

62623

SLAM: localización de robots y construcción simultánea de mapas

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<http://webdiis.unizar.es/~neira/slam.html>

Outline of the course: Lectures

- 1. Introduction**
- 2. Sensor and feature modelling**
- 3. The data association problem**
- 4. The scaling problem**
- 5. Current trends in SLAM**

Outline of the course: Lab Work in Matlab

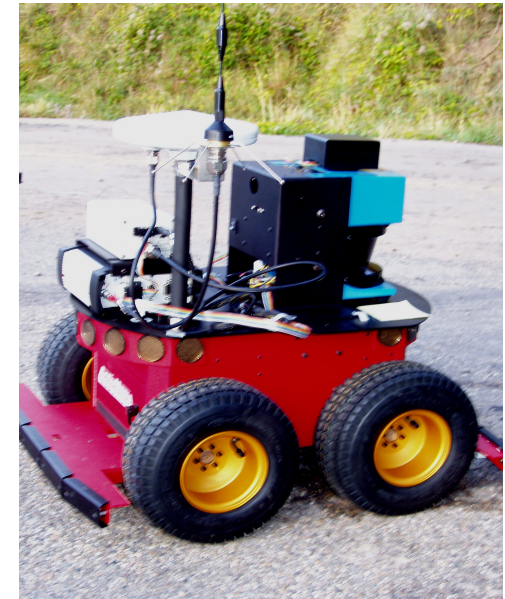
P1: Continuous SLAM

P2: Global Localization

P3: SLAM using Local Maps

1. Introduction

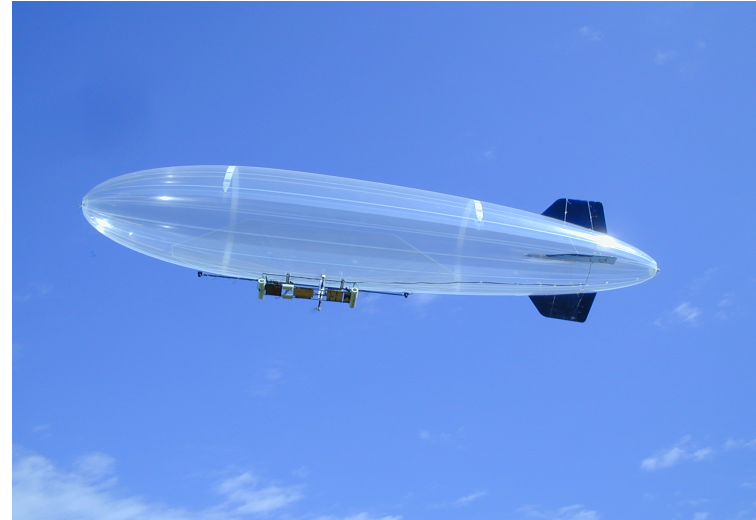
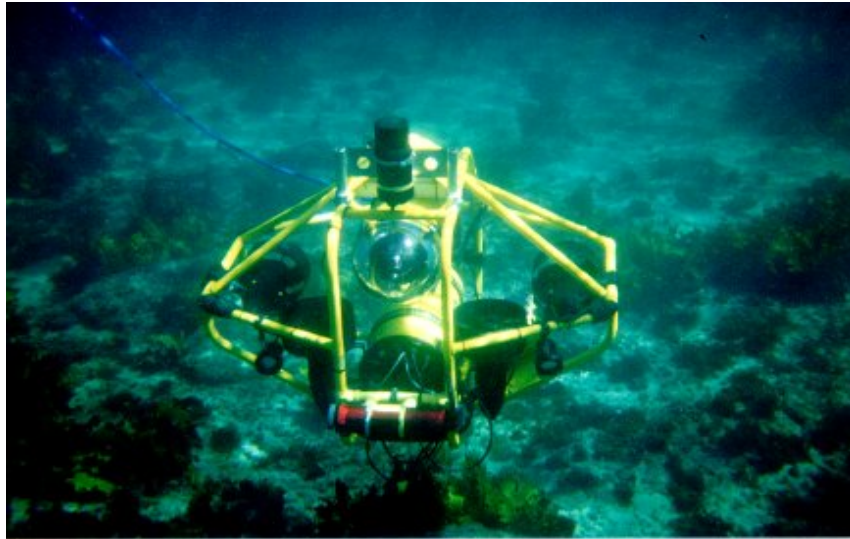
Mobile Robots



