

Final Project Proposal 1st Quarter 2009
Coverage Efficiency in Autonomous Robots
With Emphasis on Simultaneous Localization
and Mapping Algorithms
Latimer 4

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October 27, 2009

1 Title

Coverage Efficiency in Autonomous Robots With Emphasis on Simultaneous Localization and Mapping Algorithms

2 Purpose and Scope of the Research Project

The purpose of this research project is to create an Artificial Intelligence that can successfully and efficiently map and navigate a autonomous lawnmower through an obstacle filled lawn.

3 Background and Review of Current Literature/Research in this Area

SLAM: Simultaneous Localization and Mapping (Basic overview of the technique to approach the AI) ALMs : Automated Lawnmowers, User Manual for a Laser Range Finder (How the inputs work) Navigation and Control of an

Autonomous Vehicle (Virginia Tech Master's Degree Paper) The Ohio University Autonomous Lawnmower (Post-competition paper, how to determine efficiency)

4 Procedure and Methodology

Language: Python

I have programmed the input program for mimicking logical readings from a laser scanner, and beginning the processing of the data, which uses the readings to draw a series of lines symbolizing boundaries. When this is done, the programs will be combined, and I will be able to verify and improve the lawnmower's obstacle avoidance processing. Testing methods will take into account how many times the lawnmower runs into obstacles before completely avoiding them, since the laser scanner is constantly updating. Also have created an environment consisted of matrices that contain 0's and 1's that represent obstacles. The robot algorithm maps out a obstacle matrix, then prints it out when the environment is fully mapped. Comparison between the newly created obstacle map and the environment will serve as a verification of the algorithm's performance. Further down the road, I expect the program will be tested via runtime efficiency and backtracking counts, once I get the processing of the map done.

5 Expected Results Value to Others (Applications your project may have)

The immediate results we expect will be a visual demonstration of the lawnmower avoiding the boundaries of the environment. Another goal is for the program to successfully map out any given environment, including random matrices and non-matrix based environments. Further down the road, my team hopes for the robot to cover the lawn completely, leaving no spot unmowed, and eliminating the need for continuous runtime. We also hope to see our model demonstrate the efficiency algorithms, spending one simulation learning the environment, and the second simulation mowing the lawn with maximum efficiency (high coverage, low time). If the other members of the team are able to get the physical robot working, (and acquire the necessary

laser scanner,) we will provide a physical demonstration towards the end of the school year.