Name(s)	Project Number
Erik Z.S. Meike	**J0926**

Project Title

A Robot for Photo-Documenting Parks

Abstract

Objectives/Goals

The purpose of my project was to create a robot that will autonomously map trails in parks while recording its position and take 360º immersive photos of hiking trails for virtual hikes, disabled access, and preserving scenery for future generations. In order to develop the technologies required for this complex project, I created small scale versions of all the major components. There were 3 projects:
1. A stabilized base for mounting a 360º camera
2. A maneuverable robotic base
3. Vision and pathfinding systems

Methods/Materials

1: Using my hardware and software experience, I designed and built an IMU (inertial measurement unit) to sense orientation and used a servo-controlled pan and tilt bracket for keeping the camera level and properly oriented.

2: I constructed an Arduino-based circuit and wrote code to interface to the sensors and motors for the robotic base. I built three different frames before settling on the one using Lego-based motors and frame.

3: I am taking classes to learn state of the art techniques for vision and path finding systems: A* algorithm, structure from motion, particle filters, Kalman filters, Open CV.

Results

1: The camera platform performs well. I do not have access to a 360º servo or 360º camera, so the current platform can rotate 180º and has a stereo camera for proof of concept. I am confident that adapting to the final version will be straightforward.

2: The robot is able to stand, however, more work needs to be done to enhance stability and add navigation.

3: Although, I have not yet built a prototype system, I have done the background research and have a good understanding of the main components involved. I am now preparing to move to the experimental phase.

Conclusions/Discussion

I built a camera platform that reliably faces in whatever direction I want it to, and adaptively keeps the camera level. In the process of designing this, I discovered a technique to simplify the process of creating an interconnected lattice of 360º photos into a navigable scene by always pointing the camera north. Also, after testing several algorithms for the robot base, I found that the PID algorithm balances the robot the best. I have made substantial progress in designing and building two out of three of the major components of this complex system.

Summary Statement

A robot for autonomously mapping and photographing trails in parks with 360º images for virtual hikes, disabled access, and preserving scenery for future generations.

Help Received

My dad helped me with some software issues. My family helped me glue up my poster.