Active Sensing for Mobile and Humanoid Robots

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Contents

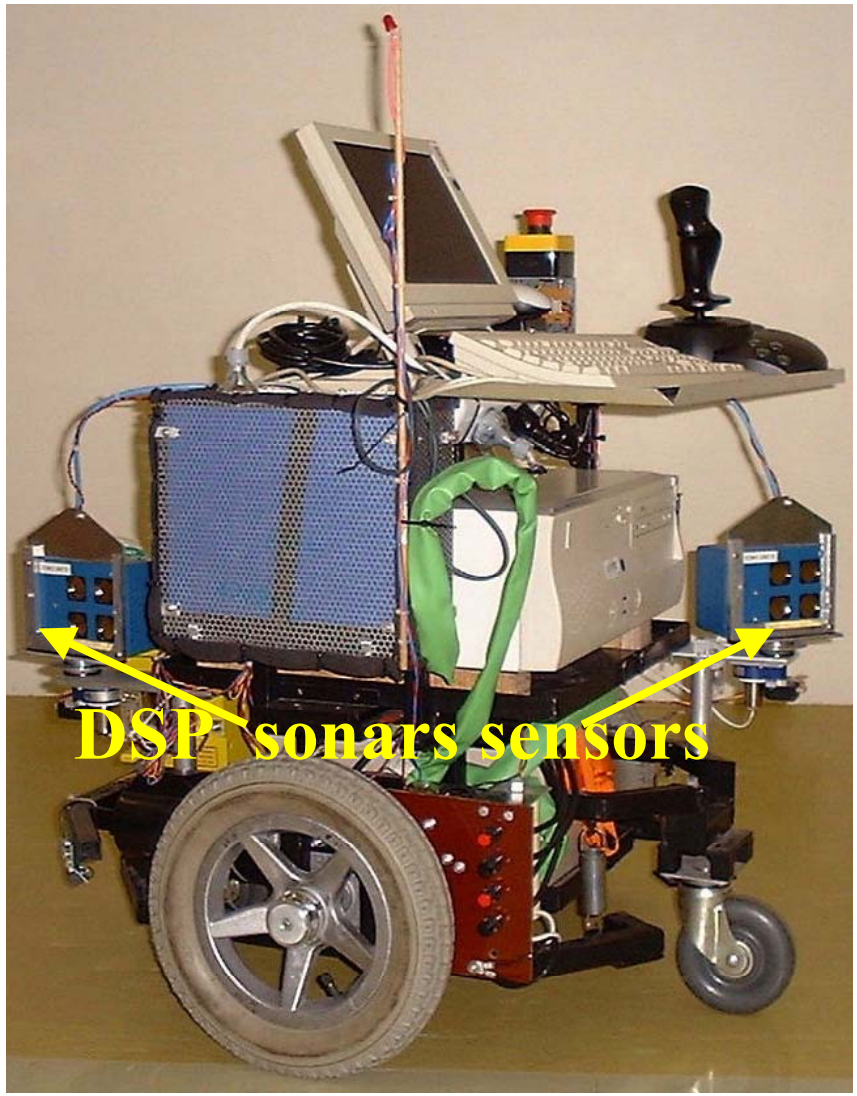
- Advanced Sonar
- Humanoid Tracking Experiments

Advanced Sonar Sensors

Mobile robot travels at speeds up to 1 metre/sec.

Sonar sensors can track acoustic reflectors from angle measurements.

