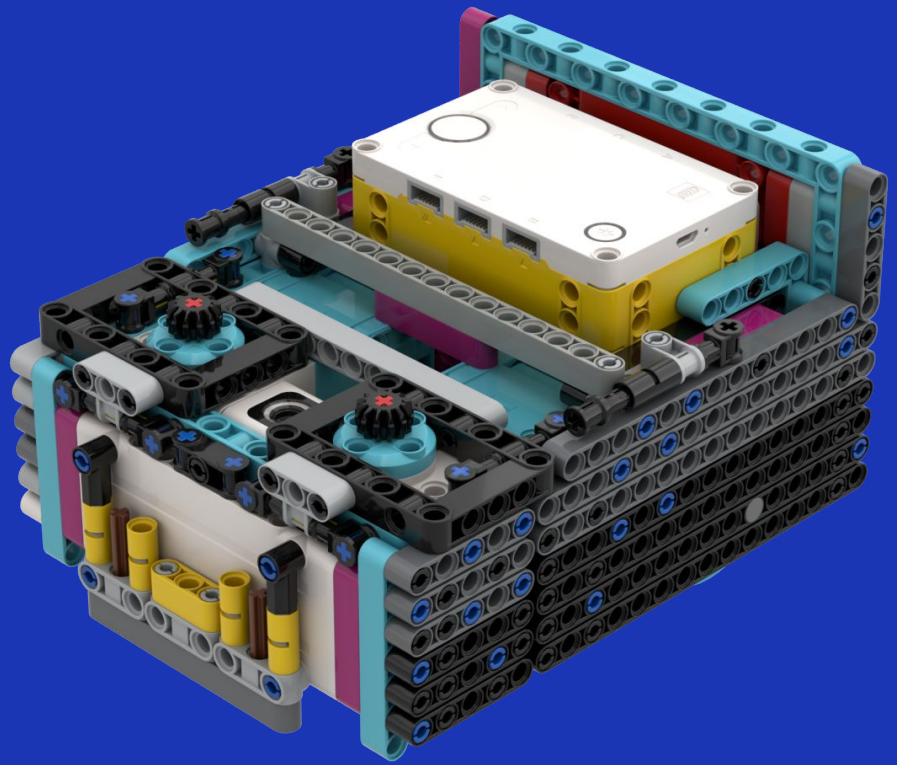
Blarney Brickbusters Present

Our Robot: Enrique

First Lego League Submerged
2025



Mission Strategy

Collect Krill / Coral

We wanted to collect these as they would be in the way when completing other missions

Don’t waste runs

Avoid driving directly from home to home without doing missions as this wastes valuable time

Quality over Quantity

We struggled with accuracy last year so we wanted to make sure all runs worked consistently

Remote Control

Use remote to test and code missions so we can be faster and more efficient

Passive Attachments

Try use passive attachments where possible for consistency and ease of coding

Submarine

Submarine needs to be on the opponent's side to score extra points, so we tried to finish with it

Coding Process

PLAN

Plan what missions to do in the run and in what order

BUILD

Build attachments to complete each mission

DRIVE

Use remote control to drive robot and get measurements for code

ADJUST

Adjust the code to ensure it works more consistently

Plan

Plan what missions to do in the run and in what order

4 things taken into account:

1. How difficult is a mission
2. Where is the mission located in relation to others we want to do
3. If mission can be solved with a similar attachment to other missions
4. What side of the board robot will be at and where it needs to go

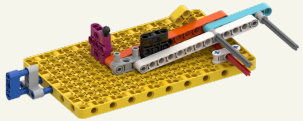
We then discuss possible routes to take and test drive them using our remote control

Build

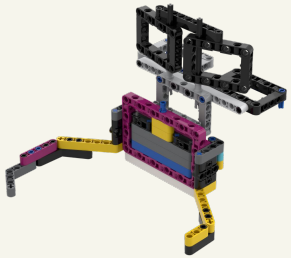
Build attachments to complete each mission

