Weekly Report - Tuesday, March 5, 2019

Auburn University IEEE SoutheastCon 2019 Hardware Competition Team

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Current Development Tasks

Task Name	Category	% Compl.	Progress Updates
ROS Localization	Software	50%	IMU not functioning as intended with ubuntu & ROS. Consideration of a new IMU taking place.
Design and Build Control Panel	Electrical-Mechanical Integration	50%	Control panel has been designed and parts have been gathered- all that remains is putting it together
Construct Protoboard	Electrical	5%	To allow for changes in design, a protoboard will be designed in place of a PCB- which has a longer lead time.
Motor Controller Integration	Electrical-Software Integration	100%	Stepper Motors have been tested, and due to connection issues between the stepper motors and the front gate the gate does not raise/lower.
Integrate Visual Detection in ROS	Software	5%	Started working with Lubuntu OS with ROS. Pi Camera has been verified to work with Lubuntu.

Senior Design Team Members Time Management

Member Name	Task Name	~ Hours Spent
All Members	Team Meetings	1
Matthew	Integrate Visual Detection in ROS	2
Nia	LIDAR Localization and ROS	1
Joe	Motor Controller Integration	5

Josh	Electrical Hardware Placement	4

Tasks to be Accomplished Before Competition

Task Name	Version*	Category	Priority	Assignee
Construct 9”x9”x11” interior sizing box	2	Mechanical	Medium	Alex
Modify wheel design to accommodate rubber tread	2	Mechanical	Medium	Alex
Incorporate encoders	1	Mechanical	Immediate	Alex
Modify frame and bumper to have > 1cm radius per rules	2	Mechanical	High	Alex
Add an interior lip to close the gap in bumper	2	Mechanical	High	Alex
Reduce the center of gravity	1	Mechanical	Medium	Alex
Design flag raising mechanism	2	Mechanical	Medium	Josh
Mounting hole improvements on Electronics plate	2	Mechanical	Medium	Josh
Inventory and Order Parts for new Robot	2	Mechanical/ Electrical	High	Alex/ Josh
Fabricate, 3D Print, Assemble, and Wire New Robot	2	Mechanical/ Electrical	Medium	Full Team
Aesthetical Improvements and Enclosing Electronics	2	Mechanical	Low	Matthew
Main and Auxilary Battery Voltage Detection	1	Electrical/ Software	Medium	Josh
Wire Encoders	1	Electrical	Medium	Joe
Design and Build Control Panel	1 or 2	Electrical	Medium	Josh
Design and build Protoboard	2	Electrical	High	Josh
Integrate Serial Control in ROS	1	Software	High	William

ROS Localization	1	Software	High	Nia/Noah
ROS Navigation/Pathfinding	1	Software	Medium	Nia/Noah
Capture ROS bag	1	Software	Medium	Nia/Noah
Integrate Visual Detection in ROS	1	Software	High	Matthew
Integrate Encoders in ROS	1	Software	High	Nia/Noah
Test and Tune Full Competiton Algorithm (With 1 robot)	1	Software	Medium	Full Team
Test and Tune Full Competiton Algorithm (With 2 robots on the field)	1 and 2	Software	Low	Full Team

* The currently built robot is version 1. The new/competition robot will be version 2. Tasks implemented in version 1 will be propagated to version 2.

Achievements, Obstacles, and Risks

The stepper motors for the front gate of the robot were wired and tested this past week. This was done by running a base program to make the motors turn 360 degrees then return to their previous position. While the motor controlling the spinning rode worked without issue, the two stepper motors controlling the gate were unable to raise the gate due to the motors not being completely connected to the threaded rods on the gate. Because of this and the high center of gravity of the initial front gate, the stepper motors will be replaced with a servo gate. The servos are lighter, smaller, and provide a lower center of gravity. The servo will be on the side of the robot, attached to a paddle that will raise and lower in order to gather debris under the robot. This new configuration will be much simpler mechanically, electrically, and software wise. Figure 1 shows the new electrical configuration.

