

Weekly Report - Tuesday, February 05, 2019

Auburn University IEEE SoutheastCon 2019 Hardware Competition Team

Current Development Tasks

Task Name	Category	% Compl.	Progress Updates
LIDAR Localization Algorithm Development	Software	10%	Pseudocode has begun for the LIDAR algorithm. Will start looking into ROS prebuilt algorithms.
Electrical Hardware Selection	Electrical	95%	Parts ordered last week arrived. Encoders for motors are still being considered.
Electrical Hardware Placement	Electrical-Mechanical Integration	15%	Creating temporary wiring on breadboard to get the prototype running. Component placement CAD is being worked on, while placing actual components in parallel
Motor Controller Integration	Electrical-Software Integration	50%	Stepper motors and DC motor controller have been connected to an Arduino and tested. The next step is being able to control them from a Raspberry Pi through the Arduino.
Raspberry Pi Cam Visual Processing Real-Time Analysis	Software	100%	Algorithm improvements and reducing resolution to 640x480 increased 0.5 FPS to 3.5 FPS. Reducing resolution to 320x240 increases it to 20 FPS but accuracy is reduced.
Open MV Cam Visual Processing Real-Time Analysis	Electrical/Software	70%	Received camera last week. Example program has functionality very similar to the existing algorithm. Needs tuning and integration with Pi to compare performance.
Follow Debris Algorithm	Software	40%	Test platform can rotate towards largest debris. Needs to be converted to proportional control. We need a way to

			check distance to object.
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Senior Design Team Members Time Management

Member Name	Task Name	~ Hours Spent
All Members	Team Meetings	1.5
Matthew Castleberry	Raspberry Pi Cam Visual Processing Real-Time Analysis	2
Matthew Castleberry	Open MV Cam Visual Processing Real-Time Analysis	1
Matthew Castleberry	Follow Debris Algorithm	3
Matthew Castleberry	Motor Controller Integration	1
Nia Perkins	LIDAR Localization Algorithm Development	2
Joe Hinely	Electrical Hardware Selection	2
Joe Hinely	Electrical Hardware Placement	0.5
Josh Jablonowski	Electrical Hardware Selection	1
Josh Jablonowski	Electrical Hardware Placement	3
Josh Jablonowski	Motor Controller Integration	1

Achievements, Obstacles, and Risks

All electrical parts that were initially anticipated have been ordered- current efforts are being put into getting the physical prototype running while developing CAD design for the 3D printed parts to properly mount all components. Potential obstacles to completing the first prototype this by the end of next week include 3D printer failure, component failure, and wiring difficulties.

The visual processing algorithm is working much faster than it had in the past making it a viable option. We are still considering the OpenMV camera and will be doing development in parallel with both cameras so that their performance can be compared. We tested the program to point the test platform toward a cube and it worked but it needs some improvement and tuning. At this point, we are ready to test the algorithm on the main bot once the electrical hardware is completed. Another aspect that will be in development this week is to be able to determine the approximate distance from the camera to an object based on the known dimensions.

Last week's brainstorming has placed us at our current step which is planning out our

pseudocode for determining how the robot will self locate. We also determined that we need a short script file that will put the data the LIDAR outputs into two separate arrays one for distance and the other angles. That script file & the pseudocode will be written in the upcoming week. We are thinking about using Robot Operating System (ROS) to help with localization. We will attempt to test the ROS library provided by the LIDAR manufacturer to see if this is the route we should take. We also have found many similar projects online that use a 3-axis magnetometer, accelerometer, and gyroscope in a 9 degree of freedom (DoF), inertial measurement unit (IMU) sensor. We have scheduled a visit with one of Dr. Roppel's grad students in the RFID Lab on Wednesday at 3 PM. They have a robot running ROS on a Pi with a 9DoF IMU and LIDAR.