- What missions can be done by similar attachments?
- Can a mission be solved passively (without using a motor)?
- Try fit all tools for each run onto a standard drop-on connector

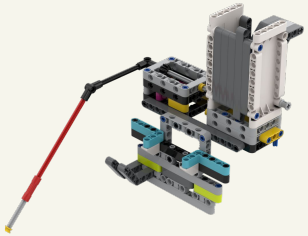
Throughout the year, we found we have been overcomplicating some attachments, so most of the time simple is best - CarWasher is a good example



Run 1 - Changing Shipping Lanes

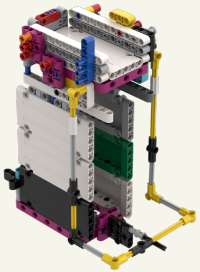


Run 2 - Krill / Coral and Anglerfish

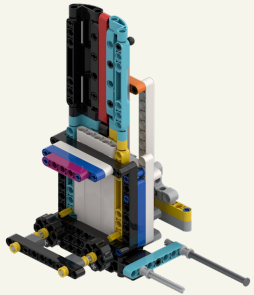


Run 3 - Coral Nursery / Reef and Shark

Run 4 - Radar and Plankton Sample



Run 5 - Whale



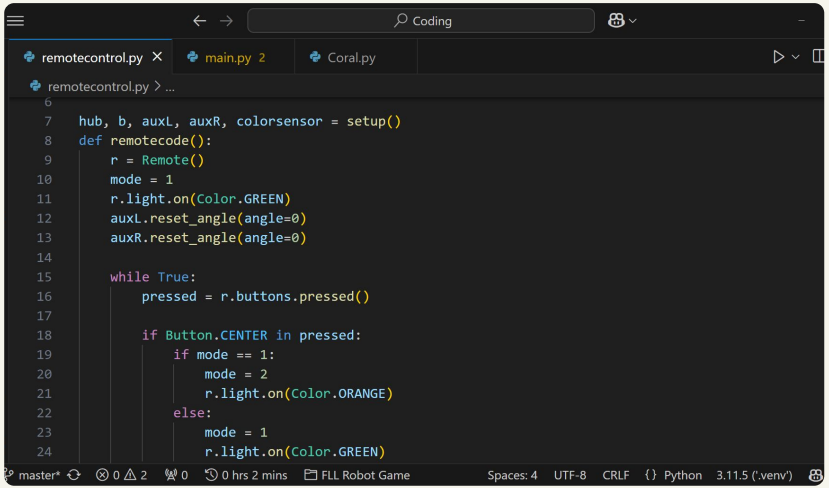
Run 6 - Submarine and Unknown Sea Creature

Drive

Use remote control to code the robot more quickly

Using Pybricks and remote control:

1. Connect robot to laptop and run code
2. Drive/turn desired distance
3. Press red button to send distance to computer
4. Copy code into program
5. Repeat for all movements in the run



</> Adjust

Edit the code for maximum accuracy and consistency

We used an iterative coding process to code the robot, running the code, then editing it and running it again. Using the remote was not 100% accurate to what we wanted every time, so code improvement actually took up the majority of our time. On our third run, completing the Coral Reef, Shark and coral nursery, we completely restarted coding it at least 4 times (in a single week).

Pybricks

Harder to use but far more customisable and accurate

- Python-based
- Built-in gyro support
- Allows use of remote control to drive robot without coding it
- Simultaneous movements
- Turns / straight line distances accurate
- Much more powerful - allows you to change things Spike dreams of doing
- Tricky to install
- Steep learning curve in terms of coding the entire system

Spike

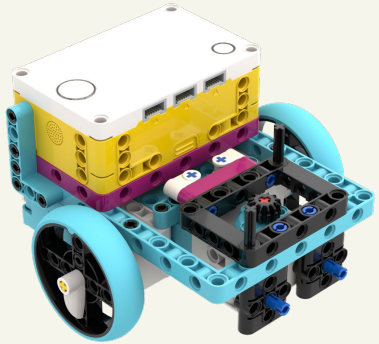
Easier for beginners and no complicated install

