STUDENT ROBOTICS 2020

KICKSTART

KICKSTART 2020

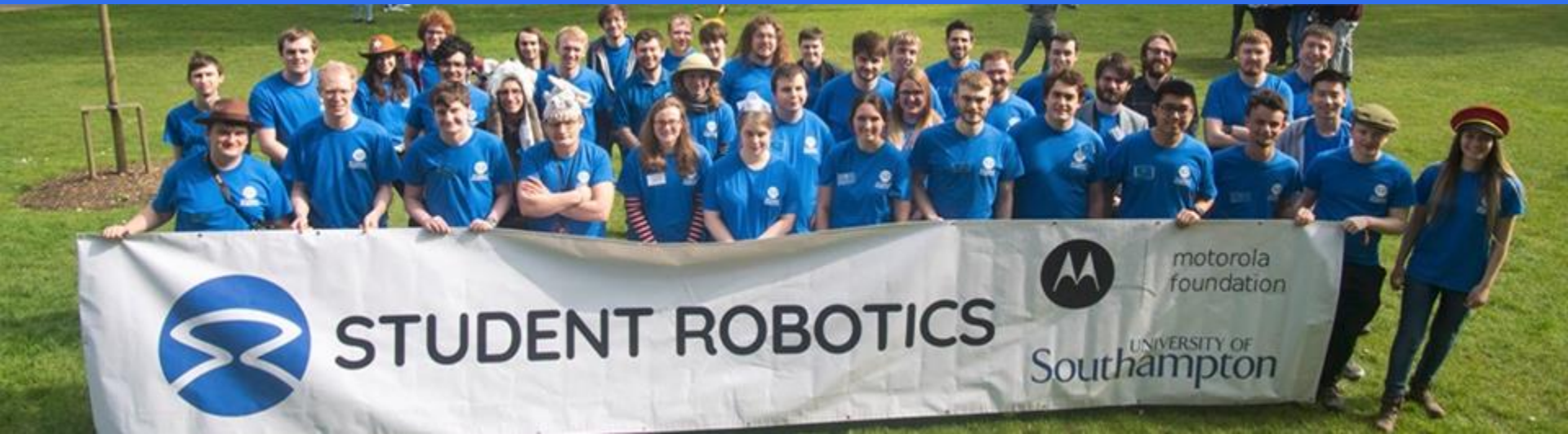
1. What is Student Robotics
2. Schedule for the year
3. Designing your robot
4. Building your robot
5. Developing your robot
6. Health and safety
7. The game
8. The rest of today

WHAT IS STUDENT ROBOTICS?

The Volunteers

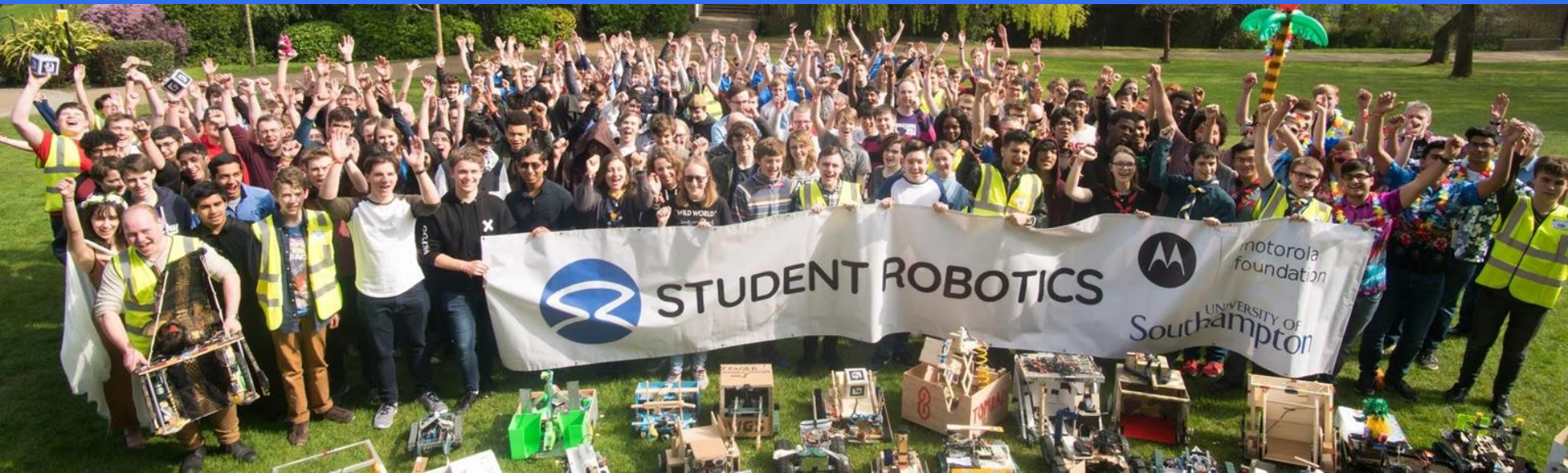
We may be nerds, but we aren’t scary!

We’re here to help!



