Simulation and Execution of Learning Methods and Algorithms of an Automated Lawnmower

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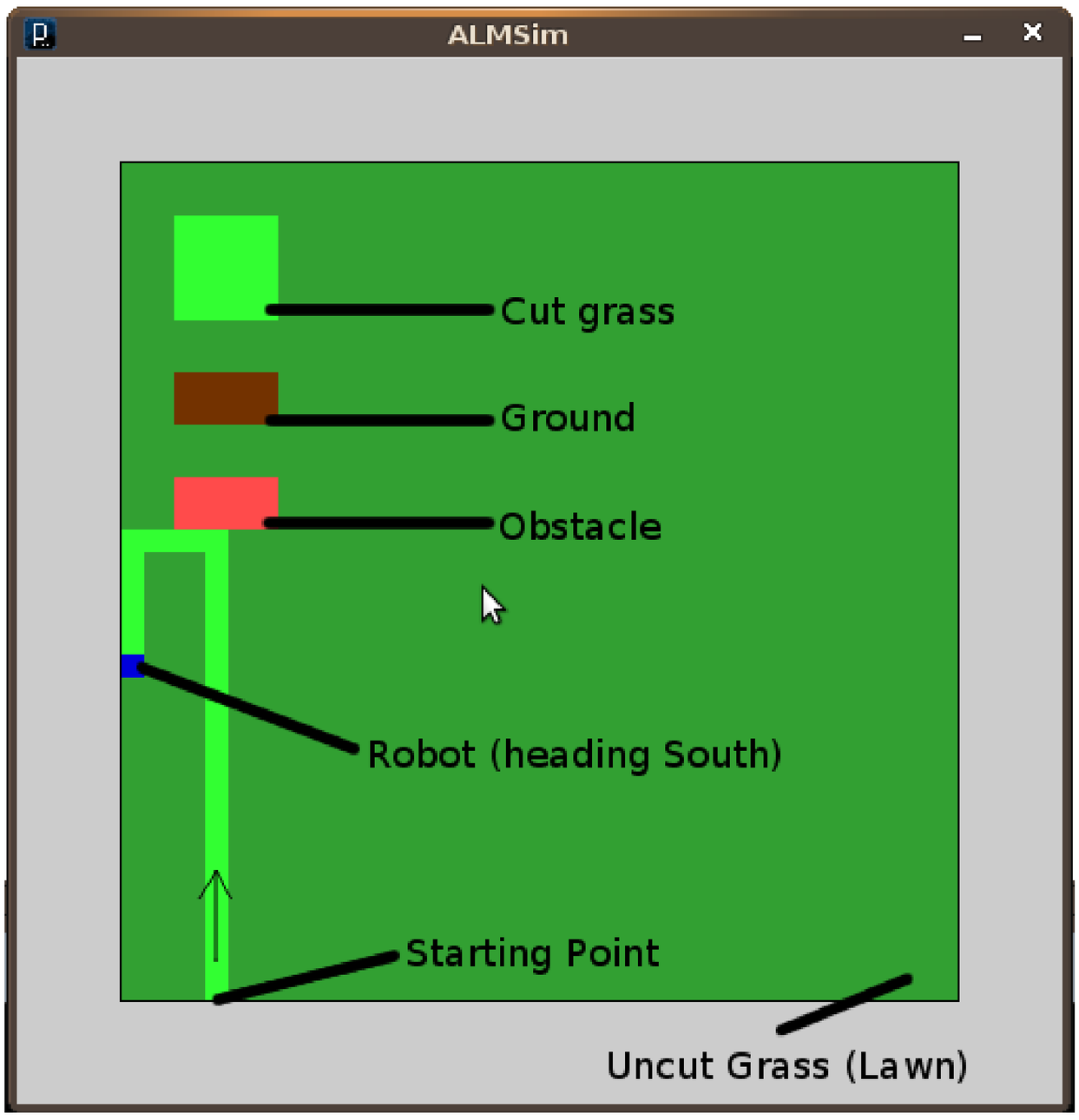
Abstract

Automated Lawnmowers, or ALMs, are already in circulation, but these function on the property that if the ALM moves in random directions consistently during most of the day, then the entire lawn will stay trim. The project centers around the idea that the mowing of a lawn can be done more efficiently, such as when it is done manually. This project uses the computer languages C# (in implementation) and Java used in conjunction with the Processing Development Environment (in simulation) in order to test and evaluate the performance of an ALM as it grows to learn its environment and work more efficiently.



Purpose and Background

The purpose this project sets out to achieve is to develop efficient technology in the field of automation, and to combine this technology with the day-to-day task of mowing one's lawn. This project involves numerous algorithms and learning methods. SLAM— Simultaneous Localization and Mapping—can be used to help create a virtual environment identical to the real one the robot traverses. This topic is to be implemented by another student and used in conjunction with this project. A thesis paper from a Virginia Polytechnic Institute graduate was released to the public titled *Navigation and Control of an Autonomous Vehicle*. This paper has provided invaluable information about different learning techniques to be considered when creating an ALM.

Results

The robot starts with poor efficiency during its first few runs on a new lawn as it moves randomly. Since the purpose of these runs is only to generate a map for the future, their efficiency is relatively unimportant in the large scheme of the project. The ALM should provide data that suggests a unique mixture of all or most of the methods will maximize the efficiency while minimizing the time spent on the lawn.

Procedures and Methods

- Identify cut grass from uncut grass and avoid backtracking
- Determine the width of the lawn at various points
- Divide the lawn into sections as needed
- Convert circular and elliptical obstacles into rectangular ones by cutting a border around them