- Default software / firmware package
- Blocks based
- Easy to learn
- Built-in menu system
- Very hard to backup codes / share code to other devices
- No gyro support by default
- Can’t import code from other runs / setup scripts

Robot Development

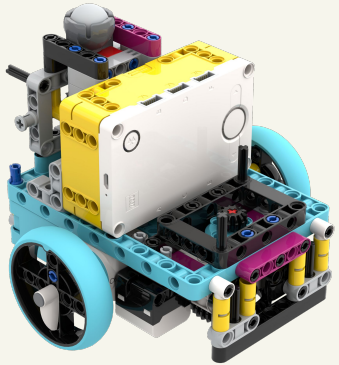
2023

Our first Spike Prime robot, not very stable and only one attachment motor



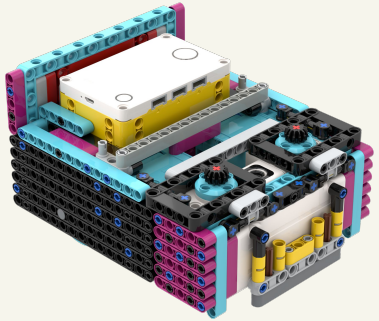
2024

Much bigger robot but still had stability issues and sensors ended up not being usable



2025

In our opinion, this is our best robot yet, with much improved connectors and body shape



