Autonomous Robots and Environmental Mapping

Mitchell Horning, Matthew Lin, Siddarth Srinivasan, Simon Zou

July 25, 2014

Contents

1 Introduction

In the field of signal processing, compressed sensing is a technique used for reconstructing signals and images from very few samples and is commonly used in fMRIs and medical imaging. We aim to apply compressed sensing to allow autonomous robots to map an environment and identify areas of interest which are significantly different from the surrounding area. In our experiment, we program a robot equipped with sensors that travels along a path and will do on- board summation of sensor readings and send that sum (or path integral) to a server. We then apply compressed sensing to the the data based on the readings and the paths the robot took and attempt to reconstruct the environment the robot traveled over from the data.

2 Experiment settings

3 Models and assumptions

4 Algorithm for solving the inverse problem

5 Conclusions and Further Work