

Field Robotics Center Seminar Series

Tuesday, August 31st, 2010 GHC 2109 11am - noon

Pizza will be served



Peter Hansen

PostDoc

Qri8 Lab

Carnegie Mellon, Qatar

Towards a Visual Perception System for LNG Pipe Inspection

Abstract

Regular inspection for corrosion of the pipes used in Liquid Natural Gas (LNG) processing facilities is critical for safety. We argue that a visual perception system equipped on a pipe crawling robot can improve on existing non-destructive techniques (Magnetic Flux Leakage, radiography, ultrasound) by producing high resolution registered appearance maps of the internal surface. To achieve this, it is necessary to estimate the pose of the robot as it traverses through a pipe. We have explored two distinct classes of algorithms (dense and sparse) that can be used for this purpose, both monocular visual odometry systems which estimate motion by observing how the appearance of images change between frames. Importantly, both use knowledge of the scene structure to resolve the monocular scale ambiguity in the visual odometry estimates. We have obtained pose estimates using these algorithms with image sequences captured from cameras mounted on different robots as they moved through two pipes having diameters of 152mm (6") and 406mm (16"), and lengths of 6 and 4 meters respectively. Accurate pose estimates were obtained whose errors were consistently less than 1 percent for distance traveled down the pipe. In ongoing work we are exploring and analyzing different stereo camera configurations which may be used to produce high resolution, and high accuracy, estimates of the internal 3D structure of pipes.

Speaker Bio

Peter Hansen is a postdoctoral research fellow, and member of Qri8 lab, at Carnegie Mellon University in Qatar. He received his mechanical engineering degree and Ph.D. from Queensland University of Technology, Australia. His research interests include: wide-angle image formation, calibration and processing; vision-based localization and mapping; and the use of mobile robots in industrial domains.

For more information, please contact:
Balajee Kannan, bkannan@ri.cmu.edu

www.frc.ri.cmu.edu