Mobile Robots



Mobile Robots

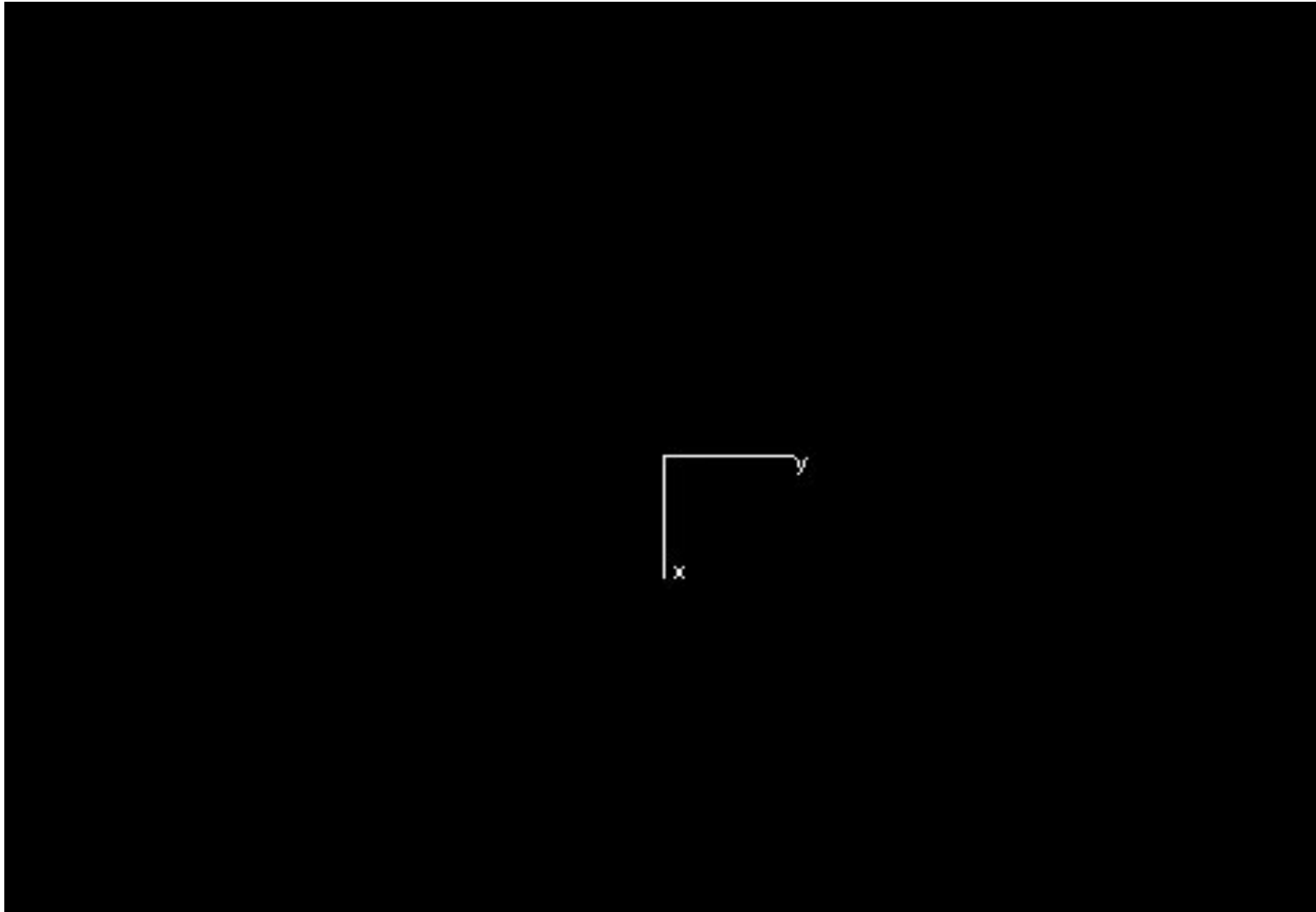


Is SLAM (late 1980s), a chicken-and-egg problem?

