TEAM 4909

Billerica Bionics Week 3 1/24/16– 1/30/16

Week 3: Testing and Decision-Making

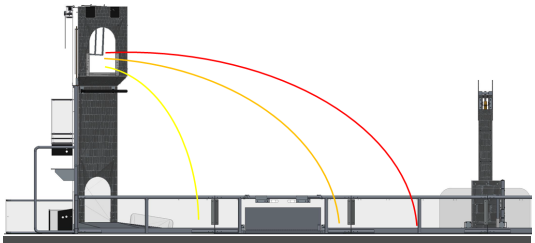
The world we live in is full of uncertainty. In the engineering world this comes in the form of physics interacting with the real world. Computer aided design and scaled drawings can only go so far as to predicting and laying out how designs will work, but the only way to find out how well they do is to test them. And that's exactly what happened this week.

Late into week two, we had got our chassis driving. Now, at about the same time, our game field elements had been roughly constructed out of plywood and two-by-fours. We had decided, with perhaps too much certainty, that we wanted to have a six inch wheel in the front followed by two eight inch wheels on each side. However, after getting it rolling, we discovered clearance issues when traversing the defenses; the face plate of the chassis covered up the wheel in the front, so when getting up the ramp to the defense, instead of hitting the middle of the wheel and getting pulled up, the chassis hit the obstacle instead, and we were unable to get over the platform. One idea to fix the issue has been to remove the face plates entirely, cut a wedge into the side panel, and run a support over the top, similar to the picture shown. However, most of the focus this week has been on shooters.

Last week we had worked on making different shooter designs and refining them. This week we tested them against each other. Each shooter was to make thirty shots at the high goal target. Ten were made from sixteen feet away; the furthest possible shooting distance from the high goal. Another set were at eleven feet away, the distance where a taped "alignment line" is located on the field. The last set was at four feet away; where the start of the ramp located at the base of the tower is located.

At the conclusion of the testing, we found all of the shooters to perform reliably and accurately. Even with all designs prone to human error in manually feeding them, they performed with about 60% accuracy with maximum range, and increased to 100% as the shooters got closer to the high goal.

After assessing the pros and cons through team discussion, we decided on a horizontal wheel shooter. It has the capability to pick up a ball from the field, store it, and shoot the ball, all within one mechanism. For its versatility in design and compactness in form factor, it won in an overwhelming majority vote. Going into week four, we will be making designs with dimensions and starting construction.



Projectiles From Three Locations

Chassis going over moat

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Game Information

FIRST Website

PTC Creo

Game Animation

In This Issue

Building our Scouting App

One of the main focuses of the competitions is figuring out which other robots work well with yours. For example, there are usually different ways to play the game, and being able to recognize and keep track of the robots that play the game differently than you is advantageous when it comes to team selection during the playoff rounds.

Based on the time and work it took to do scouting during last season, we decided that we should create our own Android app that can make it a lot easier. A division of the software team was assigned to do any of the research and planning that it would take, and then to make the app itself.

They first started by brainstorming exactly what we needed the app to do, and how a user interface could be laid out to make it as user friendly as possible. After a good deal of drawings, they knew what the plan was for how the app would work. The work for the app started before the 2016 game was released, so they had to design everything based on last year's game, at least for the time being so that they could start to understand the process of app development. Early into research the software team learned that the program that most people use for Android apps is software by Android themselves called Android Studio. After starting working with the program and they found it difficult and overly complicated.

After much research, some of the other programmers on the team found other software made by students at MIT simply called App Inventor. App Inventor provided an interesting alternative to normal Java programming. It uses blocks that you can snap together in a visual interface and uses them to create the actual code. It didn't take long to create the base code needed for the app, but then they needed a way to export the information the app stored into something such as an excel file, so that they could access it later. The app team found that the best way to do this was to use a Quick Response (QR) code that App Inventor could generate using a list of information. They then had to go on the team's Fire tablets that they plan on using the app on and download software that could read the QR codes.

At about the time this happened, the Stronghold game for 2016 was released, and they spent the next week updating the old code. It turns out that they were going to need a lot more information from the app, because there are many ways that a team can be useful during a match. The team needed to know exactly what defenses a bot could defeat and how many times they did it, in addition to low goals, high goals, challenging and scaling the tower. After some deliberation in fitting all these things onto the screen of an Android device, and pages and pages of block code, the team now has the app able to send out the QR code with all the information. The only step left is for us to hand this QR code off to an Excel file that can organize all this data for later use.

