THE CREATION OF A SELF-BALANCING SECURITY ROBOT

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ABSTRACT

The purpose of this project is to create a self-balancing robot that can roam the hallways of a school and identify people who shouldn't be on campus. This is being accomplished through three main production steps: (1) Hardware aspect of building frame and hooking up electronics, (2) Programming self-balancing code of for wheels of robot, (3) Programming face detection and face recognition code through OpenCV. This robot would ensure a safer environment on campus.

INTRODUCTION

Security is a vital necessity to maintain safety in society. With the world's growing reliance on technology, new systems must be instituted to protect the populous. Currently college and high school campuses rely heavily on traditional methods of security such as metal detectors and human security guards which are prone to mistakes and may have drastic impacts on people's lives. The solution is robotics, a growing field of engineering that has countless societal applications. The project's topics consist of three separate processes including hardware/material collection, electrical components, and face detection/recognition algorithms. Combining computer vision with segway versatility enables the creation of an autonomous human interactive security robot. To build a complete and fully functioning human interactive, self-balancing robot, we must first research and prototype the components we will be working with.

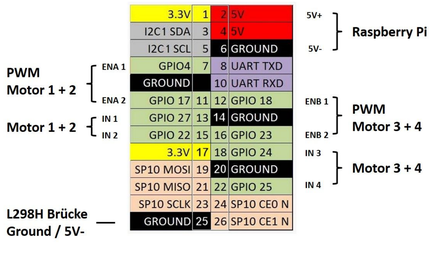
MATERIALS and METHODS

Electronic Materials:

- Raspberry Pi 3B → Microcontroller
- MPU-6050 → Accelerometer
- Talon SR → PWM Motor Controller
- Pi Camera Module
- Motors/Battery/Wheels

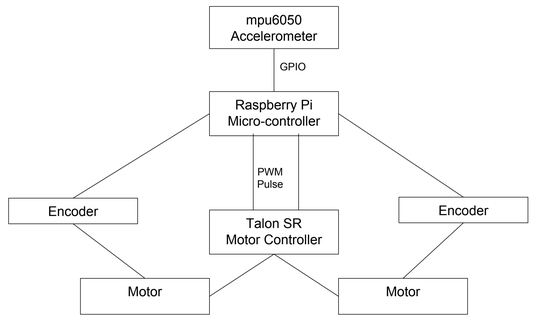
Structural materials:

- Aluminum
- Plywood
- 3D Printed Pieces
- FRC Materials



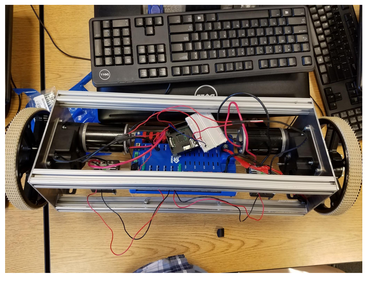
RESULTS

Block Diagram



Sketch

Prototype



CADD Images

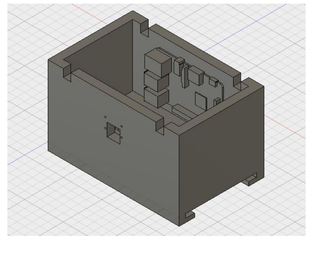


Figure 1. Top Box of Robot Holding camera, Raspberry Pi, accelerometer, and battery

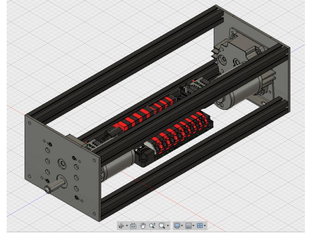


Figure 2. Bottom Box of Robot Holding motor controllers. Motors, and gear boxes

CONCLUSIONS

We have made significant strides in the production of our robot, although we did not necessarily reach the end goal we were hoping to achieve. The main aspects of the project that have been produced successfully are the sturdy frame, python code for movement of motors via PWM and talon sr motor controllers, as well as a partial understanding of the creation of a face recognition software for identifying specific people. As the project has come to a close for this year, and another candidate has come forward to continue the production of the robot, a documentation page has been created to give her a solid foundation for continuing the project.

References

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