COMP-765
Suggested Projects

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General Ideas

• ROS based software
• Vision based
• LIDAR based
• State Estimation

1. Course project
2. Summer project
3. Thesis
Underwater Vision Based

• Using data collected by Aqua
• Implement feature based algorithms considering the characteristics of the underwater domain
Performance Analysis of different Features

- Harris Corners
- SURF
- SIFT
- FAST
- etc.
- Use OpenCV


Visual Odometry

• Calculate the displacement of the camera from consecutive images


Mapping/Mosaicking

• Shipwreck, Coral reef
• Pure vision based image stitching
• Bundle Adjustment


Robot tracking from external camera
Robot tracking from external camera

- Find the robot in the picture.
- Use the geometry of the robot to find the transformation between robot and camera.
Indoor Robotics

- Exploration considerations
- State estimation
- Path planning
GVG Mapper

• Given a set of consecutive laser scans construct the GVG representation of the mapped environment.

GVG based exploration

- Topological Map
- Laser based navigation
- Relocalization on vertices
- Balance between efficiency and accuracy
- Place (vertex) recognition
- EKF based state estimation
LASER based geometric modelling

• Implement a ROS node that takes as input a 2D LIDAR scan and returns a set of lines.
• Use the algorithm presented in [1], code exists.
• Given two sets of lines, or a set of lines and a set of points, perform data registration.
• Return a correction measurement for the robot pose (where the scan was taken from) together with an uncertainty estimate.

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Kinect based geometric modelling

• Indoor environment
• Geometric primitives
• Kinect RGB-d data input

• Analysis and construction of a wireless Kinect sensor.
• Bandwidth calculation
• Pull/Push mechanism.

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Multi-Robot A*

- Using a combined cost of distance and uncertainty
- Develop an A* path planning algorithm with N starting locations and N goals (N>=2)
- Each step modifies the uncertainty characteristics of the system

Projects List
(first come first served)

1. Performance Analysis of different Features
2. Visual Odometry
3. Image stitching (Mosaicking)
4. Bundle Adjustment
5. Robot tracking from external camera
6. GVG mapping
7. GVG based exploration
8. LASER based geometric modelling
9. Kinect based geometric modelling
10. Wireless Kinect (hardware)
11. Multi-Robot A*

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