Development of Motion Planning Algorithms for Inchworm Robots

A WPI RBE 550 Project Spring 2021

Alex Tacescu
Robotics Engineering
Worcester Polytechnic Institute
Worceser, Massachusetts
actacescu@wpi.edu

Nicole Kuberka
Robotics Engineering
Worcester Polytechnic Institute
Worceser, Massachusetts
nlkuberka@wpi.edu

Meha Mohapatra
Robotics Engineering
Worcester Polytechnic Institute
Worceser, Massachusetts
mmohapatra@wpi.edu

Sri Kalimani
Robotics Engineering
Worcester Polytechnic Institute
Worceser, Massachusetts
skalimani@wpi.edu

***Abstract*—This document is a model and instructions for LaTeX. This and the IEEEtran.cls file define the components of your paper [title, text, heads, etc.]. *CRITICAL: Do Not Use Symbols, Special Characters, Footnotes, or Math in Paper Title or Abstract.**

I. Introduction

II. Related Work

III. Goals

We have created minimum, expected, and reach goals for our project. Our minimum goal is creating a fully setup simulation playground which includes a robot able to follow the gait. This simulation is necessary to test and complete the path and motion planning for our project. We will be able to visualize what the algorithm is doing and debug. The expected goals are creating a path for the robot and footstep planning for just the robot. We hope to be able to visualize the path created and see the robot taking the path by the end of our project. The reach goals we have thought about are moving with a block, creating a 3D walking gait, 3D path planning of going up walls, and implementing multiple robots into the system. Since these robots are building structures in the larger MQP our next step once we have finished our expected goals we would be moving with blocks which leads to the building of structures. The 3D walking gait would be next and have to take into account going up walls and moving around the corners of the blocks. If this gait is completed a 3D path planning algorithm could be attempted meaning adding much more complexity and destinations that could be up multiple levels of blocks. A different route we could take is adding multiple robots to the system. This would create a swarm situation where we have to account for collision detection with all robots.

Minimum Deliverables

- Fully setup simulation playground
- Inchworm robot able follow the gait

Expected Deliverables

- Functional Path planning algorithm visualized in the simulation
- Foot step planning for inchworm robot
- Inchworm robot followed layout plan in simulation

Reach Deliverables

- Motion planning of robot with block
- Creation of a 3D walking gait
- 3D path planning
- Creating a multi-robot system

IV. Proposed Methods

V. Metrics for Evaluation of Success

VI. Schedule