

Integration of a NAO robot with an autonomous mobile platform, phase II

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Abstract

The autonomous mobile platform needs to have capability to navigate the Engineering building on its own with the ability to detect obstacles in its path. It will also be able to detect where it is in the building so that NAO can give the tour from on top of it. In case of emergency, or malfunction with the autonomous driving, it will also have the capability to be driven manually.

Introduction

Northern Illinois University's engineering department is planning on revamping their tours of its building. The main reason for this is to attract new potential students by showing the work that can be done by their student body. This tour revamp will include a NAO6 robot giving tours of the engineering building. However, there is one problem with doing that. The robot itself is not able to move at a fast enough pace, as well as being unable to protect itself if someone bumps into it. Therefore, an autonomous mobile platform needs to be constructed for the NAO6 robot to give the tours of the engineering building.

Methods and Materials

I. MECHANICAL

The frame of the autonomous mobile platform is constructed using 6063-T5 aluminum alloy 2020 T-slot bars. These bars were assembled as a 2' x 1' x 6" box, with additional bars at the middle of the length. The bars are attached together via t-slot connectors. On the back of the platform there are 3" caster wheels, which are also supported by another bar on the bottom. On the front of the platform there are motorized hoverboard wheels. They are attached to the frame with angle brackets.

II. ELECTRICAL

A. Power

The autonomous mobile platform is powered by a rechargeable 20V battery, similar to the ones used for power tools. This will allow for the system to be powered with no issues.

B. Motor system

The driving force behind the movement of the platform are two motorized hoverboard wheels on the front. They have been set to about 15% power for safety reasons.

III. PROGRAMMING

The code for this project was all done in C. The platform was programmed for two different tasks, following a line on the floor and receiving inputs from a controller and moving accordingly.

A. Line Tracking System

The platform has been developed to follow a line in order to give autonomous tours. This system is also equipped with sensors that will cause the platform to stop if it will collide with anything. This system is still a work in progress.

B. Manual Control System

This platform has the ability to be driven remotely using a playstation controller. This is in the case that a tour guide would need to take control of the platform for safety reasons.

Discussion/Results

The frame of the mobile platform was completed as planned. However there were 2 areas that need improvement. The controller has 2 dead zones on the left and right side of the joystick that won't move the platform. The other area is that platform currently cannot make sharp turns.



Conclusions

By the end of this semester, the platform was able to turn on with a flip of a switch and follow whatever line is in front of it. The major parts that need to be finished for it still are a seat for the NAO6 robot, and for the NAO6 robot to be integrated with the platform. However, with the frame and fully functioning code behind it, the next group should be the final one.

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