3100 Lightning Turtles

Weekly Newsletter

Build Season Week #3 - Jan 28, 2018

Team Sponsor/Family Open House: Fri, Feb 16 - 3:15p - 6:00p - Sibley HS Tech Ed
Attending Competitions: Duluth Regionals (Mar 8-10) & LaCrosse Regionals (Apr 5-7)

****To all our Sponsors & Supporters****
We have raised $17,500 so far against our budget of $24,750. We're $7,250 short and those funds are needed to ensure our students can travel to our out-of-town competitions in Mar/Apr.

Please donate today at www.team3100.com/sponsors/

Our 2018 Build Season
by Week

1 Week 1
- -Kickoff
- -Strategic Design
- -Prototyping - claw, elevator & ramps

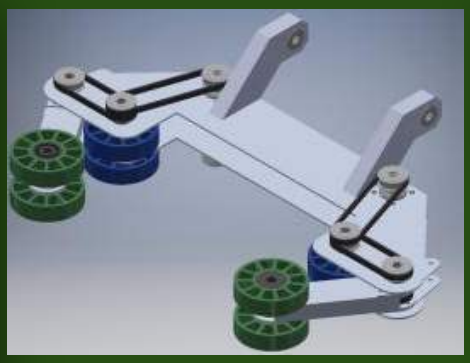
2 Week 2
- -Prototyping - cont'd for claw & ramps
- -CAD Design for Elevator
- -Drivetrain designed / fabricated / assembled
- -Preliminary design review

3 Week 3
- -Prototyping - cont'd for ramps
- -Drivetrain programmed for autonomous
- -CAD Design for claw
- -Fabrication for elevator

4 Week 4
- -Prototyping - cont'd for ramps
- -CAD Design for Ramps
- -Elevator assembly
- -Fabrication for claw

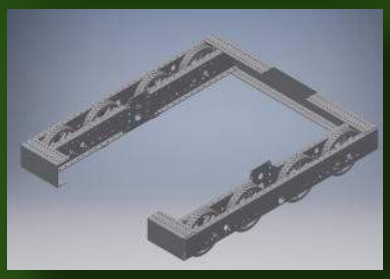
5 Week 5
- -Claw assembly
- -Ramp Fabrication
- -Ramp assembly
- -Programming for elevator, ramp & claw
- -Full robot integration

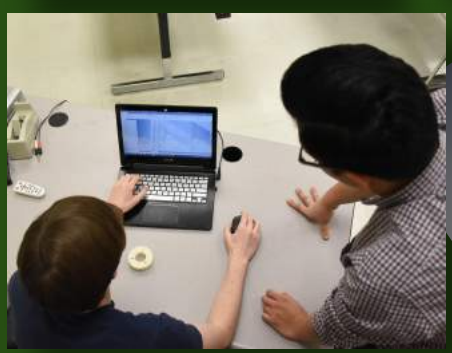
6 Week 6
- -Build Complete
- -Driver Team Training & Practice
- -Open House! Fri, Feb 16
- -Robot Sealed in Giant Bag on Tue, Feb 20 - awaits first competition

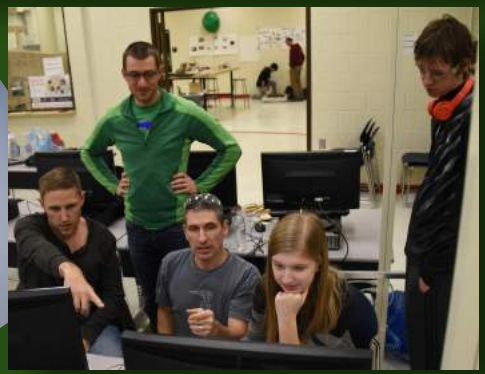


CAD* turns into BOT!