The Teams

There’s 37 of you!
(not all in this room)



National Park
York
Blackpool
Leeds
Hull
Great Britain
M61
M1
M18
Liverpool
M62
Manchester
Chester
Peak District
National Park
M6
Nottingham
Snowdonia
National Park
Leicester
Peterborough
Norwich
M54
M6 Toll
Ipswich
WALES
Colchester
A1(M)
M11
Swansea
M4
Cardiff
Reading
Southend-on-Sea
Canterbury
Bath
M5
M3
M23
M20
Brighton
Exeter
Bournemouth
A16
Torquay

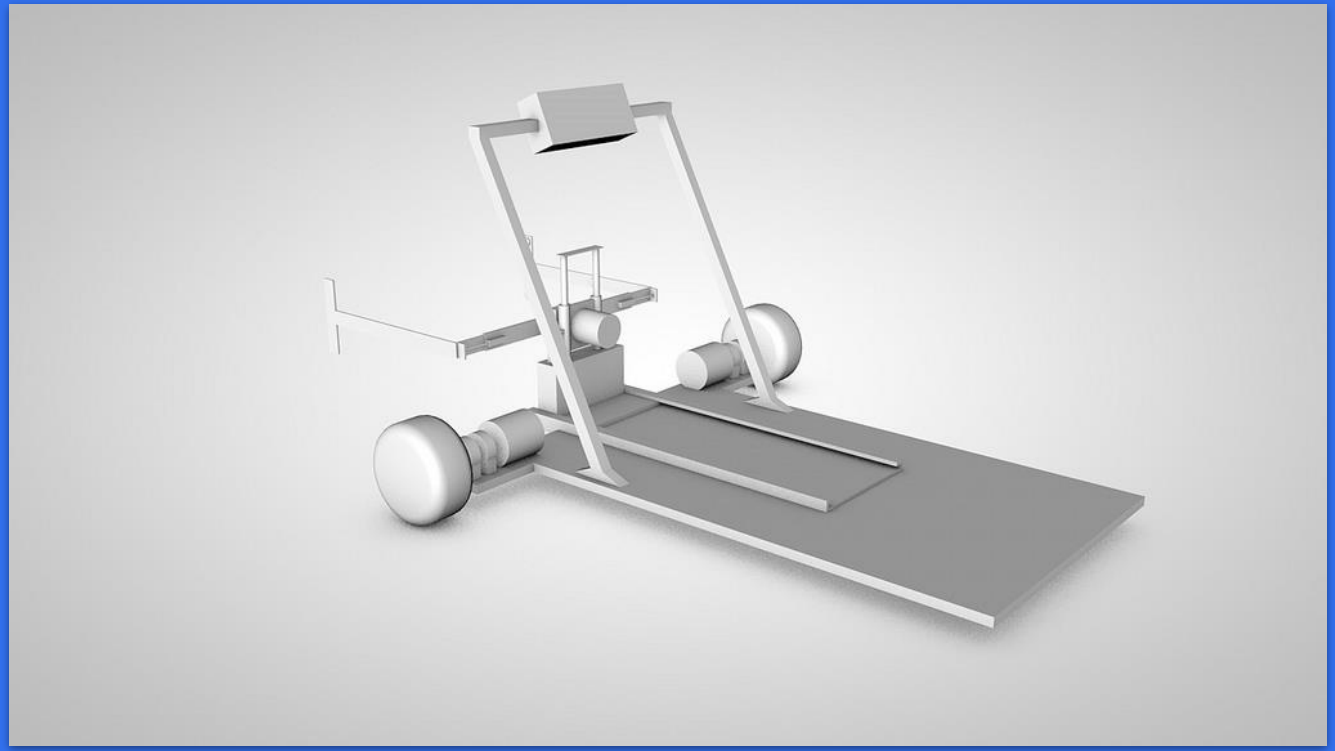
Guernsey
La Villiaze
Icart
La Râde
CHANNEL ISLANDS

Regensburg
Straubing
Ingolstadt
Ulm
Augsburg
Munich
Rosenheim
Kempten
Garmisch-Partenkirchen
Berchtesgaden
Innsbruck