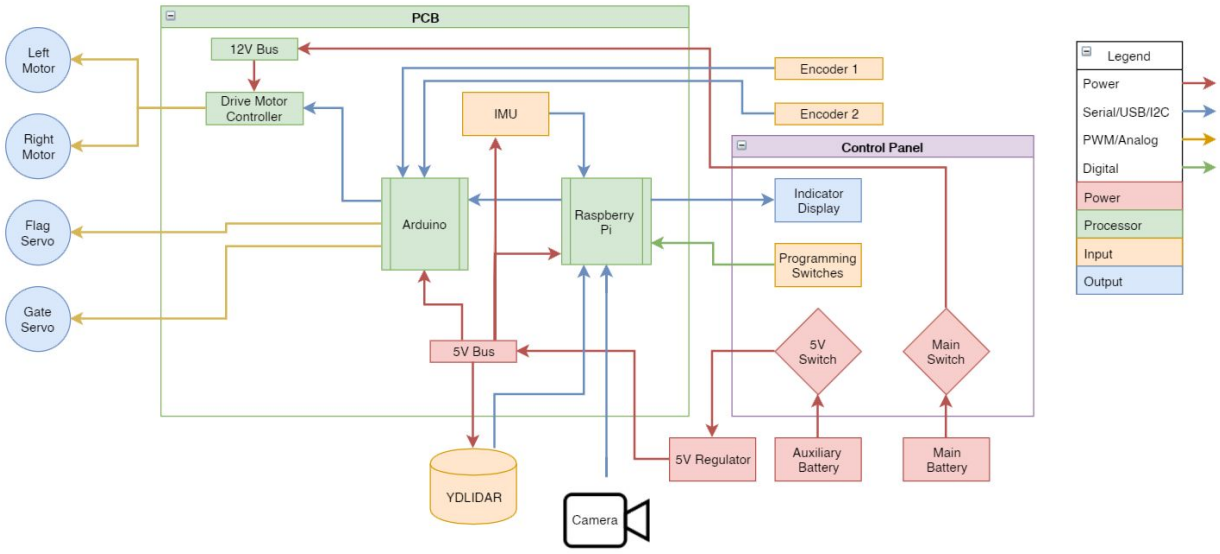

Figure 1: Wiring Block Diagram with Adjusted Design Simplifications

For electrical hardware design, the battery mount has also been printed and added to the robot. The next major design component would be the control panel, which has been designed and needs to be 3D printed. A printed circuit board (PCB) was drawn up and designed as shown below. However, after a number of changes in components and operation of the robot, we've decided to avoid PCBs due to the difficulty created when changing ideas. If time permits and ideas are more solidified, a PCB can be designed and ordered to fit the top of the Raspberry Pi using KiCAD. The first iteration of the PCB is displayed in Figure 2.

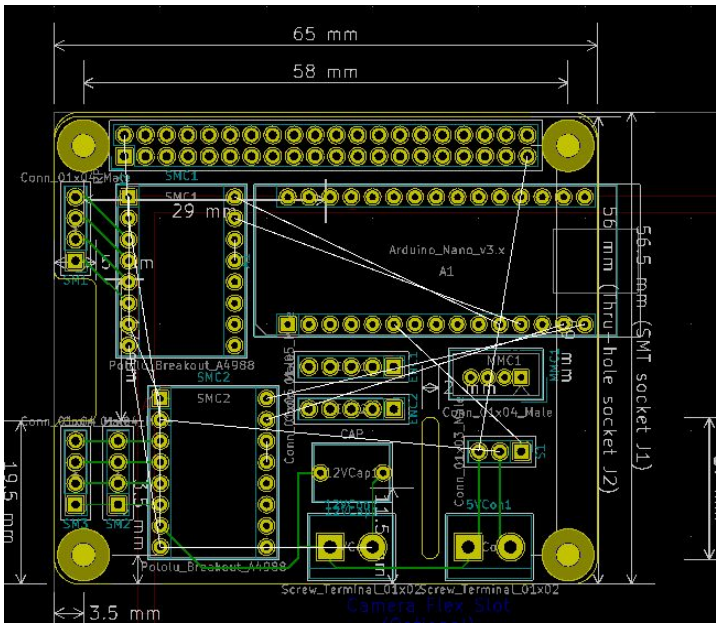

Figure 2: First iteration of PCB Layout

The IMU we had selected is not very well supported by ROS and we were unable to use

the available libraries with it. We did establish communication with it on the Arduino but this would make the serial communication program development more complex. We found a very well supported ROS library for an affordable IMU from Sparkfun that has a built-in Arduino that we will utilize instead of the original one to shorten development time.