*CAD= Computer-Aided Design







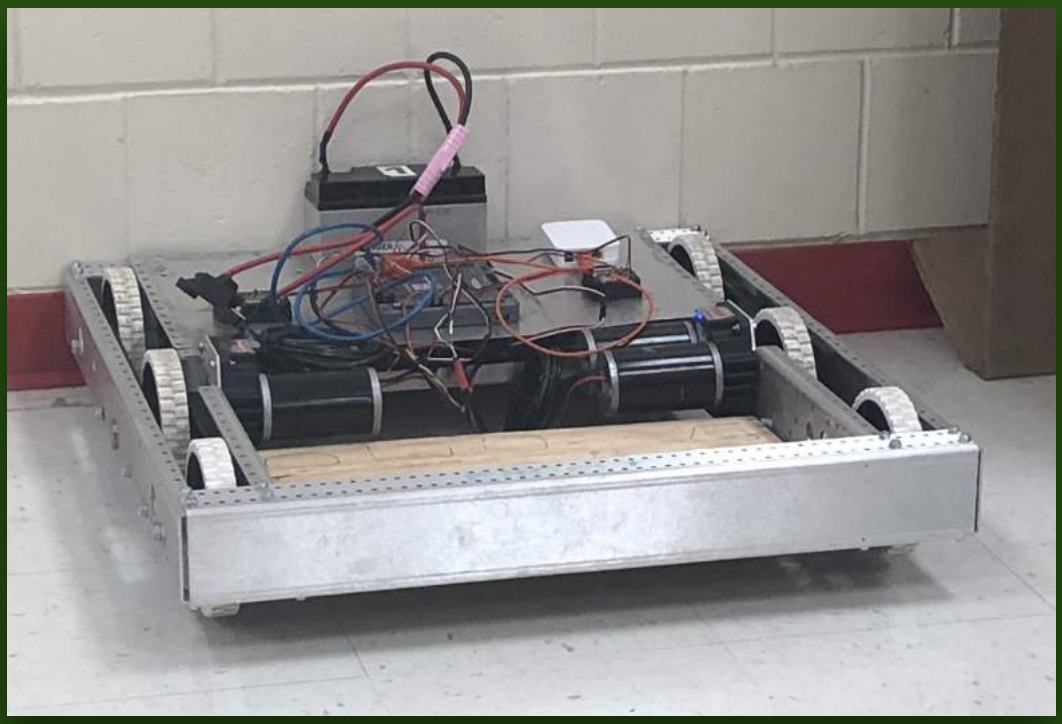
SNOW DAY(S)!

Due to the 12.5 inches of snow we received on Monday Jan 22 , school was canceled for 2 days - which seriously delayed our design / build process. We were back on track by Wednesday, but semester finals were delayed and then there was a 2-day end of semester break on Thurs/Fri. After the storm, we took our 2016 Stronghold Robot out sledding (well, for a deep snow photo shoot).