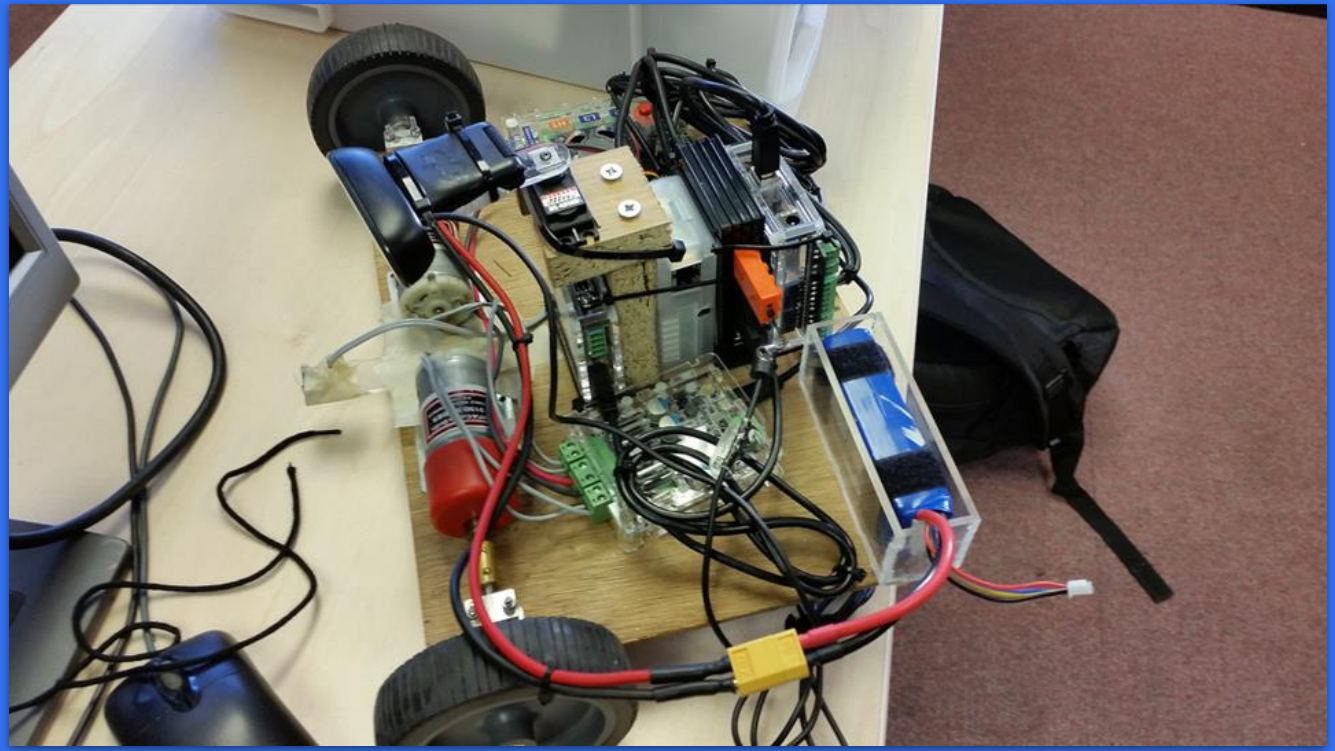
6 MONTHS

You have **ONLY** 6 months to...

