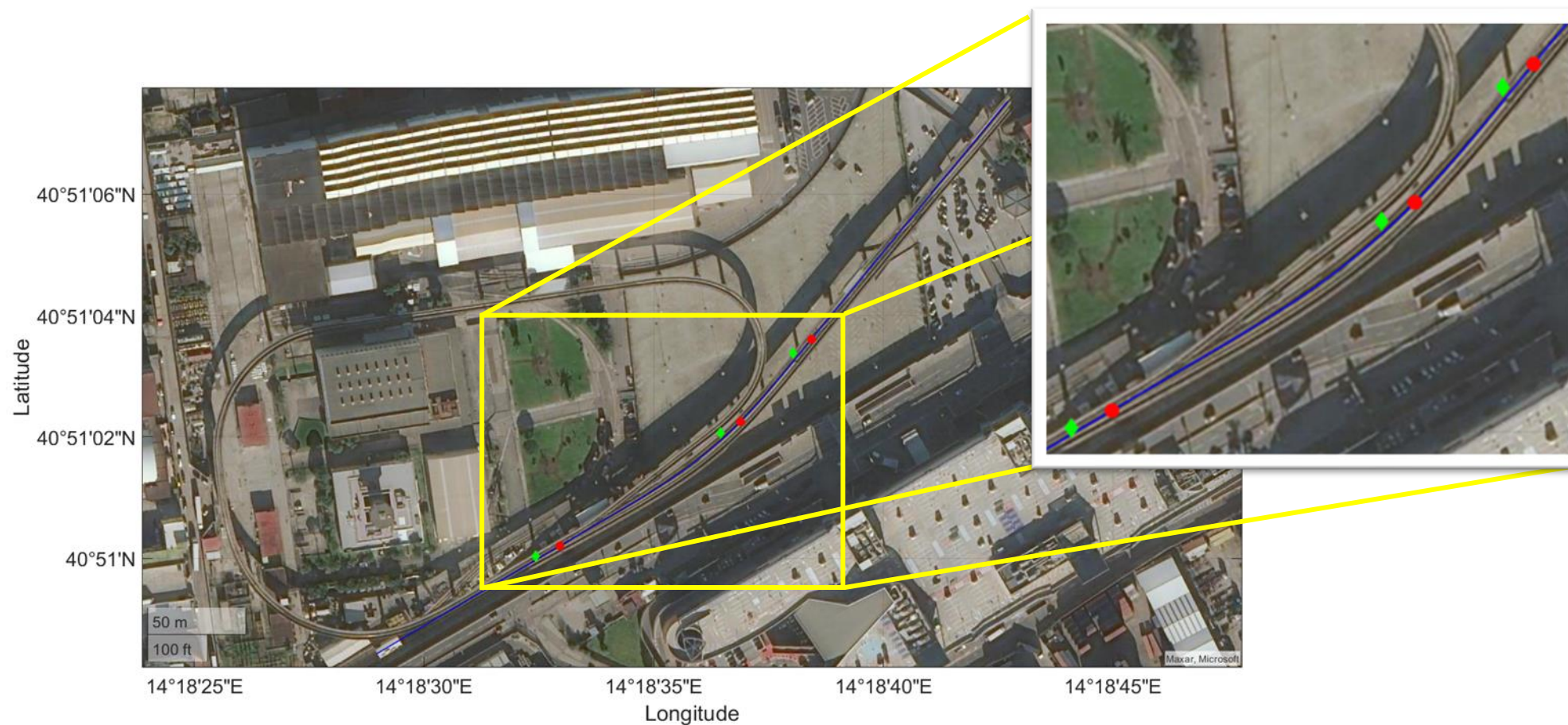


It includes three switches, one railway traffic light and four track-side railway signals.