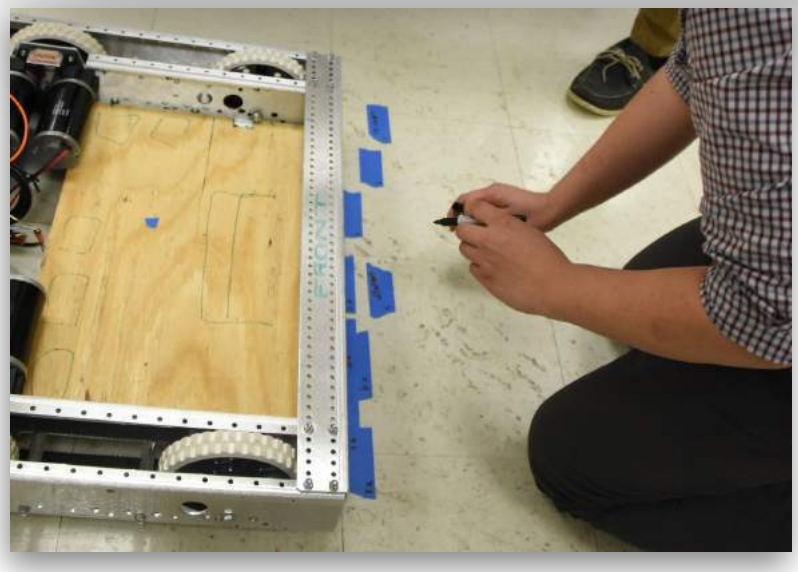
FABRICATING PROTOTYPE PIECES

Rapid prototype fabrication (cutting & making rough examples) continues as we test out final versions of our ideas. Principal Munson observes the new plasma metal sheet cutter with Bryson. Khai works on our collector and Joe fashions the pneumatic lifters we plan to use to lift other robots and gain more points in our competitions.

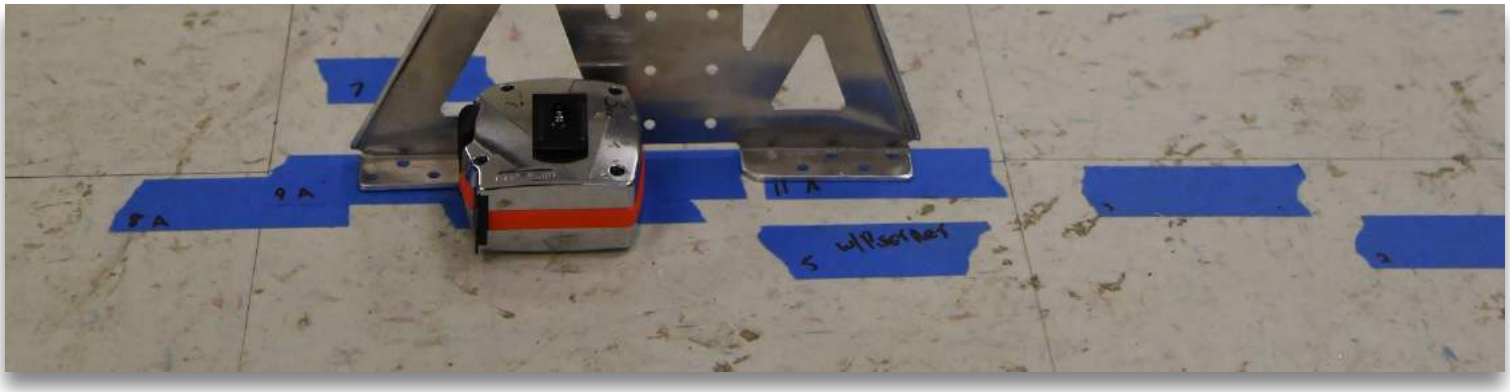
PROGRAMMING THE DRIVETRAIN



First Chassis Build Completed to test Early Autonomous Mode Code.



What's all that mean? At the beginning of each 2 min 30 sec match, the robot has 15 seconds of autonomous (not driver controlled) time to complete a set of pre-programmed tasks. Knowing exactly how far the robot travels with each wheel rotation is critical (see sensor article later in this newsletter) to knowing where it will end up in autonomous mode.
Here we're measuring distance traveled over and over for the same autonomous drive code. The different stopping points on blue tape indicate a problem that we plan to fix with our sensors and more wheel spokes.



T-SHIRT DESIGN

James - our Master T-Shirt Designer - Silk-Screening our Lightning Turtles Logo Onto Team Shirts

We were in need of a few more shirts to represent our team, so James took a day this week to create a bunch of new ones for us.

TEAM FUN!

Interview:

With Rookie, **Charlie**

Q: What got you involved in robotics?

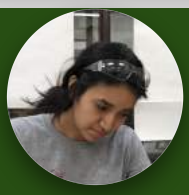
A: I decided to join FIRST Lego League in elementary school.

Q: How did you hear about the team?

A: There wasn't a robotics team at my middle school, so I decided to join a High School team. Once I saw that Sibley had one, I decided to join.

Q: What do you think is the most exciting thing about being on the team?

A: Having fun with the team and getting to help build a robot!