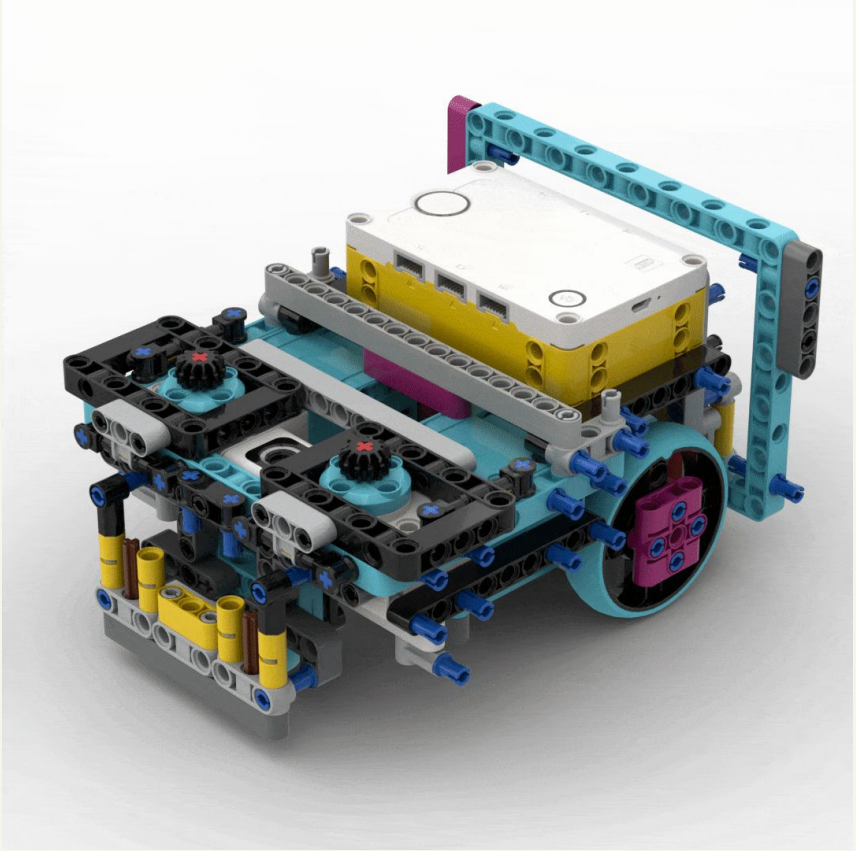
Our Robot

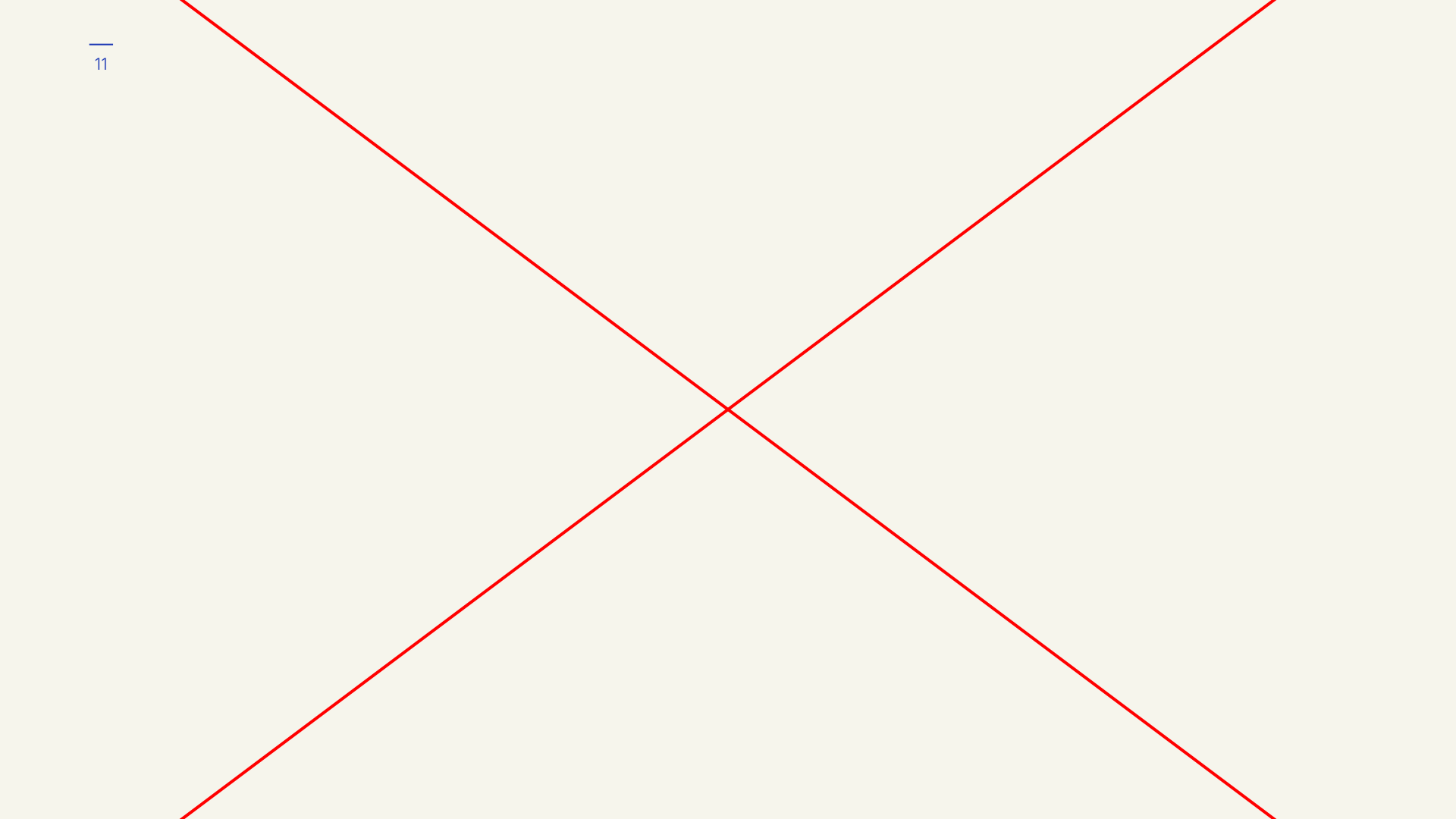
Design Constraints, developed over the last 4 years:

