

IRPS Achievements

- **Cooperative Project**
 - Technology Innovation brought from lab to Operational application
 - IRPS Service Demonstration (IRPS Simulators+ Live demos)
 - IRPS/ LIMS showcase
- **Technology Integration & Showcase**
 - **Mobile Robotic Platform : MRP development & Integration (PIAP, ISR)**
 - LIDAR Measurement System Sensor :LIMSS development & Integration. (IAI, Scisys)
 - LIDAR Measurement System development & Integration (LLG,ISR,CS)
 - Mission Control Center MCC development & Integration (Scisys, CS)
 - IRPS Global Reference Model IGRM development & Integration (CS, LLG)

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IRPS December 17-18th, 2009 ANA, FARO, Portugal

IRPS Final Event, MRP Integration

Presentation by FCT-UC

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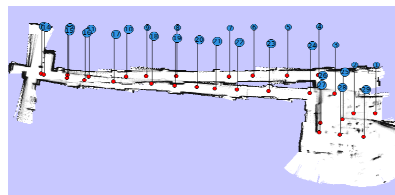
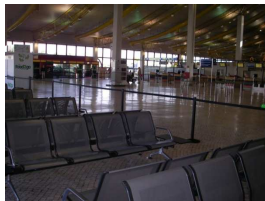
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Mapping for Navigation and Localization

- What is the importance of Mapping for Navigation and Localization?
 - Autonomous Navigation of Mobile Platforms
 - Metric Maps (machines) / Topological Maps (human)



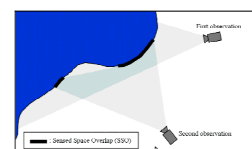
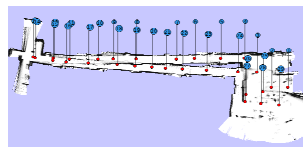
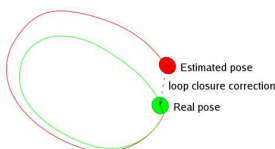
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Mapping for Navigation and Localization

- What is the importance of SLAM (Simultaneous Localization and Mapping)?
 - Odometry errors correction
 - Automatic Registration of Large 3D Data
 - Loops and Overlapping Detection



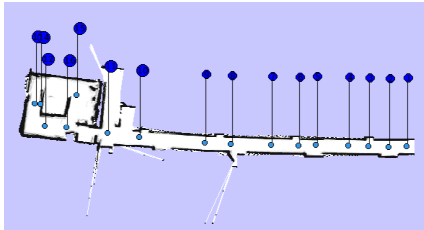
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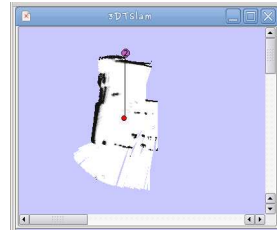
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TSLAM - Our approach

- Topological SLAM
- TSLAM is a probabilistic approach to Simultaneous Localization And Mapping
- It builds Hybrid Topological – Metric maps



Hybrid map



Metric map + Topological node

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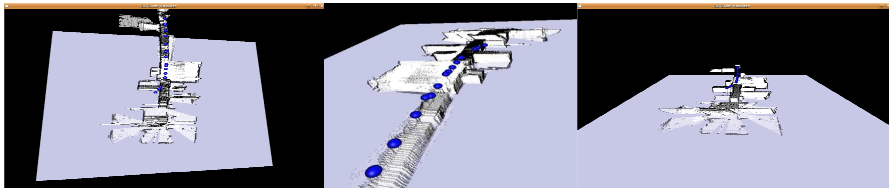
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TSLAM 3D capability

- Why is so important within robotics field?



- 3D reconstruction
- Data registration
- Infrastructures surveillance

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Loop Detection system



- Loop Closure allows to recognize re-visited areas

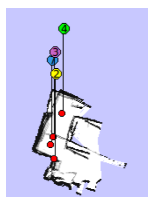


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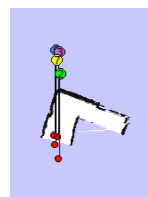
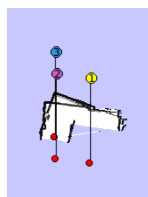
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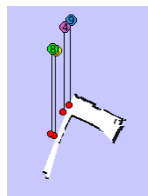
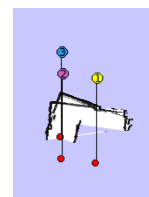
Loop Detection and Map Matching



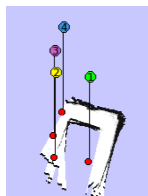
Match between node 7 and node 3: 51%;



Match between node 8 and node 3: 95%;



Match between node 9 and node 4: 61%;



- A threshold is defined according to the environment where the robot moves, to decide if a match between maps is positive.



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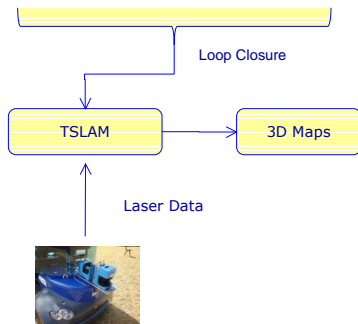
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Data acquisition



Yamaha OR Segway OR Melex



- Laser, Camera and Odometry data is acquired and processed to define Hybrid Metric-Topological Maps;

- This data is analyzed and compared to a pre-recorded environment;

- This process allows novelty detection and object changes revealing.



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TSLAM live demo



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MRP development

- A MRP was instrumented to achieve autonomous capability
- A PLC system allows traction and steering control
- Incremental encoders provide odometry data



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LIMSS integration with the MRP



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Potential Benefits

- What are the Potential Benefits?



- Autonomous patrolling
- Assisted Living
- Surveillance
- Automatic novelty detection on 3D structures
- Tour Guiding



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Team



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Paulo Drews



Filipe Ferreira



Ivone Amorim

Thank you!

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