Interview:

With Rookie, **Luz**

Q: Why did you join the team?

A: I wanted to try something new...something that might benefit me. So I joined robotics, and I never regretted it. Everyone is so nice and filled with determination. I also wanted to be like my brother, a huge role model of mine, he fixes computers and other tech. I just want to be as cool as him, he's cool.

Q: (Follow up question) Since you mentioned your brother, do you have any other role models you'd like to share?

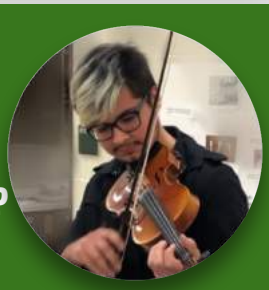
A: Elon Musk, he's pretty cool too! I want to be like him one day...I want to change the future!

Q: What's your favorite thing about robotics?

A: Everything! The people, learning, fabrication, and the teamwork that goes into all of it!

Interview:

With Veteran, **Micco**



Q: Why did you join robotics?

A: I wanted to get a better understanding of programming

Q: What has been the most exciting moment during the time you have been on the team?

A: I was part of the drive team last year, and that was pretty cool!

Q: Have you always have an interest in this sort of thing?

A: ...Yes.

Q: What other activities do you take interest in?

A: A LOT of music!

Interview:

With Fabrication Lead, **Ben**

Q: Why did you join robotics?

A: I have always been interested in making things and tinkering with electronics. When I heard there was a robotics club at Sibley, I joined. It's a lot of fun, so I stayed.

Q: What are your plans for a career?

A: I'm currently looking for careers in industrial automation and machining. That said, I'm interested in just about anything from search and rescue to being a chef.

Q: What has been your favorite moment while on the team?

A: Probably going to the LaCrosse competition. Being surrounded by like-minded people and friends is always fun, especially at a competition like that. Also, you can't forget the ice cream there, it was really good!

Q: Do You Think we'll win regionals?

A: I think we have a really good shot, yeah

On-Board Sensors Deliver Accuracy

Counting Wheel Rotations

Light Detecting Laser Sensor – mounted in robot below & we 3D-printed additional wheel spokes (dark grey) above to give it "higher resolution" (detect light change more frequently as wheel spins – improving positioning accuracy.

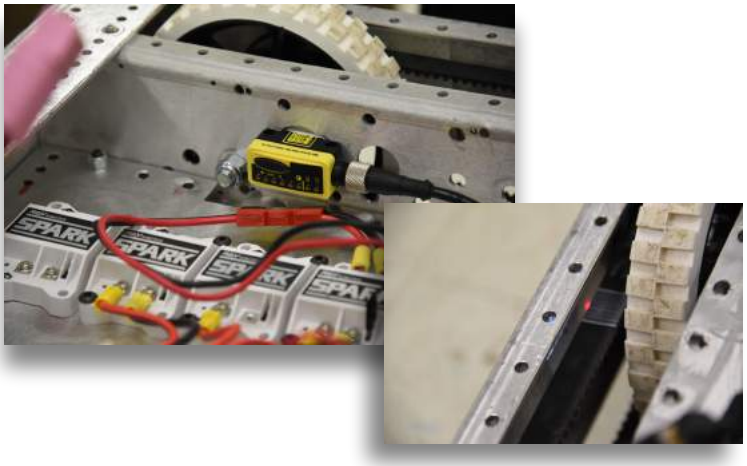


Photo-reflective material from 3M (thanks John!) – photo light easily bounces off this material and reflects back to the detector when no spoke covers it.

What sensors are being used by the Lightning Turtles for the 2018 FRC Season?

There are many sensors under consideration for use on this years robot, and several that have already been installed.

In the drive train, **retroreflective light detecting sensors** are being used to detect motion in the wheels and compute distance traveled. This type of sensor use is generally termed odometry and works like a car's mileage indicator. These sensors come to us from Banner Electronics. The sensors use a laser to send a beam of light through the spokes of the wheels, bouncing it off a piece of reflective material, and detecting the return light. The robot controller counts when the beam is interrupted by the spokes.