Sonar can scan back and Forth building a map

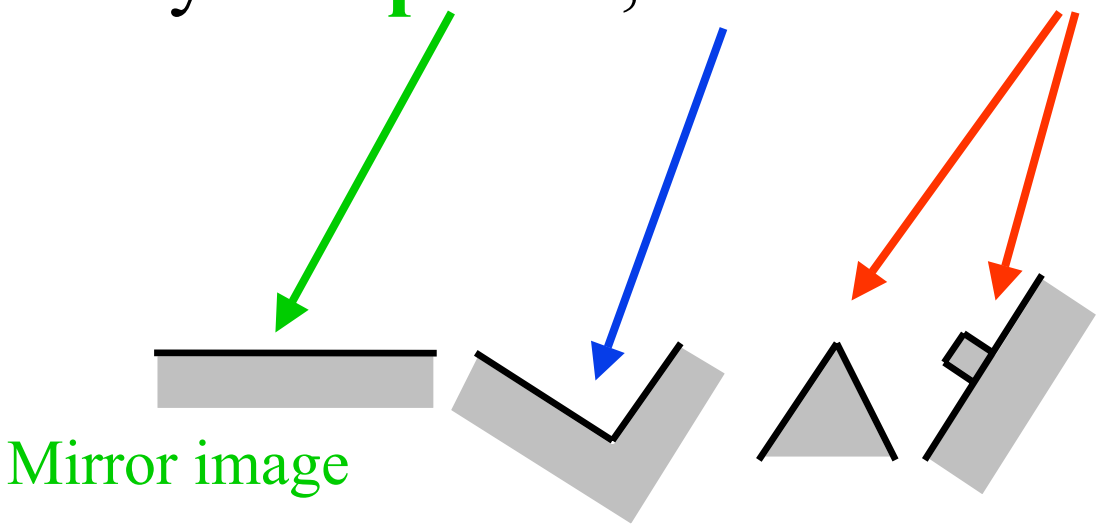


Target Tracking - Moving Target

Target Tracking - Moving Robot

On-the-fly Sonar Classification

Two transmitters fire nearly simultaneously to classify into **planes**, **corners** and **edges**.