- Is it possible to use a vehicle, starting at an
- **unknown initial location**, in an
- **unknown environment**, to
- **incrementally**
- build a map of the environment,
- and **at the same time**
- use the map to determine the vehicle location?

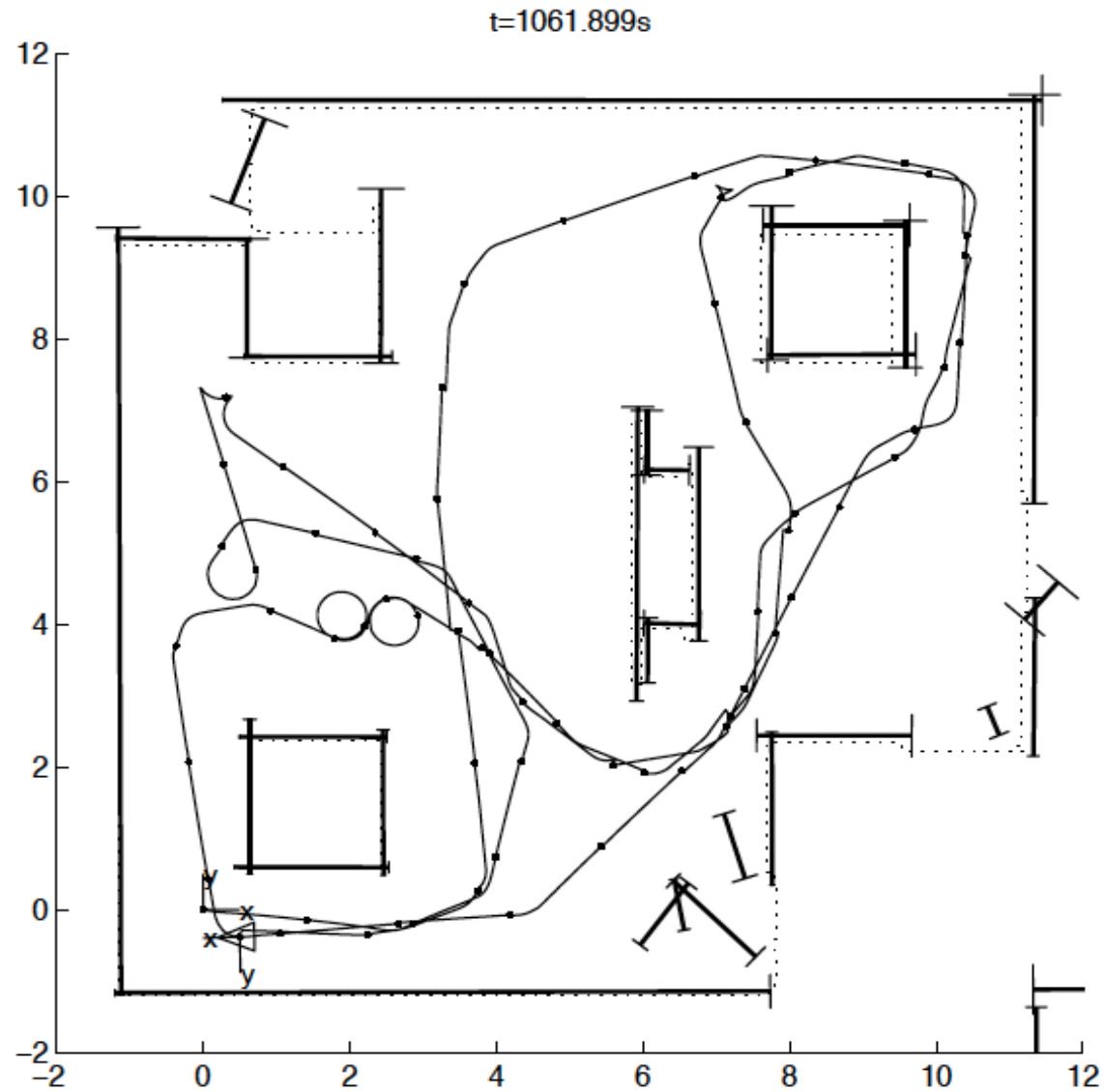


2000, Laser

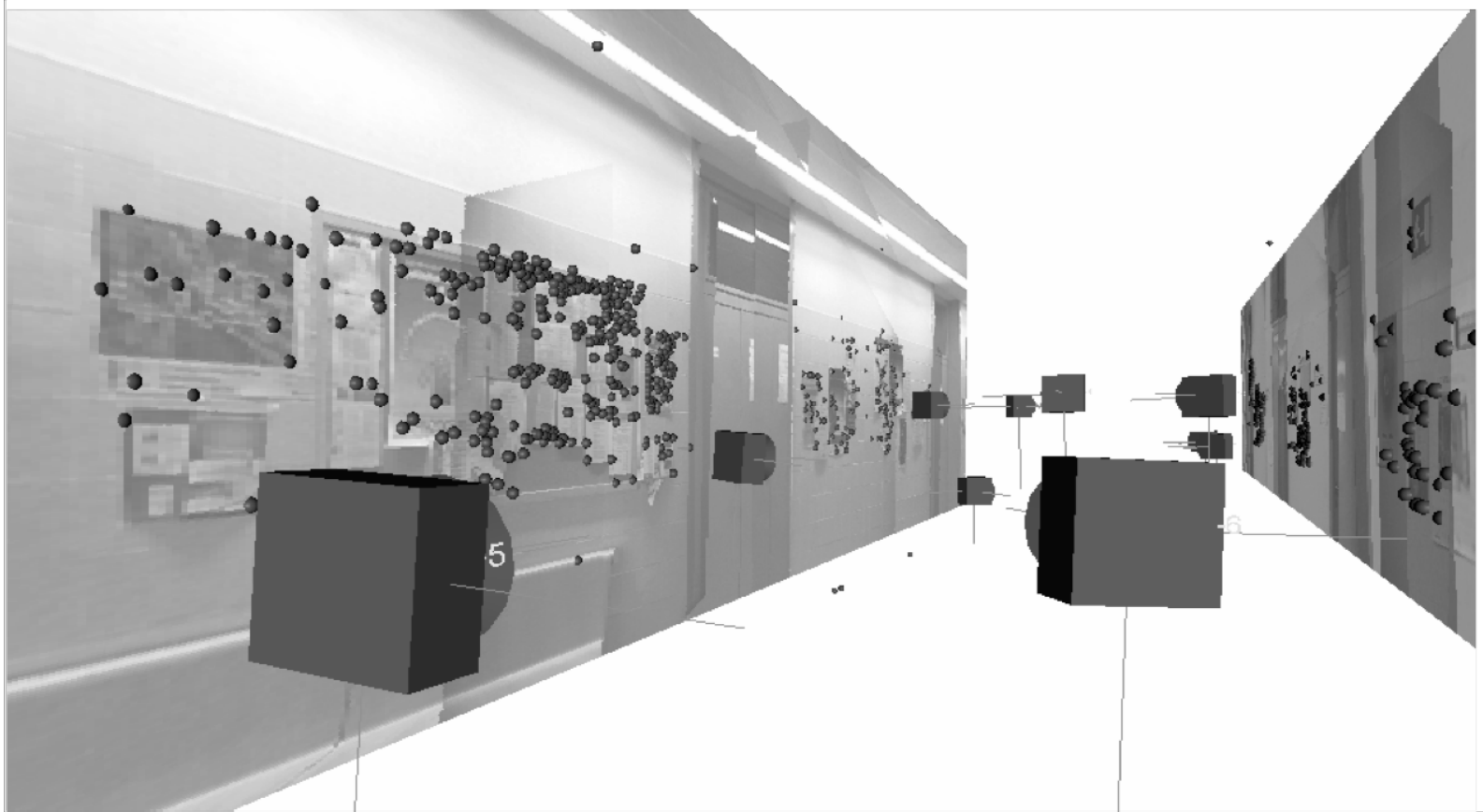


(video: Paul Newman)

