

Project Results

Meeting the challenge of accurate 3D positioning for mobile robotic applications

LIDAR indoor measurement, 3D scanning techniques and autonomous navigation

The purpose of the project is to provide mobile robotics platforms with advanced mapping and navigation systems based on accurate positioning, 3D measurement technology and change detection.

The 3D measurement technology, named **LIMS (LIDAR Imaging and Measurement System)** is based on an innovative concept of real time laser system position measurements in a dynamic environment.

- **The project produced an accurate 3D sensing LIMS system** as a key component for advanced navigation and surveillance. Systems.
- **The project demonstrated a public service using the Intelligent Robotic Porter System** to help porting and guiding the public in large airport areas.

Current robotic systems are missing a highly accurate indoor 3D sensing technology that could provide more advanced and autonomous robots. LIDAR based systems used on mobile platforms provide a number of advantages when compared to currently available localisation systems.

Overcoming limitations of current localisation and 3D mapping techniques

The robotic 3D mapping is a valuable task for supporting navigation & positioning of robots based on a world model. Current robotic positioning systems are mostly vision based and do not provide enough accuracy, preventing their use in human populated or congested areas.

The measurement technology principles for 3D measurement in IRPS supports 3D real time measurements and change detection at speed of up to 5m/sec in presence of sparse objects.



IRPS (FP6 IST 045048)

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Partners

- ANA (Faro)
- ATB (Toulouse)
- CS (Toulouse)
- FCT-UC(Coimbra)
- IAI (Tel Aviv)
- LLG (MontReal)
- PIAP (Warsaw)
- Scisys (London)

Project start
January 2006

Project end
December 2009

Contact

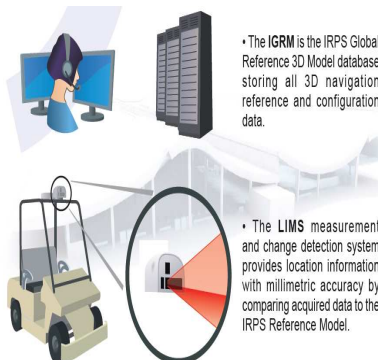
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• The Monitoring and Control Center is in charge of controlling a set of mobile robotic porters attached to a given IRPS Reference Environment.

• The MRP is the Mobile Robotic Porter platform who transports passengers and/or luggage from one place to another.



• The IGRM is the IRPS Global Reference 3D Model database storing all 3D navigation reference and configuration data.

• The LIMS measurement and change detection system provides location information with millimetric accuracy by comparing acquired data to the IRPS Reference Model.



Project Results

Maximising the benefits of LIDAR measurement and 3D sensing

IRPS set out to promote the use of LIDAR based measurement for 3D sensing of large operation areas. At the same time, it supported the development of operational procedures to benefit of LIMS on mobile platforms.

The project produced the LIMS 3D sensor system, mission control centre, mobile robotic platforms, operational procedures and integration into a mobile robotic porter application to demonstrate operation access and use. Moreover, results showed that such 3D techniques being structure independent represent a promising solution to major issues that have arisen with new positioning techniques :

- non-accurate/non-reliable positioning systems GPS/DGPS based techniques (in-door use)
- dependency on reference structures

Within the project, the LIMS was used to recover the position of the robot related to the environment by using natural landmarks, through the comparison of the current environment 3D map with pre-processed scanned model. Due to the accurate positioning capability the technology can be extended as the core of numerous applications, like:

- Position accuracy based systems over long distances
- Plant Monitoring (Electric Wires, Pipes, defect monitoring)
- Railway maintenance (analysis of 20cm large objects at 180km/h)
- Large indoor 3D dense environment allocation and mapping (airports, public areas,..)

Pushing the spread of the technology

IRPS now serves as a driving force for the robotic and sensing market. Its results address the 3D sensing, measurement and homeland security market. The partnership that has resulted from the IRPS project will help spreading of the technology in Europe. The project developed and integrated hosting components for mobile robotic applications :

- The mission control center for a robotic porter service to be deployed on a large public area such as airport
- two Mobile robotic platforms, based on commercial electric cars
- The 3D polynomial, solid model of the Faro Airport allowing for real time LIDAR simulation, model update during operation and navigation.

LIDAR based measurement technology & hosting components for mobile robotic platforms were developed by the IRPS partners enabling them to gain a competitive advantage over their US competitors. Moreover, the partners acquired new competences in 3D sensing technology and supported its use, leading to associated new technological projects and employment.

Most importantly, the project is bringing added value and competitive advantage to the European embedded systems and robotic industry in terms of 3D sensing, localisation, navigation, safety and security.



IRPS (FP6 IST 045048) Major Outcomes

- IRPS service concept illustration and demonstration
- LIMS concept illustration and demonstration
- Dissemination of LIMS based technology in mobile applications, security and global industry;

Dissemination

- 12 publications
- One final event demonstrating the concepts and applications:
- IRPS service demonstration
- LIMS homeland security application demonstration

Exploitation

- Industrialisation of the LIMS
- Industrialisation of the Mission Control Center
- Industrialisation of the 3D modelling and visualisation
- LIDAR geometric simulation, model updates, navigation system with route planning and real time collision avoidance
- Mobile & Home land Security applications