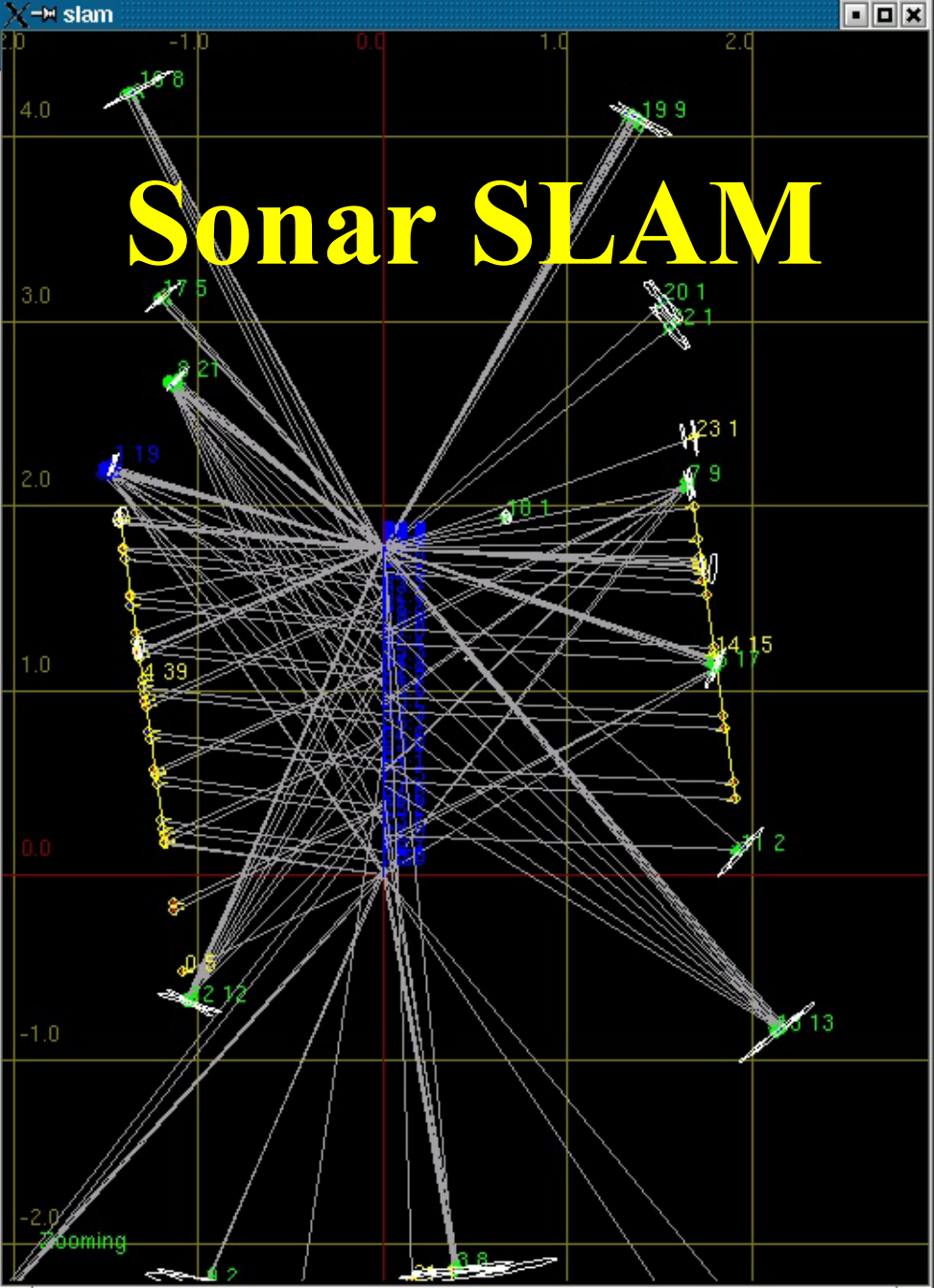
Mirror image

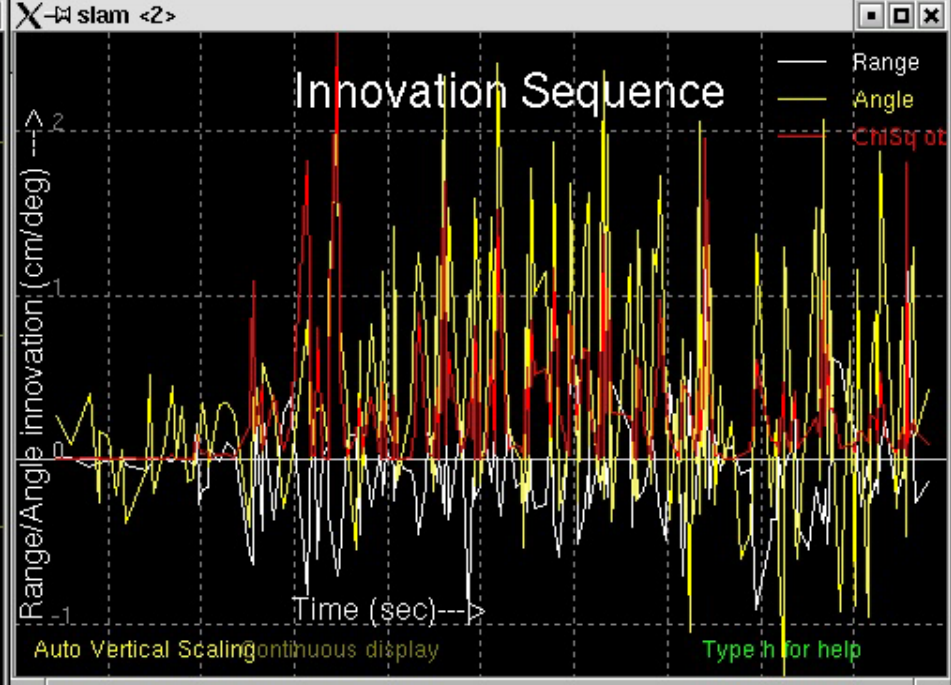
Reversed image

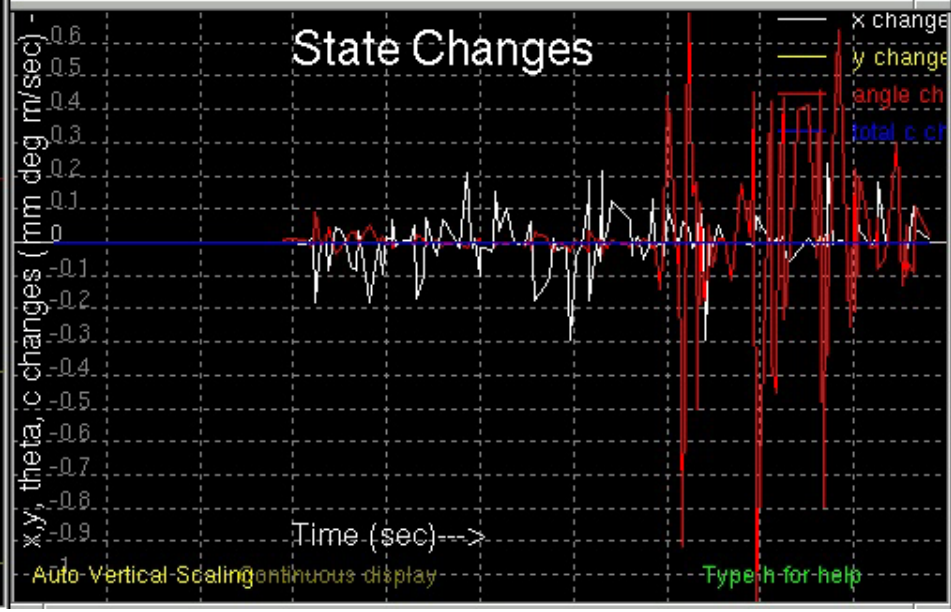
Image independent of transmitter position