UPCOMING EVENTS

Reading Competition

3/11/2016 - 3/13/201

Reading High School

62 Oakland Road
Reading, MA 01867

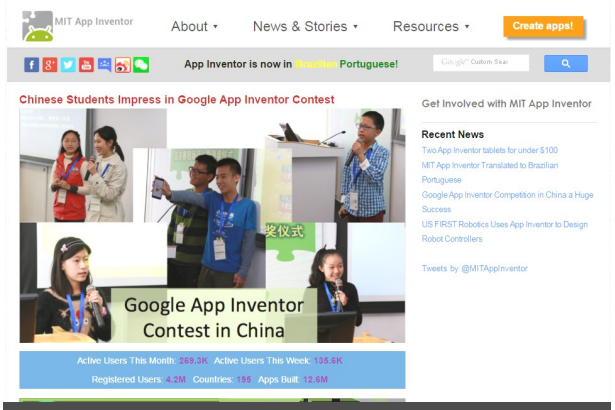
UNH Competition

3/24/2016 - 3/26/201

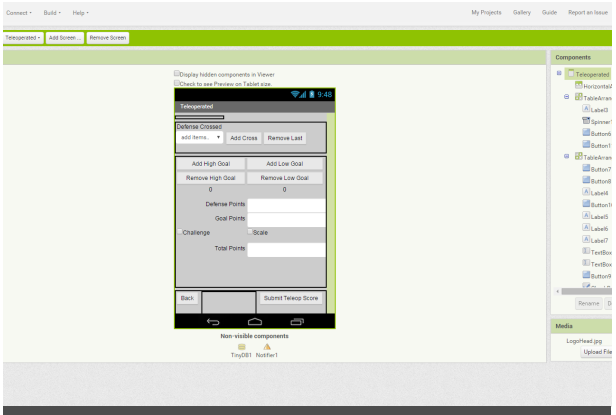
University of New Hampshire

105 Main Street
Durham, NH 03824

A sample of the visual-based code



MIT App Inventor



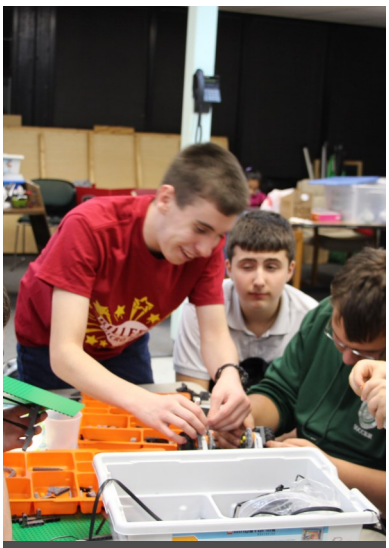
Our scouting app interface

Billerica Bots Driving at Their Competition

Team 4909 Mentoring Billerica Bots

FIRST Lego League With The Billerica Recreation Dept.

FIRST, the same organization that runs our FIRST Robotics Competition, also organizes the FIRST Lego League. FIRST Lego League (FLL) is a competition that is for children of ages 9 to 14. It involves kids receiving a game challenge that includes a competition mat the size of a large dinner table. The mat has many unique challenges on it that each team can address in different ways. There are game elements places onto the field usually with some sort of theme. This past year's game, Trash Trek, had a trash sorter in miniature Lego form, for example.



Team 4909 Helping Out

The teams use Lego Mindstorms kits to construct Lego robots to complete various challenges on the field. A Mindstorms kit comes with Lego parts that are capable of housing small motors and sensors. It hooks up to a battery powered "brick" that holds and operates all of the programming to run the bot. Each robot has to run completely autonomously without remote control or human interaction. This means that they need to write programs that navigate through the challenges and teams may not touch or move the robot to assist it in completing challenges. This creates problems for the kids to face and gives them the opportunity them to develop and apply problem solving skills.

In Billerica, there are two FIRST Lego League teams, the Billerica Bots and the Billerica Microbots, both hosted and run at the Billerica Recreation Center. Starting early this fall until December, both teams were hard at work coming up with their robots. Each week, at their meetings, just like with the Marshall's FTC team, we had sent team members to help nurture and develop their ideas. By the end of their build season both teams had designed completely different robots.

In addition to their robotics competition, something unique to the FIRST Lego League is that teams must also create some sort of research project solving a real-world problem based on the theme of that game, and present their findings to judges at their competition. As the theme this year was waste management, one team focused on composting in the community, and other looked into how cathode ray tubes from old TVs were disposed of.

At their competition, both teams did very well and placed highly in the rankings. The Microbots went on to the Quarterfinals and both teams won an award for their team, one for innovation in robot design, another for their team presentation. FIRST Lego League helped teach many of the members how to work in a team and to design solutions to problems. We look forward to seeing their team grow in the future.

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