- Dual front motors
- Wheels / Ball wheel far from centre
- Hub at back and facing upwards
- As much weight near wheels as possible
- Squared off flat sides for easy setup
- Passive / active connection system

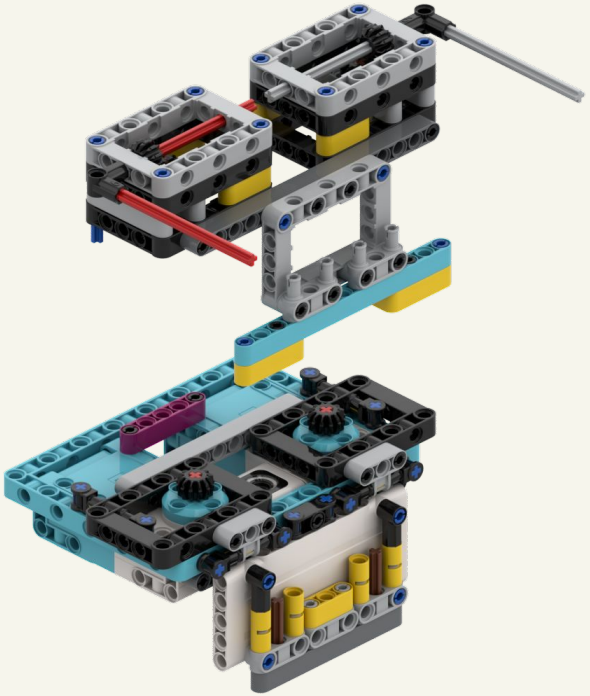
Optional:

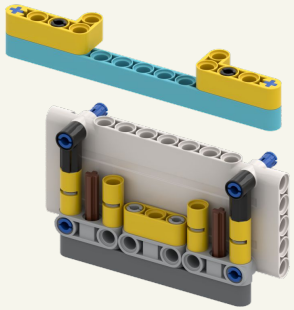
- Colour sensor to detect attachment
- Drop-on attachments
- Slipless active motor attachment - not implemented as we could not figure out how to





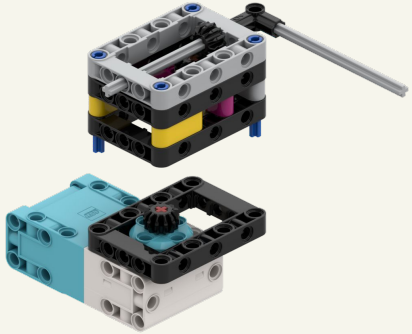
Connectors





Passive Connector

Our passive connector is used for attachments that don't require a motor on both the front and back of the robot

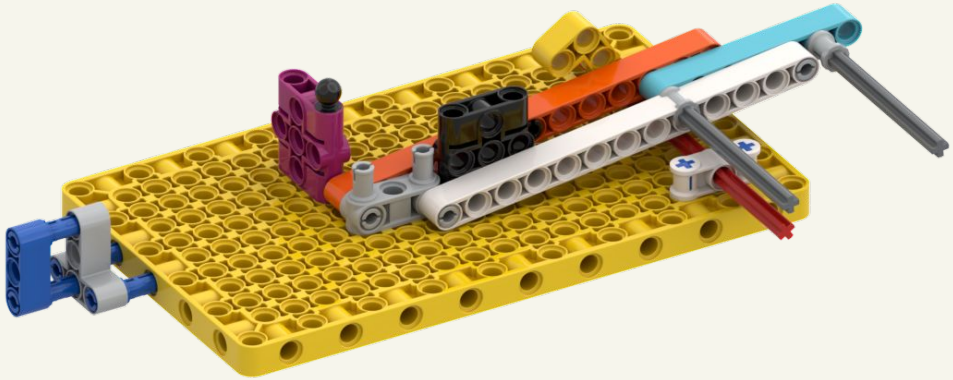


Active Connector

Motor-powered attachments use this for a fast, drop on connector. Last year we had issues with gears slipping, so this new gearbox design helps combat this.