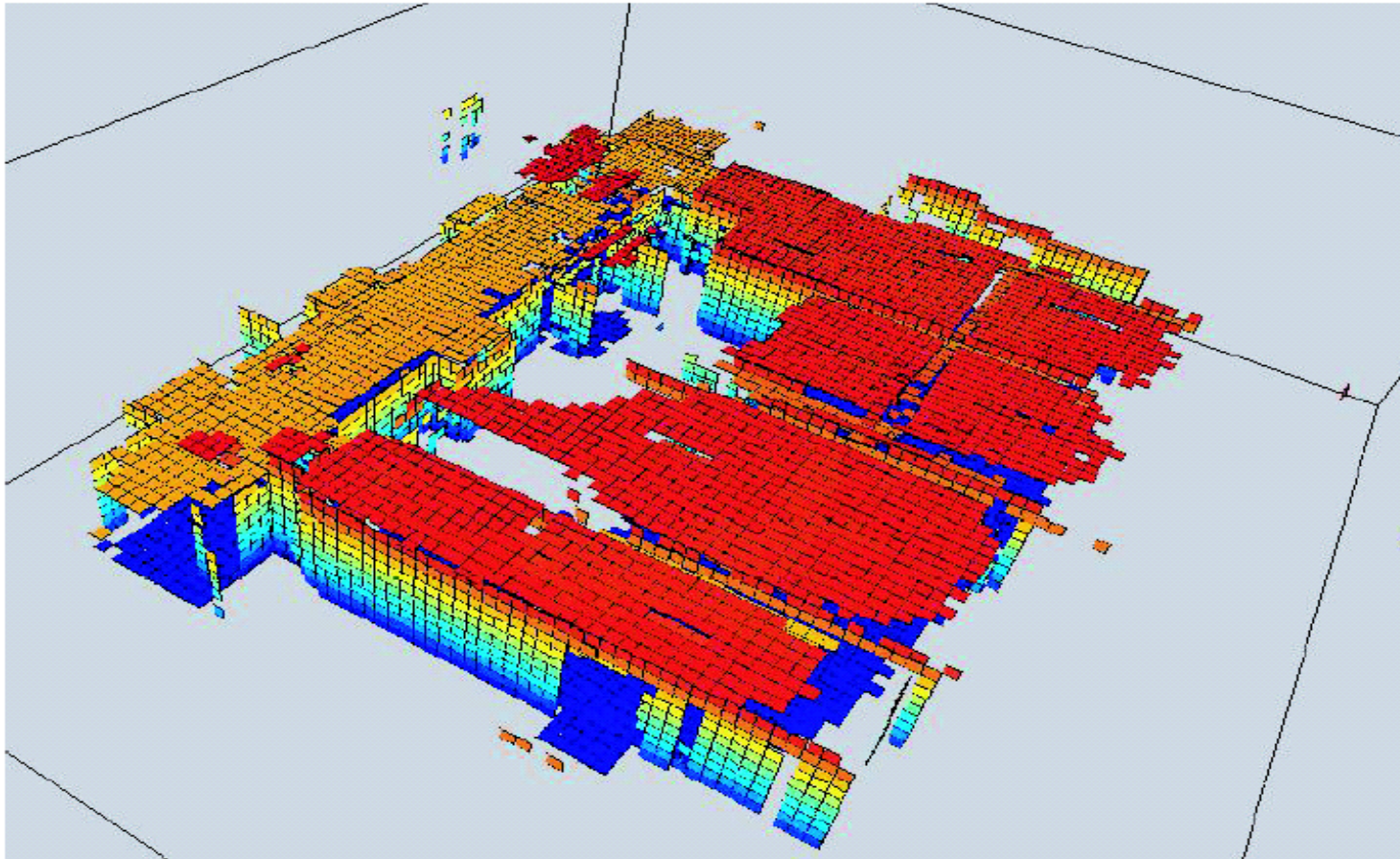
2000, Sonar



2005, Laser + Vision



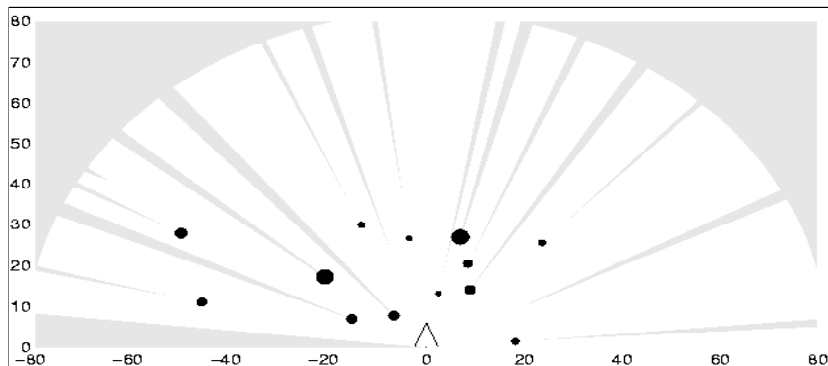
2.5D Maps



Outdoor vehicles

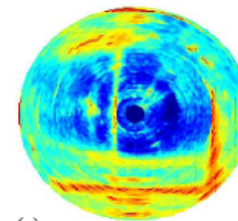
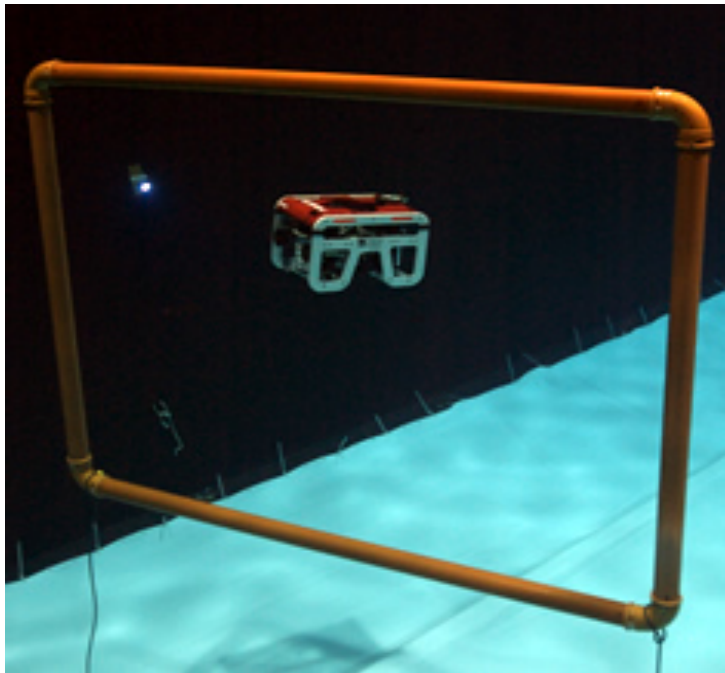


Victoria Park, Univ. Sydney

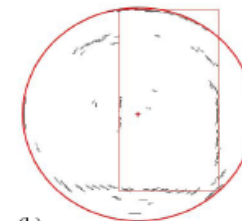


2006, Underwater SLAM

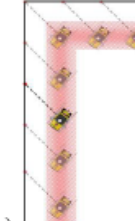
- **Ictineu (With Univ. Girona)**: winner Student Autonomous Underwater Challenge - Europe (SAUC-E).



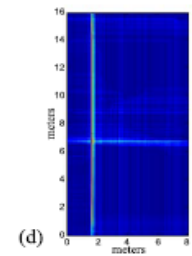
(a)



(b)

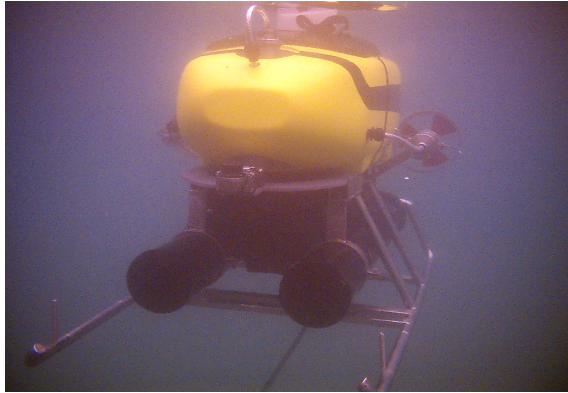


(c)