The claw grabber mechanism is incorporating a **limit switch** to detect when a cube has been fully captured. This limit switch can plug directly into the motor controller driving the capture wheels, turning that motor off when the box is secure.

The lift mechanism which will drive the capture mechanism to the various heights for carrying or delivering cubes, will have an **encoder** (exact type still tbd) that will be able to measure the current height of the lifter.

The robot also has a pneumatic (air pressure) system that is used in the grabber and the wing robot lifter mechanisms. The pneumatic system has a **required pressure switch** which controls the compressor, turning it off before the air storage system reaches 120 psi.

Other sensors under consideration for use on the robot are:
Gyro – a sensor that detects and measures rotation of the robot. Possibly useful for autonomous navigation.
UltraSonic Range Finder – a sensor that measures distance based on sound pulses. This may be also be used in addition (or possibly in place of) the limit switch in the grabber. This also may be used for navigation, detecting distance to various field elements.
Potentiometer – This sensor is a variable resistor, that can be adjusted by linkage to some mechanical movement inside the robot. Typically this is used to measure the angle of an arm, or some linear motion. The value of the potentiometer will be proportional to the angle or distance measured.
We are also continually considering the possibilities of other sensors, for use in this year's robots, or for investigation in the off season for future use.

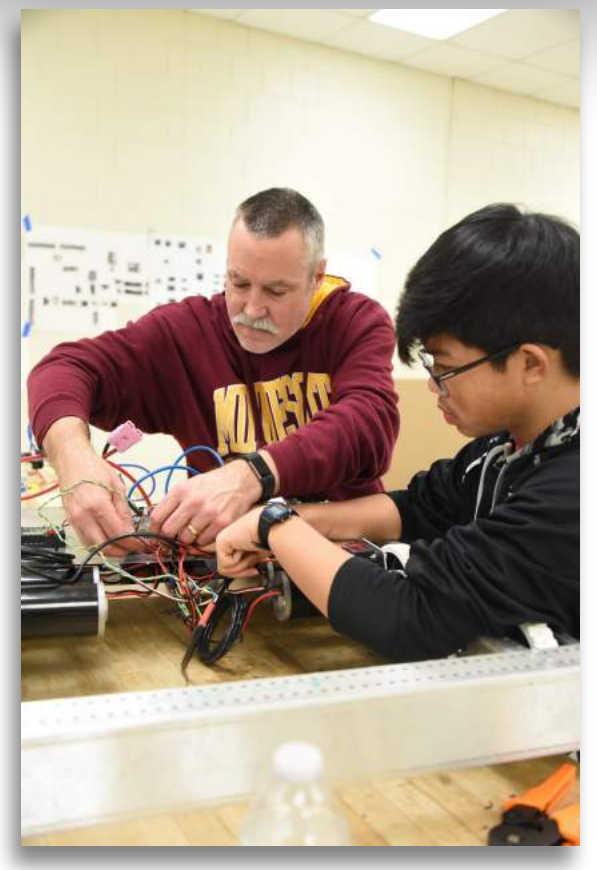
Thanks Eric – Programming mentor – for the sensor details!