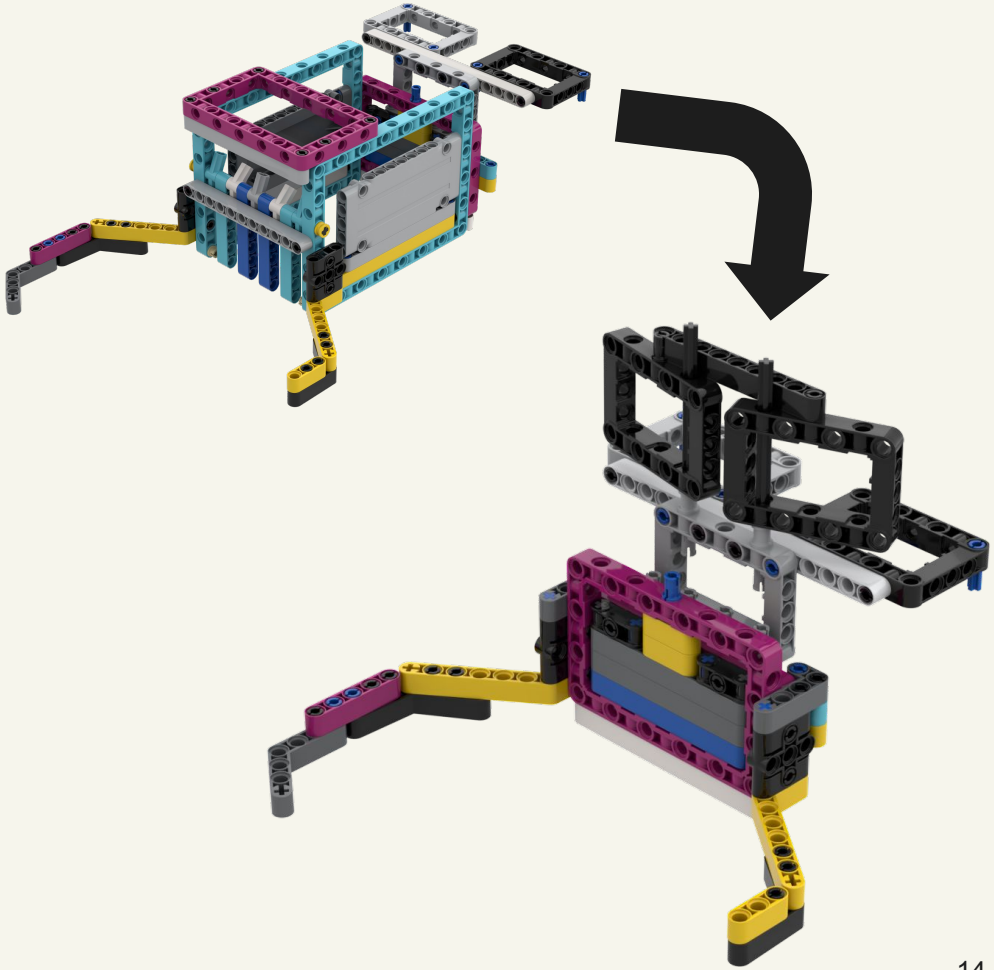
Run 1 - Banana Boat

- Uses a trigger release system with a rubber band for power
- It activates when the red bar is pushed inwards upon contact with the mission
- The grey bars then swing upwards in an arc, completing the mission



