Weekly Report - Tuesday, January 29, 2019

Auburn University IEEE SoutheastCon 2019 Hardware Competition Team

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Current Development Tasks

Task Name	Category	% Compl.	Progress Updates
LIDAR Localization Algorithm Development	Software	5%	Researching & brainstorming begun.
Electrical Hardware Selection	Electrical	80%	New camera, motor controllers, and batteries have been ordered- expected arrival this week. Encoders for motors are still being considered.
Electrical Hardware Placement	Electrical-Mechanical Integration	5%	First robot will be able to be mostly assembled by the end of the week for testing- barring timely arrival of parts. Will compile wiring diagram this week with specific parts
Visual Processing Real-Time Analysis	Software	70%	The original program developed has a latency of ~1.8s. After some improvements, the latency was reduced to ~0.3s. Further testing is needed to determine if this is enough of an improvement.
Visual Processing Alternatives Analysis	Electrical/ Software	50%	Some alternatives are being considered to using the OpenCV+PiCam. We purchased the OpenMV camera and will directly compare its performance to the current method.

Senior Design Team Members Time Management

Member Name	Task Name	~ Hours Spent
All Members	Team Meetings	2.5
Matthew Castleberry	Visual Processing Real-Time Analysis	7

Matthew Castleberry	Visual Processing Alternatives Analysis	3
Nia Perkins	LIDAR Localization Algorithm Development	2
Joe Hinely	Electrical Hardware Selection	1.5
Josh Jablonowski	Electrical Hardware Selection	2

Achievements, Obstacles, and Risks

The major obstacles to the vision detection aspect to the software is the latency. The higher the latency, the slower the robot can understand its surroundings. In order to ensure a high success in the competition, we must maximize the speed at which it can accurately short the debris. There are currently three solutions to solving the low latency issue: improve the original algorithm with the Raspberry Pi and Pi Cam, use a programmable camera module like the OpenMV or Pixy 2 Cam, or replace the Raspberry Pi with a faster single board computer like the LattePanda. We achieved a significant improvement with the optimized algorithm but it may not be better than the capability of the OpenMV camera. A new single board computer with a significant improvement from the Pi costs $150 to $350 whereas the OpenMV camera costs approximately $60. We purchased the OpenMV camera. Hopefully, it will come in during the next week or two.

The LIDAR is used for robot localization. This is done by the LIDAR outputting numerous points that need to be interpreted into a static graph. This is causing a bit of an issue because the LIDAR's center point moves with the robot. We found an article where a group of students used a LIDAR sensor to plan a path with an indoor ATV, on a set grid. We will use this article as much as we can, however, in the article, they had one set start and end location where ours can change. We are still seeking outside help.

Electrical hardware has been chosen and purchased for the first prototype robot. We're confident in the parts that we have ordered, but it is possible we may run into issues. Consideration is being taken into account over buying motor encoders to provide data on actual motor speeds. We intend to have the robot wired to working condition by the end of the week given the parts arrive before Friday. We started brainstorming ideas to integrate the electrical parts with proper mounts on the mechanical frame.