(d)

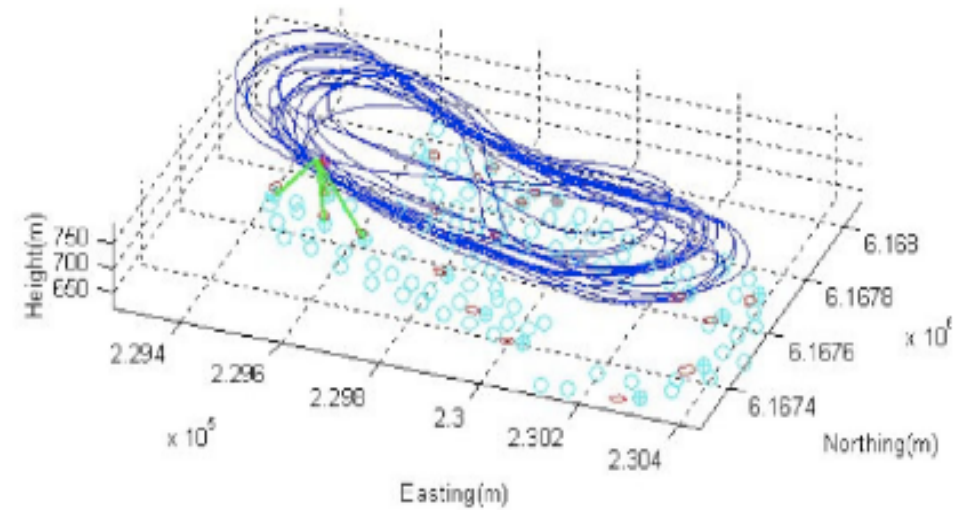
Underwater, Airborne



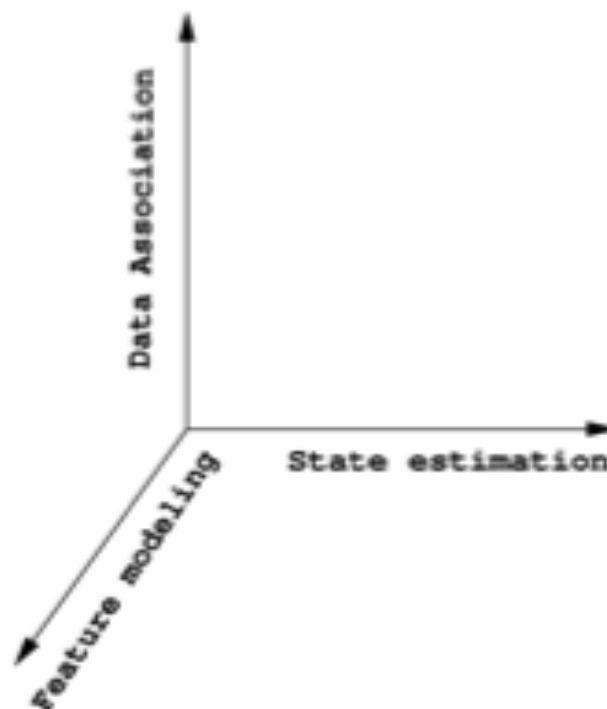
Garbi, Univ. Girona, Spain



Brumby, Univ. Sydney



Why is SLAM difficult?



"The key scientific and technological issue in robotics is that of coping with uncertainty ... In fact, the uncertainty is such that one of the most challenging activities for a mobile robot is simply going from point A to point B."

Tomas Lozano-Perez, 1990

How important is SLAM?

- “SLAM is arguably the most important development in mobile robotics.”
- <http://royalsociety.org/people/hugh-durrant-whyte/>

Fundamental issues

- **Sensor and feature modelling:** what information can we extract from sensors (odometry, lasers, sonars, cameras)?
- **Data association:** how can we deal with sensor error and with complex, cluttered environments?
- **State estimation:** how large are the environments that we can map in real time?