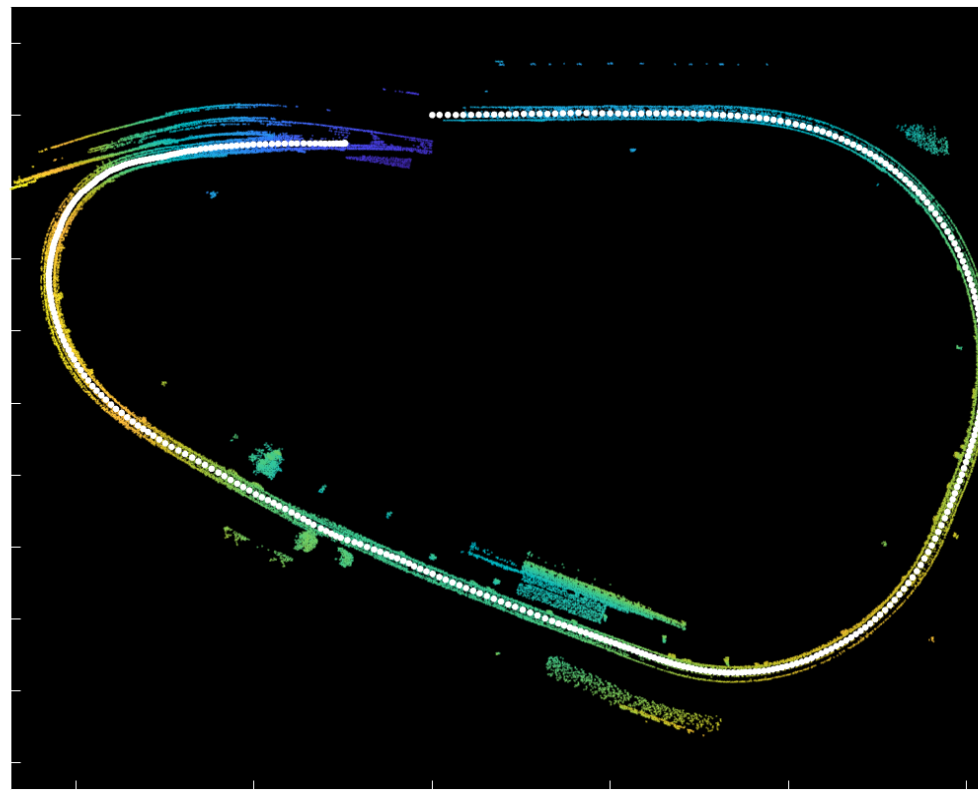
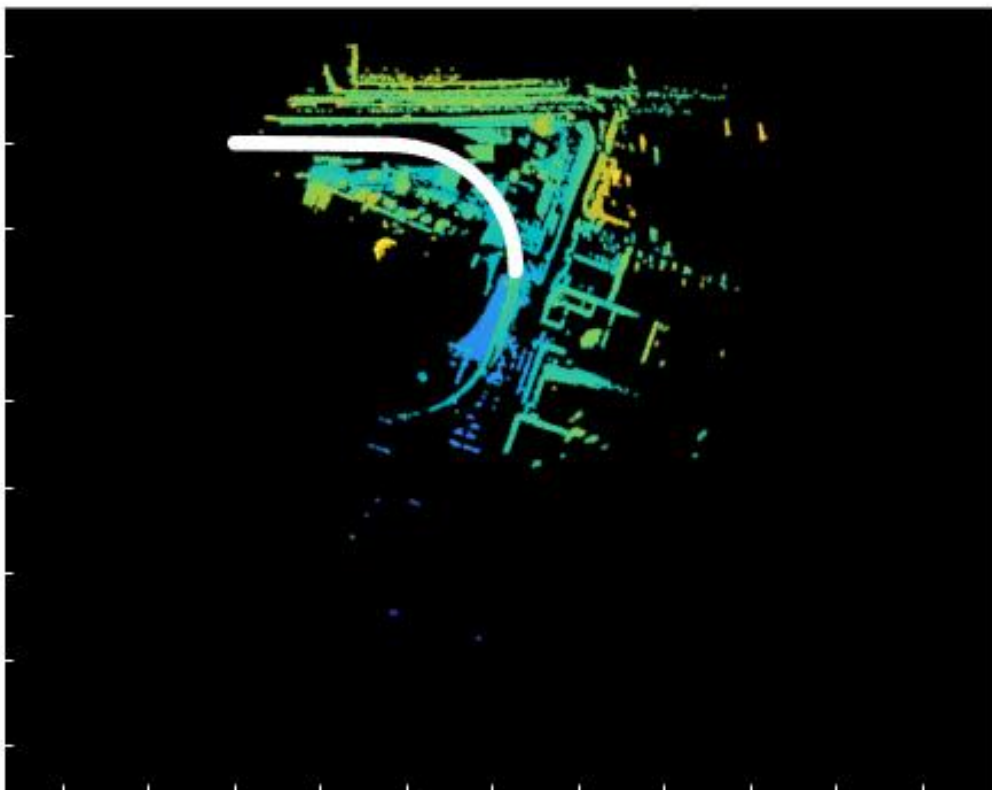
Experimental results: Track discrimination



