TEAM 4909

Billerica Bionics | Week 4 1/31/16– 2/6/16

Week 4: A Driving Chassis

There comes to a certain point in every sort of job where you can just get into the 'groove' of things as it is. This week, we made strides in the construction of the chassis and the design specifications of the shooter.

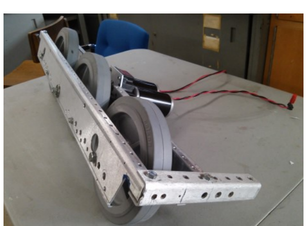
As it was addressed last week, our chassis was having the issue of getting over many of the wheel-type defenses like the rock wall and moat because our frame was contacting the obstacle before our wheel was. This week, we made permanent modifications to the chassis to solve this problem. The standard chassis front and back panels were completely removed. Then, the edges of the side plates were cut and bent, as shown in the picture, so that a thinner support rail could be mounted.

Another issue addressed this week was the tread wheels. Although we had thought the plastic wheels with a rubber tread along the outside and plastic 'spokes' would be sturdy enough to hold up against the defenses, after some further testing, we determined an alternative. That being, a Colson wheel. It's still plastic, but it has a much more rugged rubber layer and a solid plastic inner layer. A lot of work this week went into the difficult process of getting the stand alone plastic wheels to mate with hex shaft pulleys so that we could power them and make them spin. Additionally, lots of time and effort went into coordinating the spacers that position the wheels within the wheel wells from the CAD to the real model.

By the end of Saturday, we had a fully mechanically assembled chassis with a temporary electronics board mounted on top. It was drivable, and we were able to test out how our chassis stood up against the defenses. We could clear the Rock Wall and Rough Terrain with ease. However, the Ramparts and Moat were still giving us some trouble in the form of beaching, or, getting caught on an obstacle and losing wheel contact with the ground. At the moment, we already have some plans already in the works to have some ways to keep us rolling over those defenses without getting stuck on the frame in between the wheels.

Next week, we will be focusing on our other onboard subsystems: the shooter, the climber, and the mechanism to prevent getting beached on defenses. We made a lot of good progress this week, and are on track to have a lot of good construction for next week.

Chassis edge bends



One side complete

Preparing to connect sides

Get Connected!

Team 4909

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Game Information

FIRST Website

PTC Creo

Game Animation

In This Issue

- Week Summary
- Get Connected/ Helpful Links
- Editorial
- Outreach
- Upcoming Events
- Sponsors

Various obstacles to test a robot

A “step field” to test durability

UPCOMING EVENTS

Reading Competition

3/11/2016 - 3/13/201

Reading High School

62 Oakland Road
Reading, MA 01867

UNH Competition

3/24/2016 - 3/26/201

University of New Hampshire

105 Main Street
Durham, NH 03824

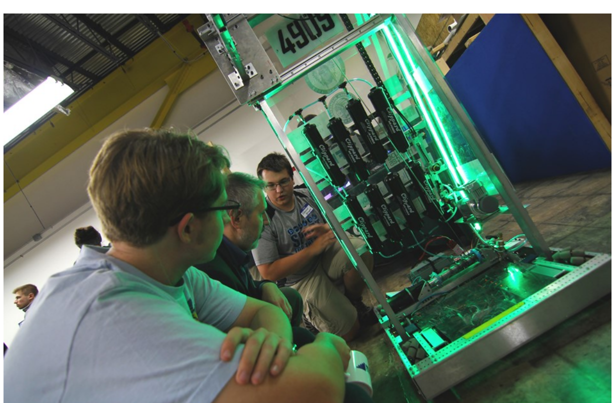
NERVE Center

The New England Robotics Validation and Experimentation (NERVE) Center is a robotics research, testing, and training facility hosted at the University of Massachusetts Lowell. They house replicas for the National Institute of Standards and Technology’s (NIST) Standard Test Methods for Robots, in addition to water test areas made in collaboration with the army, and a plethora of other standardized test structures for robot testing.

Two times each year, the NERVE Center hosts an open house event to show off what kinds of crazy cool robots that people are working on in their facility and the community. Last year, we attended that event and showed off our robot to people of all ages in the community. We also learned about some cool robots being developed from a student organization at UMass Lowell and an IED disposing robot from iRobot.

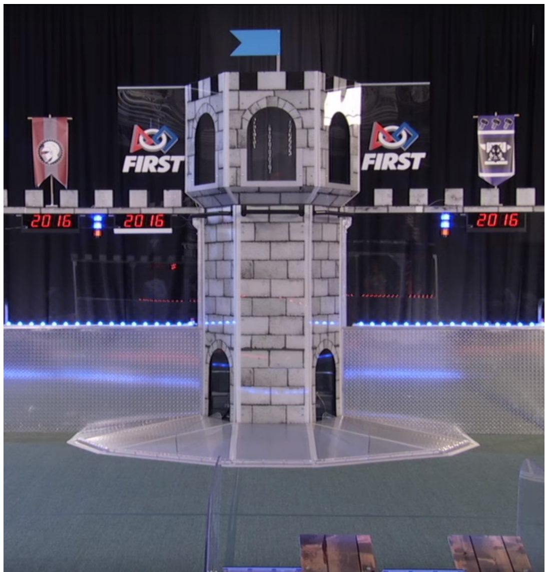
Our goal as a FIRST Team is not just to build robots. It’s really about getting future generations of kids interested in how interesting the end-game of Science, Technology, Engineering, and Math can get you in the future. So that, when the need keeps rising in the future, there will be enough engineers and analytical minded people to meet the needs of those challenges. That’s why it’s always an amazing experience going to events like this; we’re helping to shape the future of society.