Autonomous Exploration

Sonar SLAM

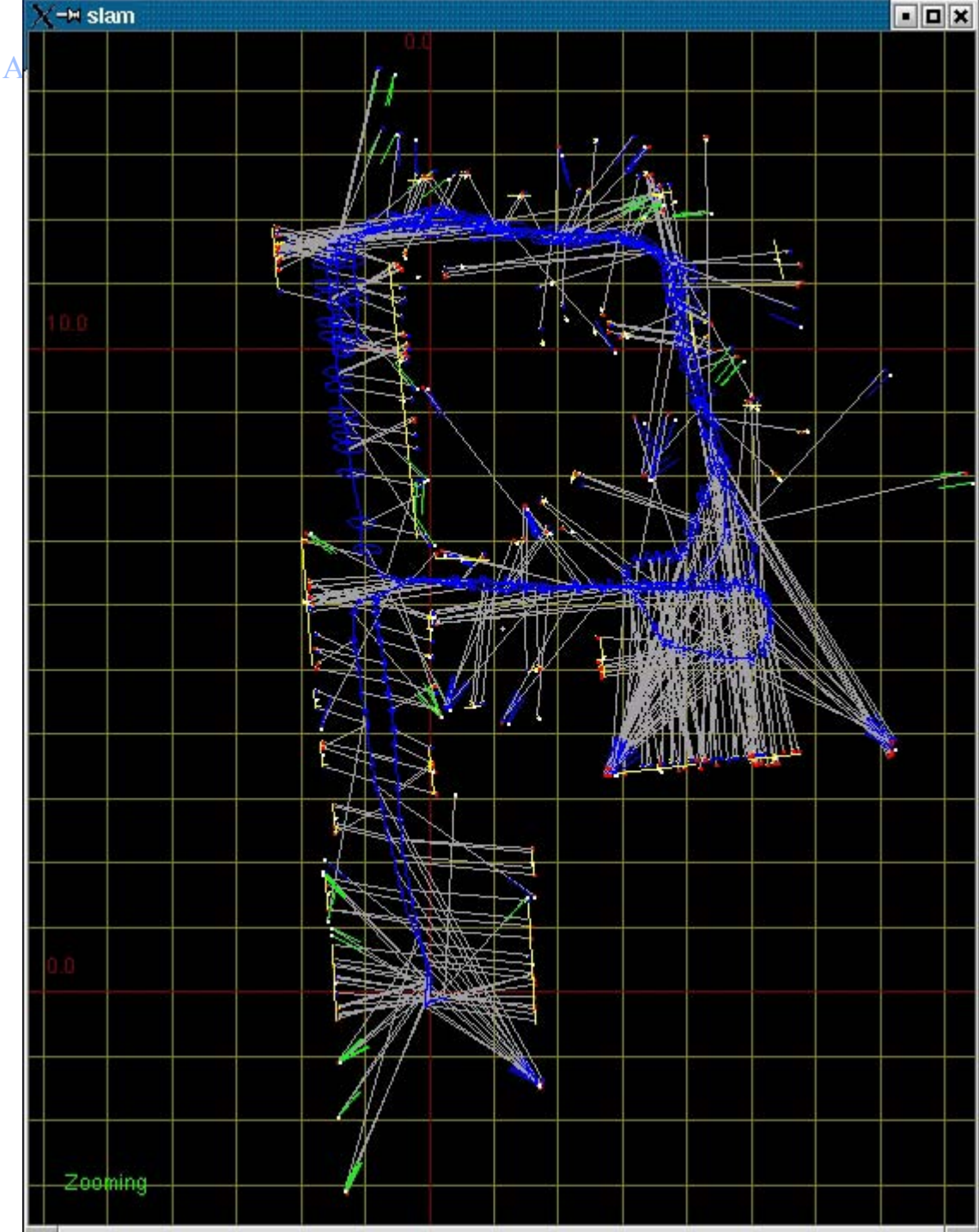

slam
Zooming


slam <2>
Innovation Sequence
Range
Angle
Range/Angle innovation (cm/deg) --->
Time (sec)--->
Auto Vertical Scaling
Type 'h' for help


State Changes
x change
y change
angle ch
x,y, theta,c changes (mm deg m/sec) -
Time (sec)--->
Auto Vertical Scaling
Type 'h' for help