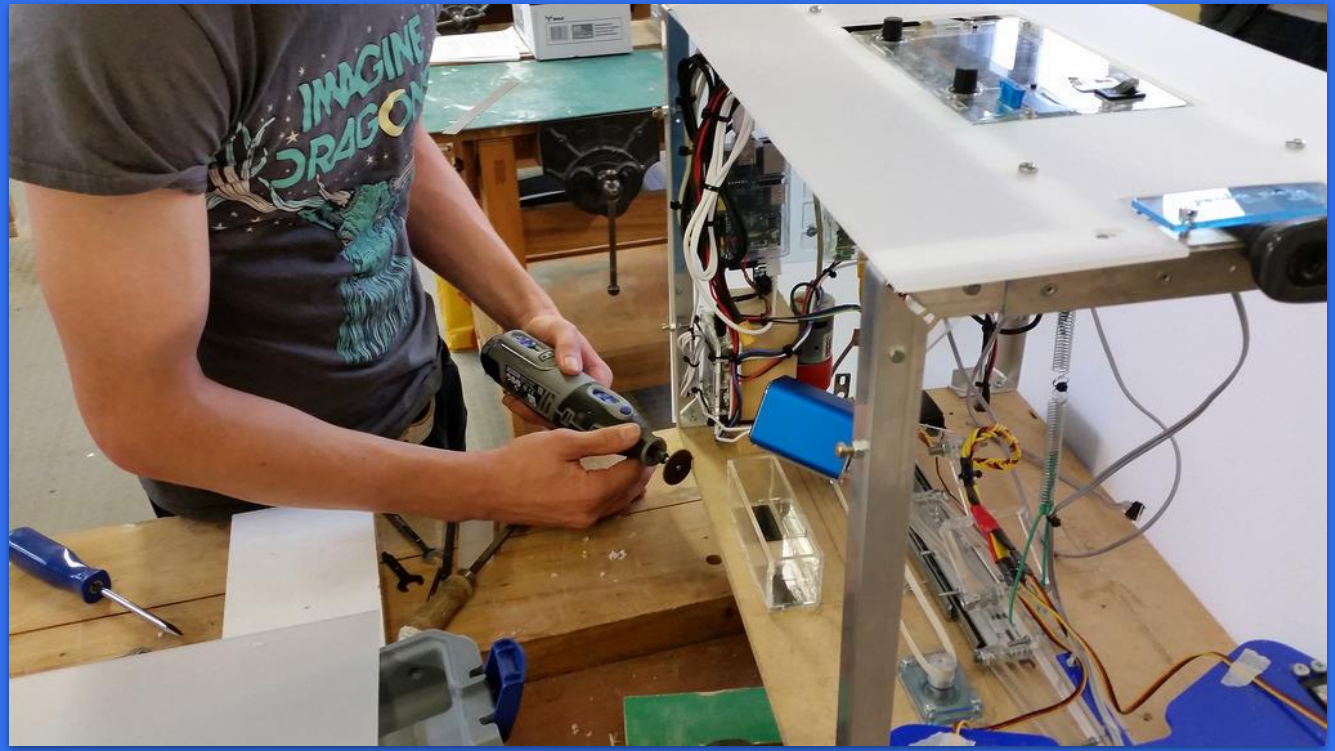
Design



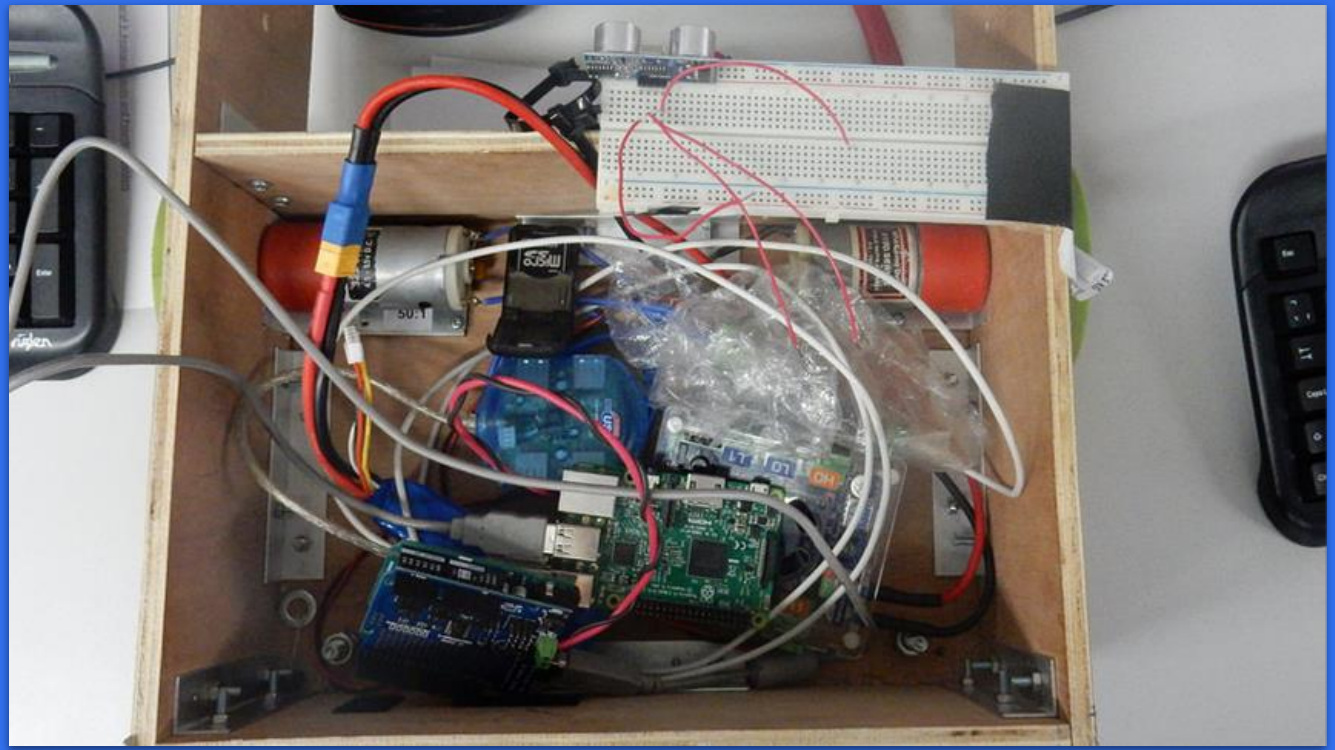
Prototype