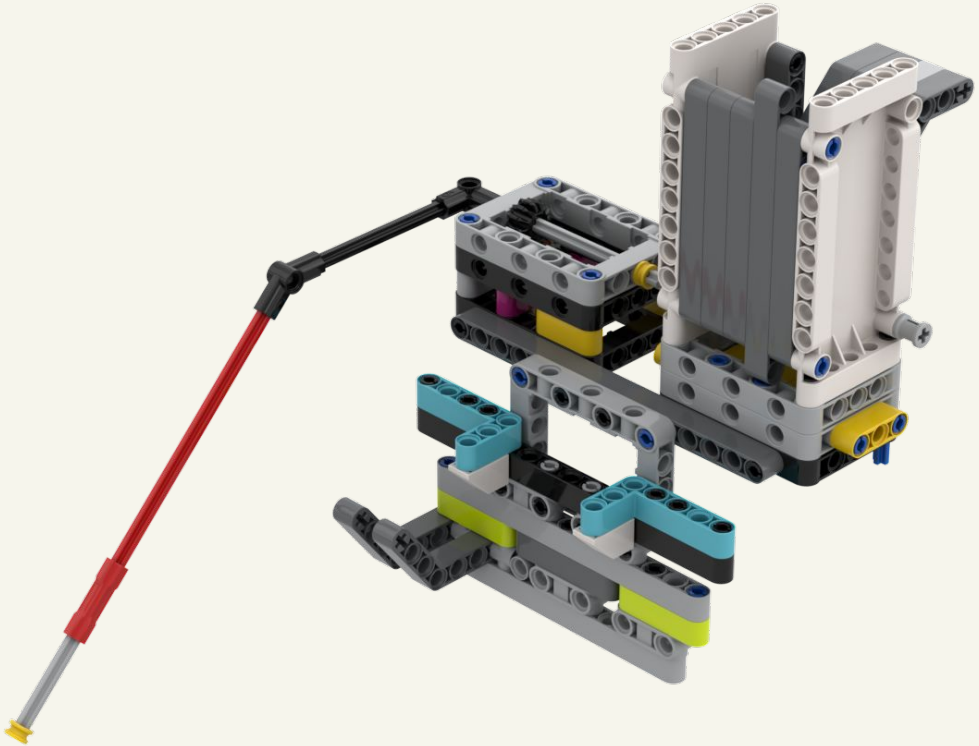
Run 2 - Krill

- Goes from one side of the board to the other, collecting the 4 krill, water sample, and 3 coral
- It also does the Unknown Sea Creature and the Anglerfish mission on the way
- This clears the board, allowing us to drive freely to do the other missions
- Used to be the very over complicated and large Carwasher, but we simplified it immensely



Run 3 - Shark

- This launches from the Left Home, after the Krill run
- Put 4 Krill and the octopus into the rectangular chute on the arm for use in later runs launching from the right side
- This goes all the way around the board and does the Coral Nursery, The Shark, Raising the Mast and Collecting the Seabed Sample

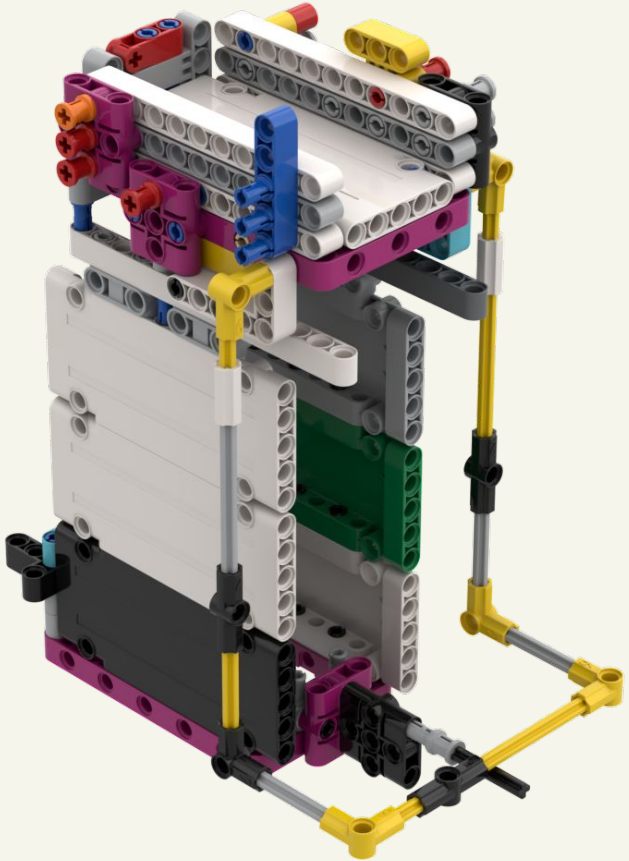


Run 4 - Radar

- We partially complete the radar as the second Whale is only worth 10 points and we are limited in time, scoring more points if we leave it
- Then collect the Plankton Sample
- This type of “long arm” has been used in all of SMGS FLL games since 2020, evolving with the games