Experimental results: Absolute positioning

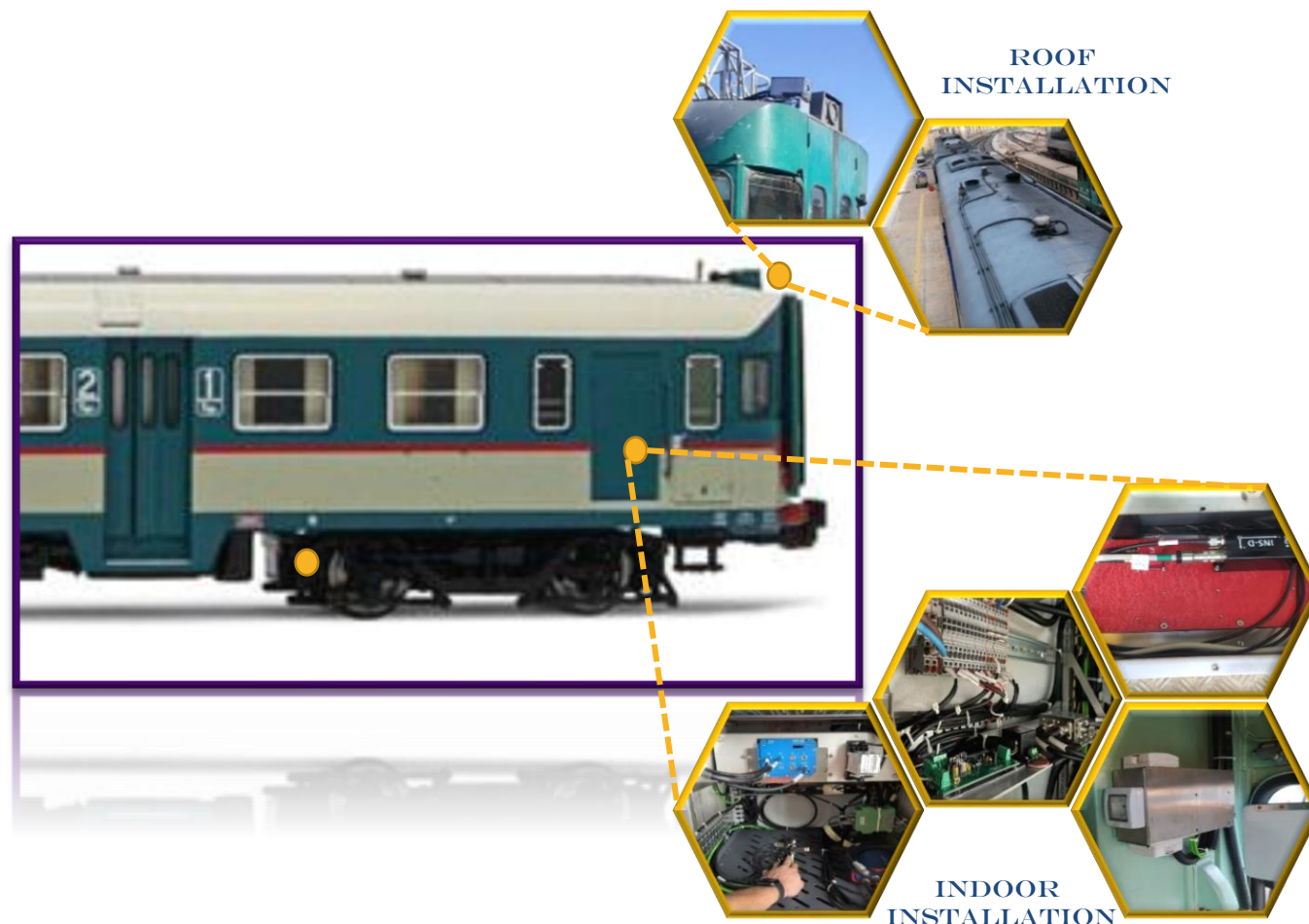


Experimental results: Visual odometry



Conclusions and future work

- VOLIERA project (co-funded by ESA NAVISP-2 program) has demonstrated the feasibility of Video Odometry with LIDAR and EGNSS for ERTMS applications.
- Experimental tests on a test track have confirmed the predictions, opening the way to an innovative solution for relative and absolute train positioning and odometry information for the ERTMS.
- As next step, VOLIERA will exploit the information on track ID, absolute positioning and visual odometry to estimate the train direction and the track occupancy if the train length is known.



Thanks for your attention



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<http://voliera.eu>