Build

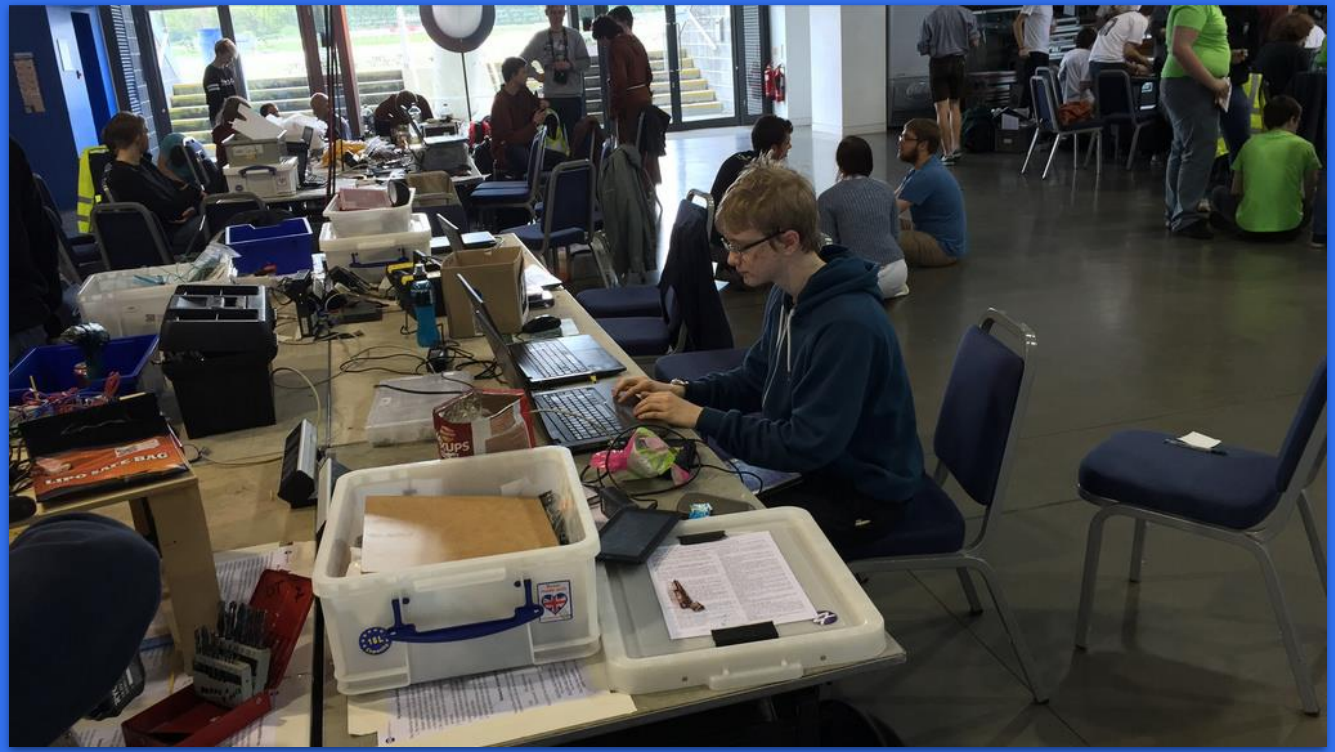


Do all the electronics (Hopefully better than this)