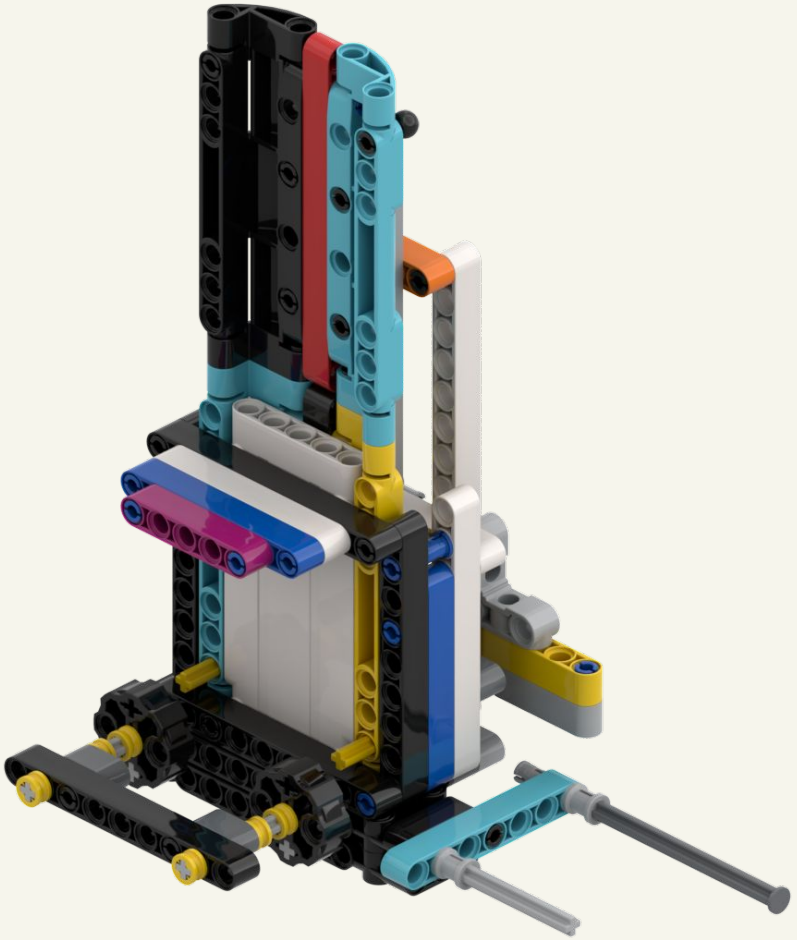
Run 5 - Whale

- We will put the Krill obtained in Run 2 and transported in Run 3
- We proceed to the Whale and dump the Krill into the Whales mouth



Run 6 - Submarine

- Using our rubber band powered passive attachment, we put the Octopus into the deep sea, utilising the prongs on the side.
- We then turn towards the submarine and aggressively drive into it, triggering the attachment and sending the Submarine across the board to the other team



Planned / Unfinished Runs

Boat Run

The plan was to put the collected samples into the boat, it is coded and we have an arm built for it however we realistically do not have time at the end of the game to complete it.

Diver Run

We tried to catch the diver whilst pushing in the coral nursery, push the shark, put the diver on the hook and collect the seabed sample. However the arm was not stable enough to be accurate. This became the Shark Run.

Artificial habitat

We had built an arm to do the Artificial Habitat. It would work but we realised it would take too long to code and would be very hard to get it 100% accurate. We realised we needed to prioritise our time and ultimately decided to not do the artificial habitat.