Autonomous Robot Control and Automatic Navigation
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Abstract

The final objective of our project is the creation of an autonomously controlled robot capable of maneuvering around a predefined field. The robot’s design and functionality simulates one capable of entering a fire-devastated forest to collect multiple soil samples. The playing field is an 8’x8’ space designed to simulate a forest terrain. Paint buckets and wooden dowels model downed trees, boulders, and branches. Soil samples are simulated by plastic discs, with steel tops for automatic retrieval with an electromagnetic crane. Though incomplete, the current progress of the project, including design and results, are shown.

Future Work

- Add a tilt-compensated compass sensor to allow for more accurate direction and position tracking.
- Create a tracking method that is accurate when the robot goes over downed objects and uneven playing fields
- Create an arm capable of retrieving simulated soil samples.

Method

The robot keeps track of how long it has traveled in the xtimepos and ytimepos direction. It travels at a constant velocity so these time variables roughly correlate to position variables. The robot updates its position every 5 milliseconds and will react appropriately if it approaches an object in its path or the boundary of the field. The size of the field and distance between each ytimepos lane are defined in the code.

Approach

A preliminary goal was to create a robot capable of autonomously performing a simple search routine. Such a routine allows the robot to methodically cover the entire area of a defined space. The simplest search routine is a “serpentine” route. The robot’s position in the playing field is determined by keeping up with the time spent traveling in both directions (x and y).

Once this was achieved, object avoidance capability was added to the robot using an infrared sensor and a “go-around” routine. The combination of both routines allow the robot to maneuver around a flat playing field with randomly placed objects.

Hardware