Write lots of code

Work as a team



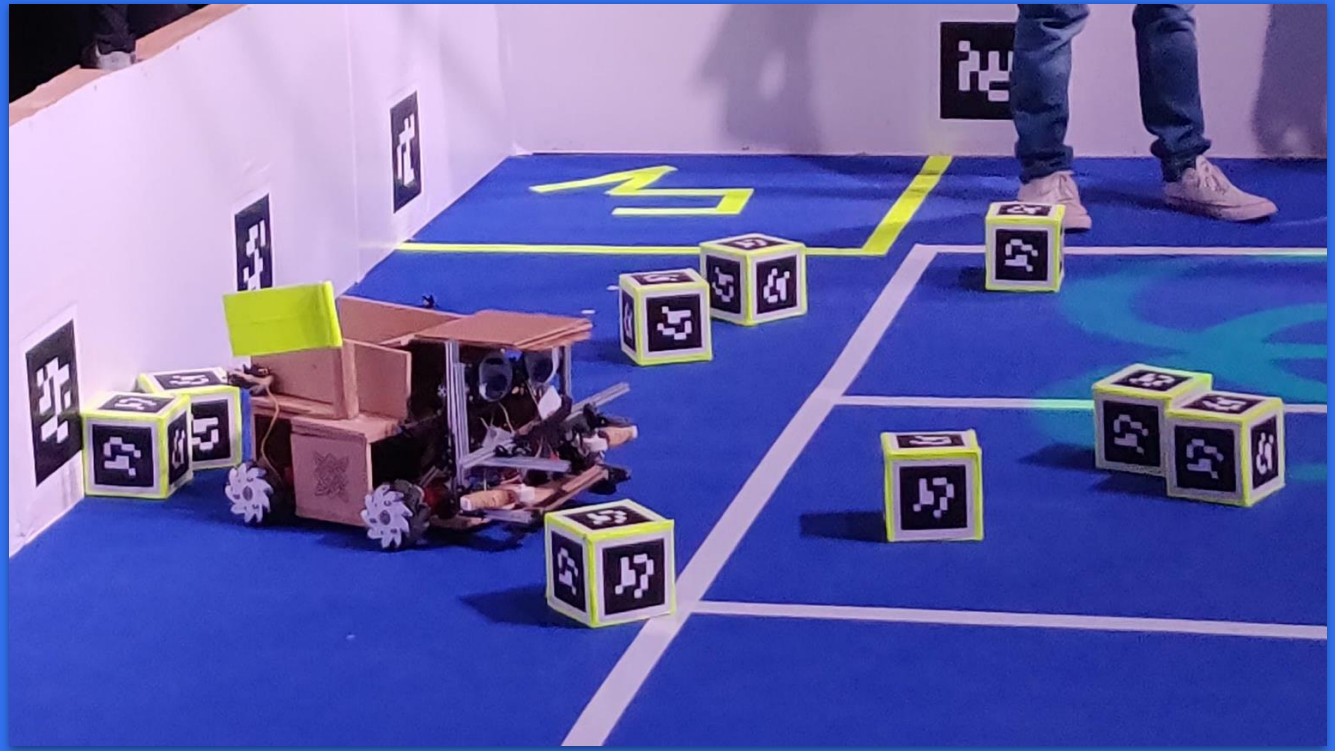
* Work as a team

Test it a *bajillion* times

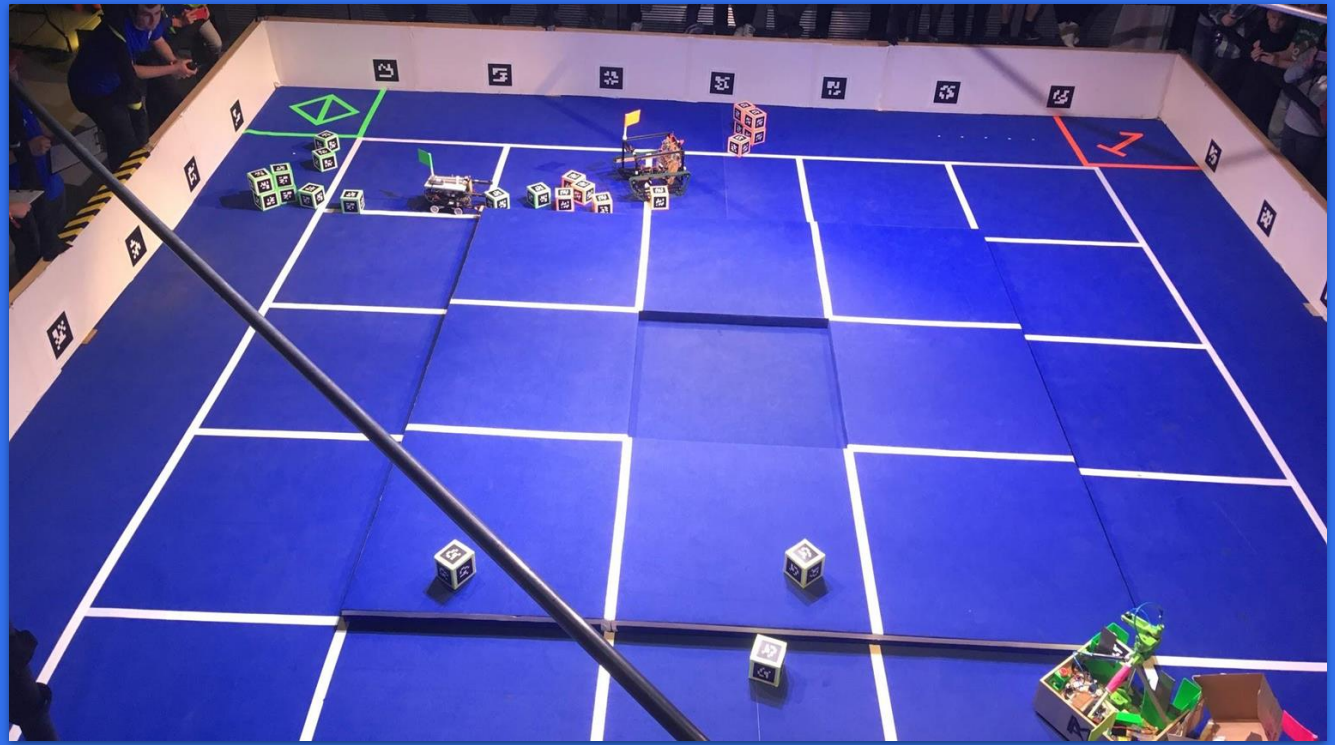