SLAM with Loops

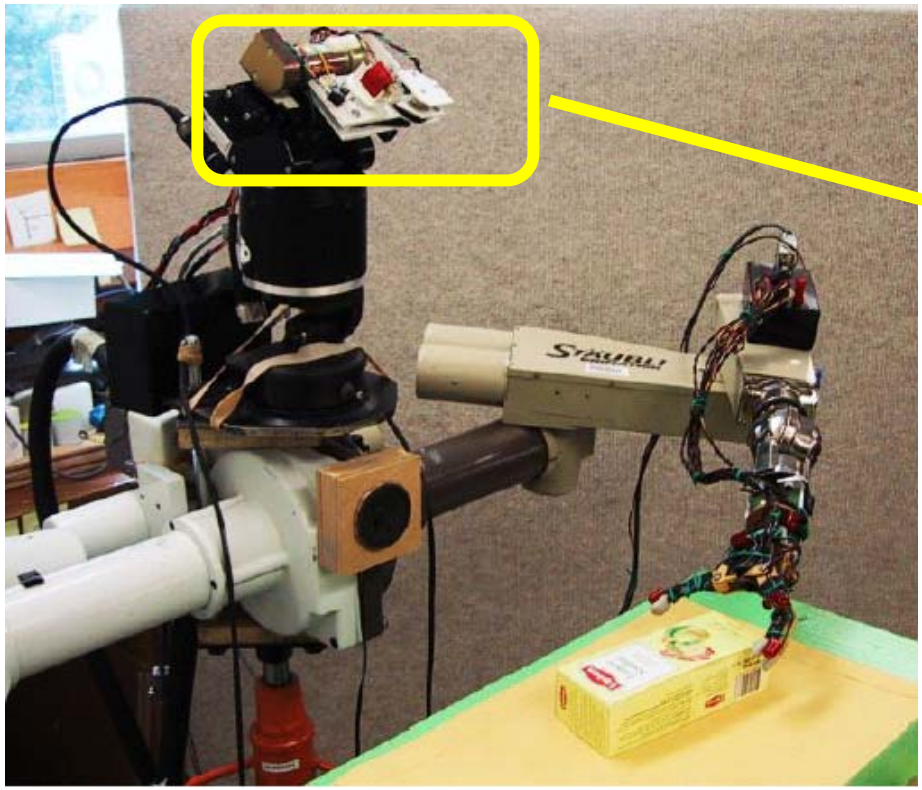
SLAM with Loops

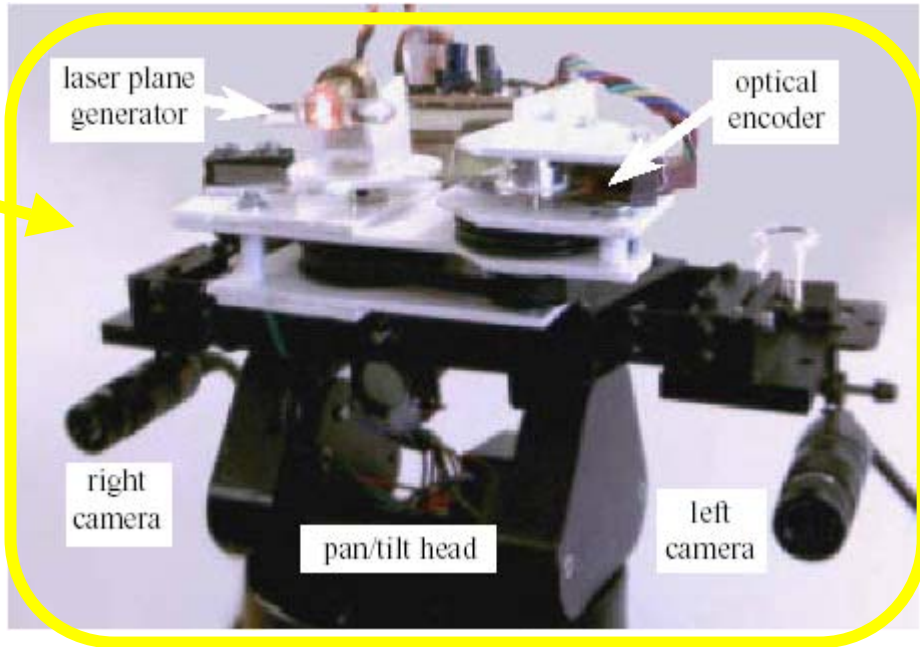


Simultaneous Localisation and Mapping (SLAM)

- Difficulties with classic Kalman Filter Soln:
  - computation per step and memory scales as n^2, n=number map features
  - association problem
  - kidnapped robot
  - loop closing
  - multi-sensor fusion with inconsistency, noise..
- Future research to study these problems.

Metalman in action ….





Geoff Taylor's PhD work…

Metalman likes rice …
hard and uncooked.