Field Robotics Center Seminar Series

Tuesday, Apr 12, 2011 GHC 2109 11am - noon

Pizza will be served

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Acoustic Self-Awareness for Outdoor Robotic Vehicles

Abstract

Outdoor mobile robots are increasingly maturing in their ability to handle complex environments; however, a robot is only as good as its perception system, and often these perception systems fail. This calls for the use of more sensors to be integrated into such systems that can complement the sensors already on board. Far range sensors such as vision and lidar are powerful tools for understanding a large volume of space around the robot, but they are very sensitive to environmental parameters. Proprioceptive sensors can only give Information about the space that the robot is in contact with, but that information is more robust to failure, or at least has different failure modes. Furthermore, robots can teach themselves how to perform in the world by proprioceptively experiencing the world and then learning to predict those experiences with their far-range sensors. To maximize the potential for these these sensor fusion approaches, richer forms of proprioception must be developed.

This work explores how to use acoustic sensors as a new type of proprioceptive data source for mobile robots, which can complement other sensing modalities already being used. Acoustic data was recorded from mobile robots interacting with different types of terrains and objects in outdoor environments. This data was then labeled and used offline to train a supervised multiclass classifier that can distinguish between these interactions, based on acoustic data alone. To the best of our knowledge, this is the first time that acoustics has been used to classify a variety of interactions that a vehicle can have with its environment, and so in the talk I will survey acoustic techniques from other domains, and explore their efficacy for our application. In particular, different feature extraction methods will be discussed, and then some of these used as inputs to our system. I will then present our classification results, which show an average 95% accuracy on all of our trained classes, suggesting strong potential for acoustics to enhance self-awareness on mobile robots.

Speaker Bio

Jackie Libby is a Ph.D. Student in the Robotics Institute. She has a B.S. in Computer Science from Brown University and an M.S. in Mechanical Engineering from Carnegie Mellon. She worked for several years as tutor, teaching college-level math and science. She is interested in robotics technology that is practical, affordable, and reliable, which can help make the world a better place. To that end, she is interested in perception, sensor fusion, and learning methods that can help make these technologies a reality.

For more information, please contact:
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