Get your robot inspected

Compete,

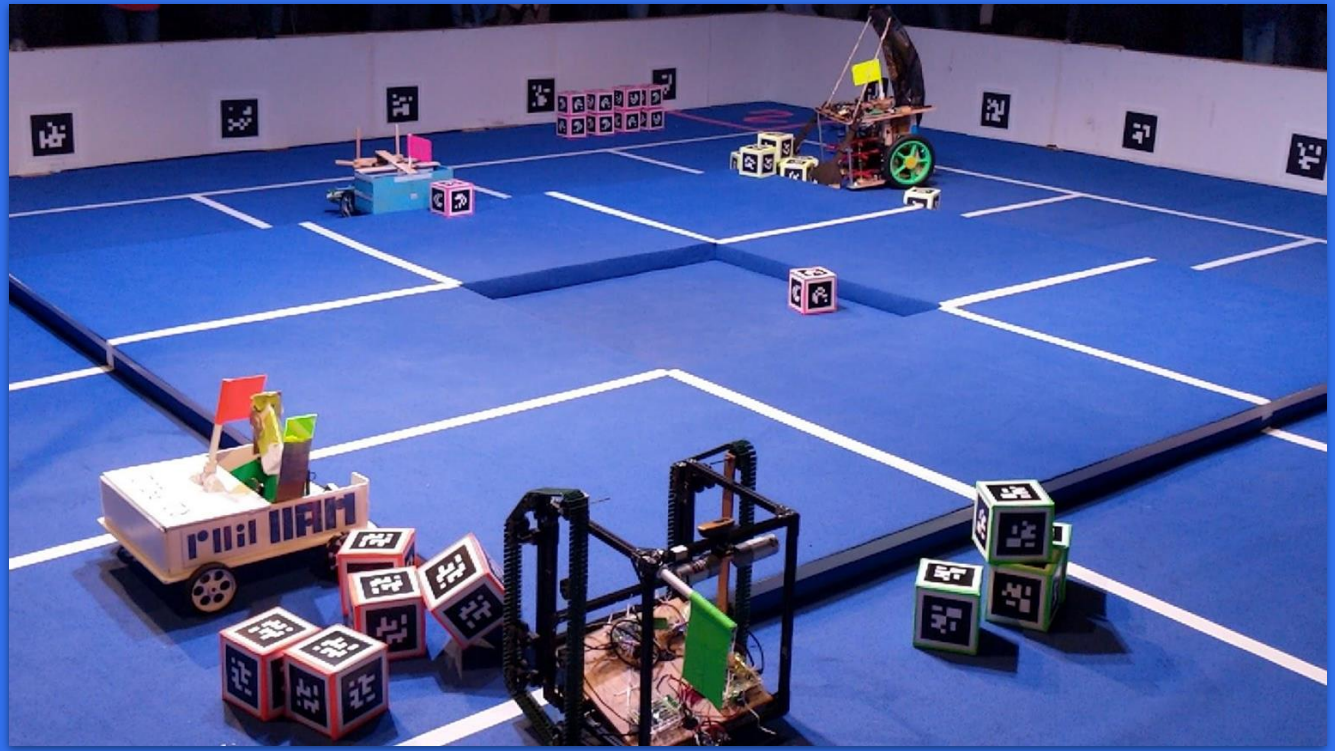
Compete some more,



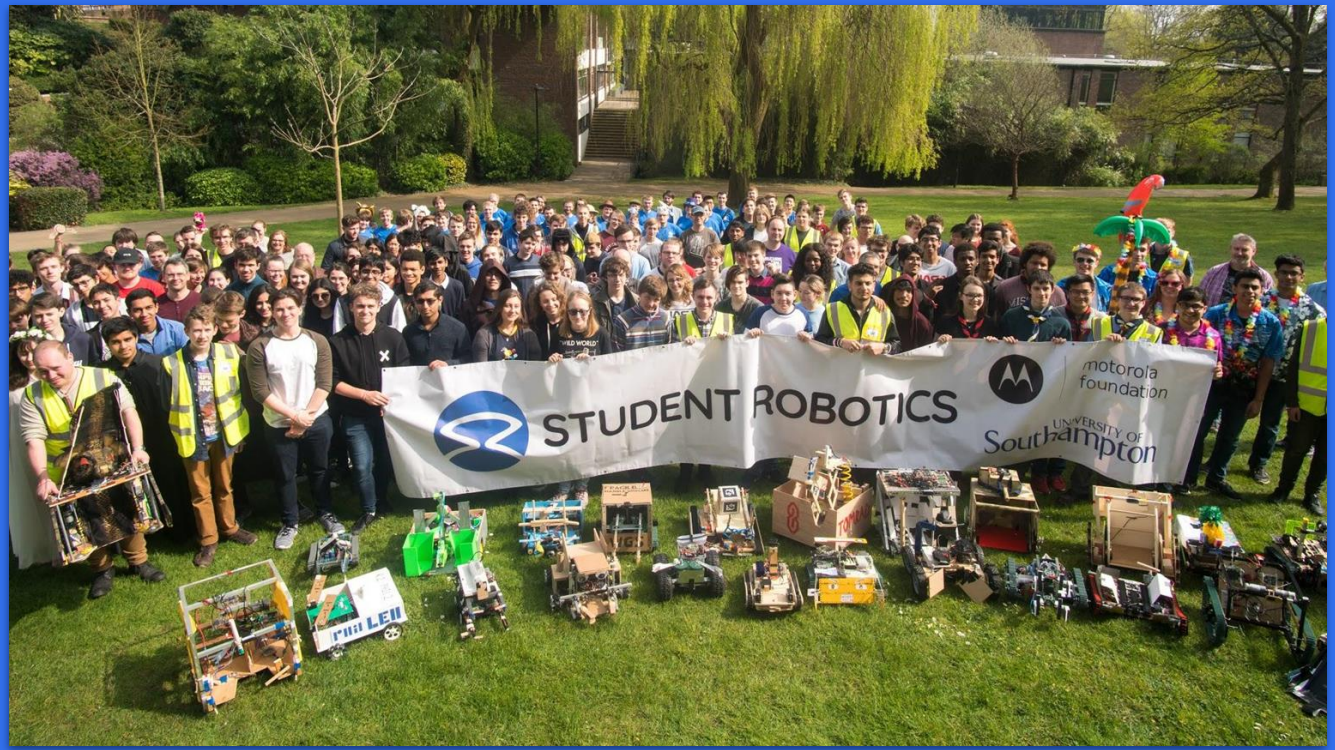
Compete *even* more!