Programming

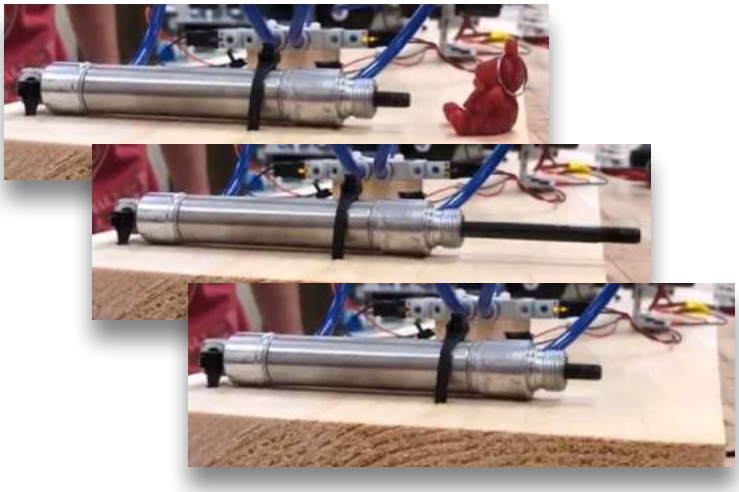
In FRC Robotics, there are three programming languages we can use to control our robot: **LabView, C++, and Java.**
We've chosen to use **Java** because of its versatility and it's not quite-as-steep learning curve compared to the other two. We use IntelliJ IDEA as a code editor and to deploy our code, and we store it on GitHub – which is an online code repository that can be shared by many programmers on a team. GitHub allows us to split up the tasks between several programmers by turning them into branches. Each branch is then used to edit certain parts of the robot code to ensure we do not overwrite each other's progress.

We use command-based programming, meaning the robot's program is split into commands and subsystems. Subsystems are where we define the capabilities of each part of the robot. For example, if a robot has a drive train, it's driving subsystem would have functions to move it forward, backward, and turn. Commands are where we define how the robot will operate. Using the same example, if we want to move forward, we'd use a command to tell the drive subsystem to activate its forwards function. Command-based programming is extremely powerful because it allows us to chain multiple actions together to automate almost everything the robot does. Instead of individually running each command, we can also string them together into command groups to run a series of actions. This is especially useful in the autonomous period of each robotics match, where our robot has 15 seconds to complete as many tasks as possible without the driver's help.

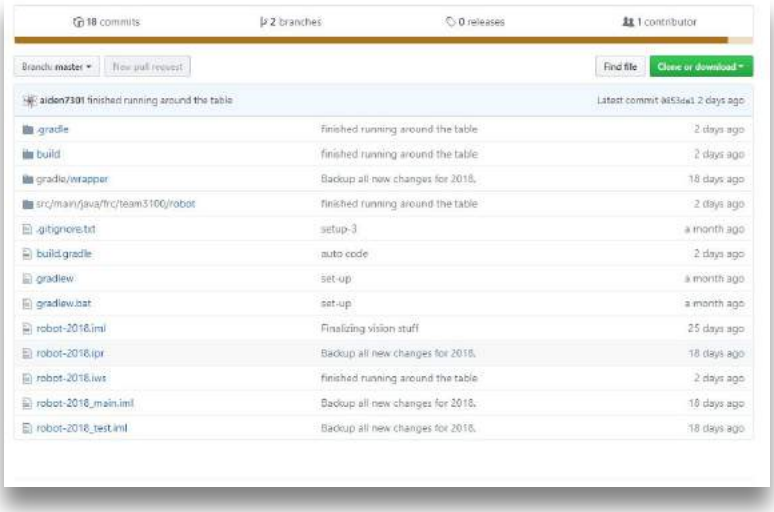
Thanks, Aiden-Team Co-Captain and Programming Division Lead- for the Article!



Mentor Mike and Quan wiring up the robot before it can execute any code fed to it.



Programming the pneumatic piston to fire the wee bear across the table (this IS real-world learning!). In reality, we'll use air pressurized pistons to open/close our grabber claw.



A snapshot of our GitHub repository where we stash our robot code.

A BIG THANK YOU TO OUR SPONSORS!

Amelia Beach

Joanne and David Binder

George Halsey

Paul Nyhus

James Price

Want to get in touch with us? Email 3100lightningturtles@gmail.com
or contact Doug Sisk – Tech Ed Teacher at Henry Sibley High School

Want to become a sponsor? Sponsor us here! https://www.gofundme.com/frc3100
or learn more at www.team3100.com/sponsor/

Visit our website at: www.team3100.com to find our complete season calendar