A Team member explains our game strategy

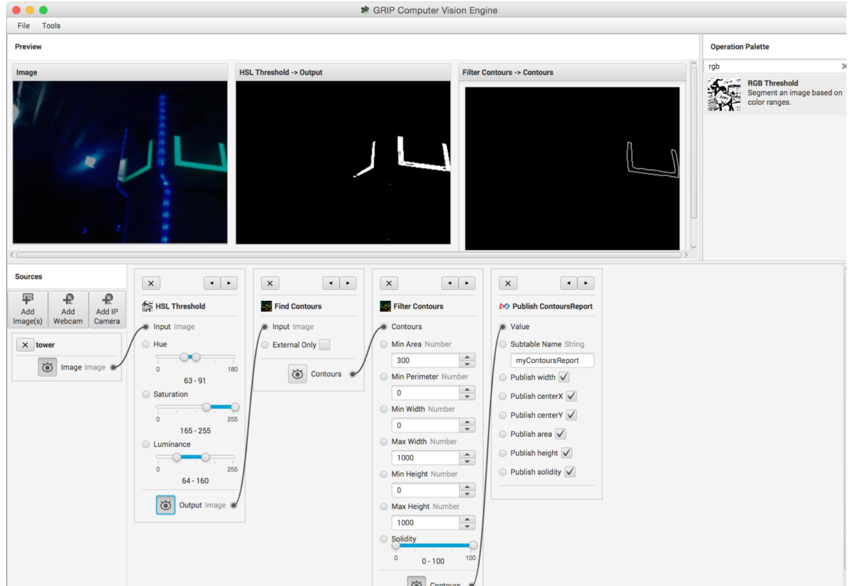


A Team member describes our lifting mechanism

A group gathers to watch us demonstrate our robot



How we see the high goal



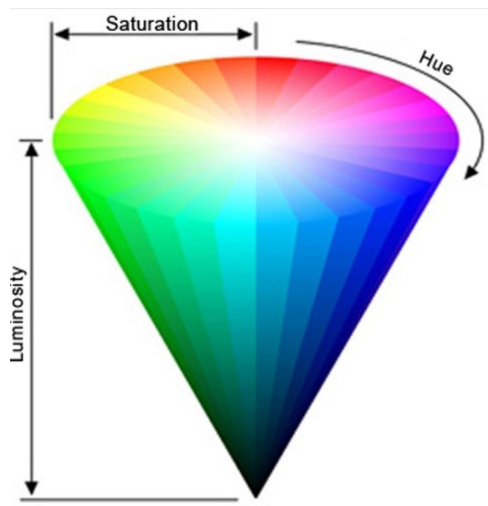
How GRIP filters light to “see” the reflective tape

Robot Vision

Something that you may hear being thrown around is ‘robot vision’. How does a robot ‘see’? What can it do with that and how does it do it? This year, we explored that tricky question.

In this year’s game, there is retro-reflective tape that outlines the cutout for the high goal in the tower. Basically, it means that if you shine a light on the retro-reflective tape, the tape will reflect that light back to you. What we can do is use how the light is reflected to tell how we are positioned in relation to the high goal.

The WPI library provides open source code for all FRC teams to use. It consists of code which is often used by FRC teams for example, code to drive a CIM motor or to control how a gyroscope sensor works. This year, the WPI team has released a tool called GRIP which stands for Graphical Image Processing. This is a program that can process what the robot’s webcam camera can ‘see’ from reflecting light off of the tape.



A visual representation of HSL

Something that you may be familiar with is “RGB” or Red Green Blue color space, which is a way of quantifying how colors are distinctly their colors. If you mix the values of Red Green and Blue from zero to two hundred and fifty-five, you can make all observable colors in the visible spectrums of light. We can us an RGB filter to attempt to identify the part of the image which is the reflect light from the goal. Unfortunately, for us, we can’t tell if someone is shining a flashlight, or spotlight back at us of the same color of the tape, or if it’s the tape that we’re looking for.

This is where the HSL color space comes in. HSL is another way of describing colors, but instead of focusing solely on the color, it defines the Hue (color), Saturation (how much of the color), and Luminance (brightness). This is what we chose to filter the image in the GRIP tool. Basically, we can use HSL as a way to see what kinds of light we’re dealing with, then, GRIP will be able to see the shape in the image that we are looking for; the contour of the goal, and not the shapeless blob of a flashlight.

After GRIP processing is done, it outputs information about the image, including the x position, y position and area of the identified shape in the image generated from the tape. From there, our programmers are working on code to tell us how to find out what our relation is to the center point of the goal shape. Once our camera’s center is lined up with GRIP’s interpretation of the center, we’re lined up… horizontally at least.

The second phase is how far we are from the goal itself. This is where ultrasonic sensors come in or, sonar, as most people call it. An ultrasonic sensor emits a sound wave at a target and measures how long it takes for it to bounce back. That will tell us how far away we are from the goal. From there, our programmers should be able to come up with a way, using trigonometry, to have the shooter at the proper angle to hit the high goal.

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