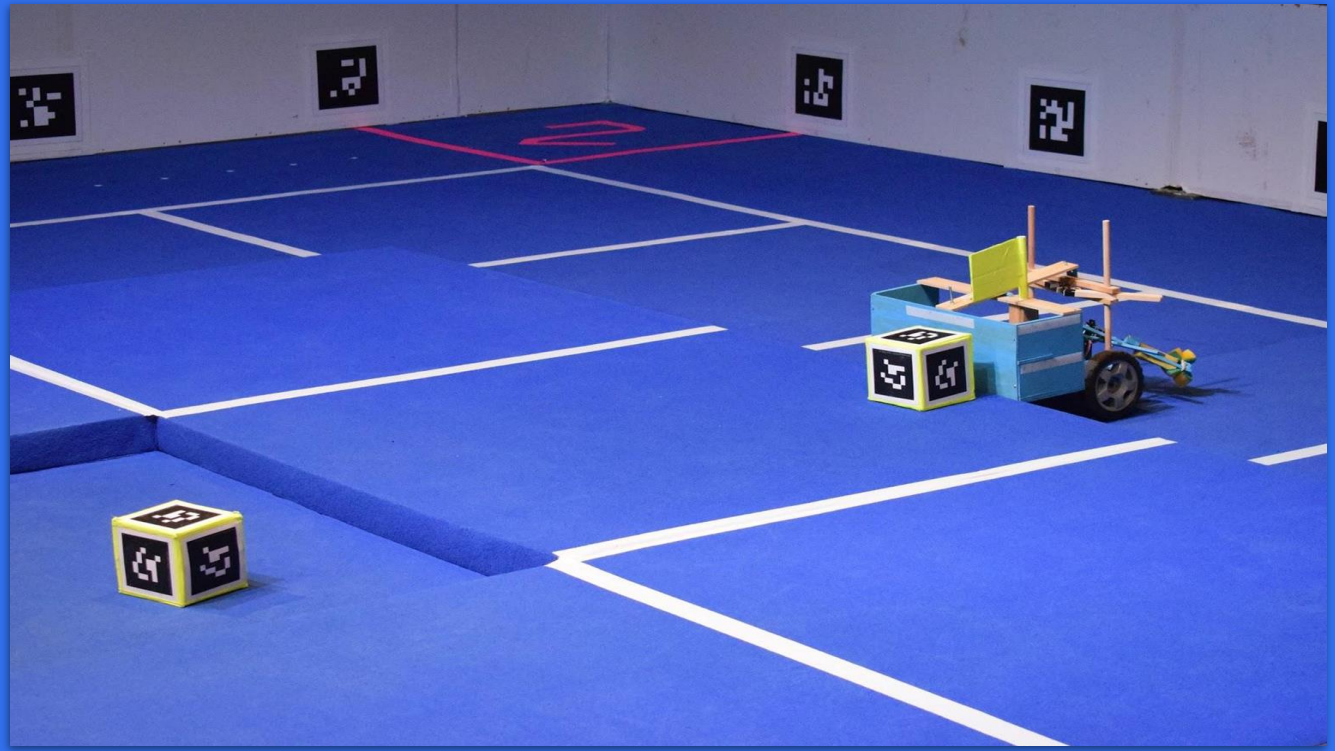
Meet other robots



Meet other people

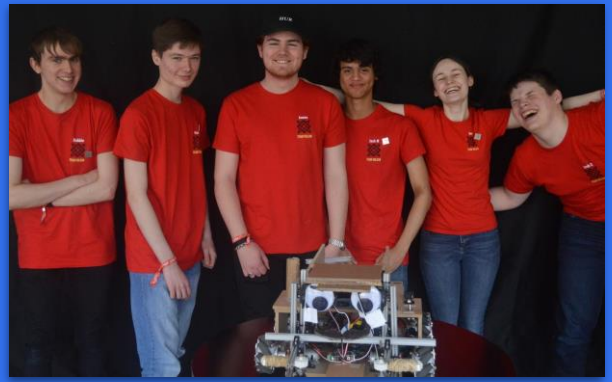


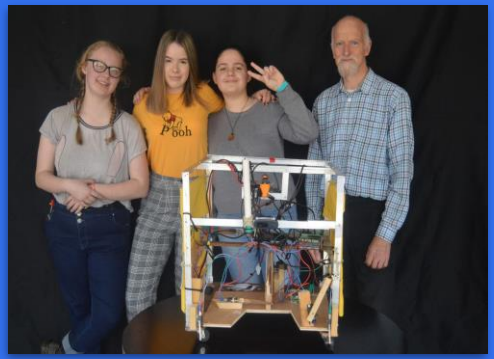
Score some points

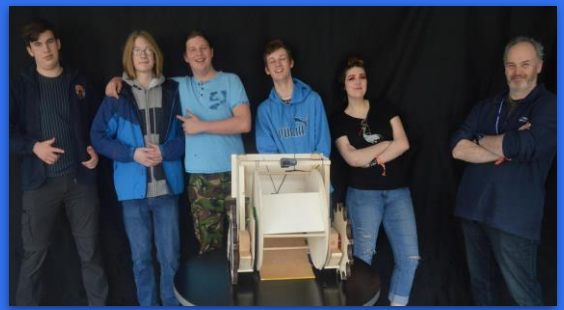


Win some prizes

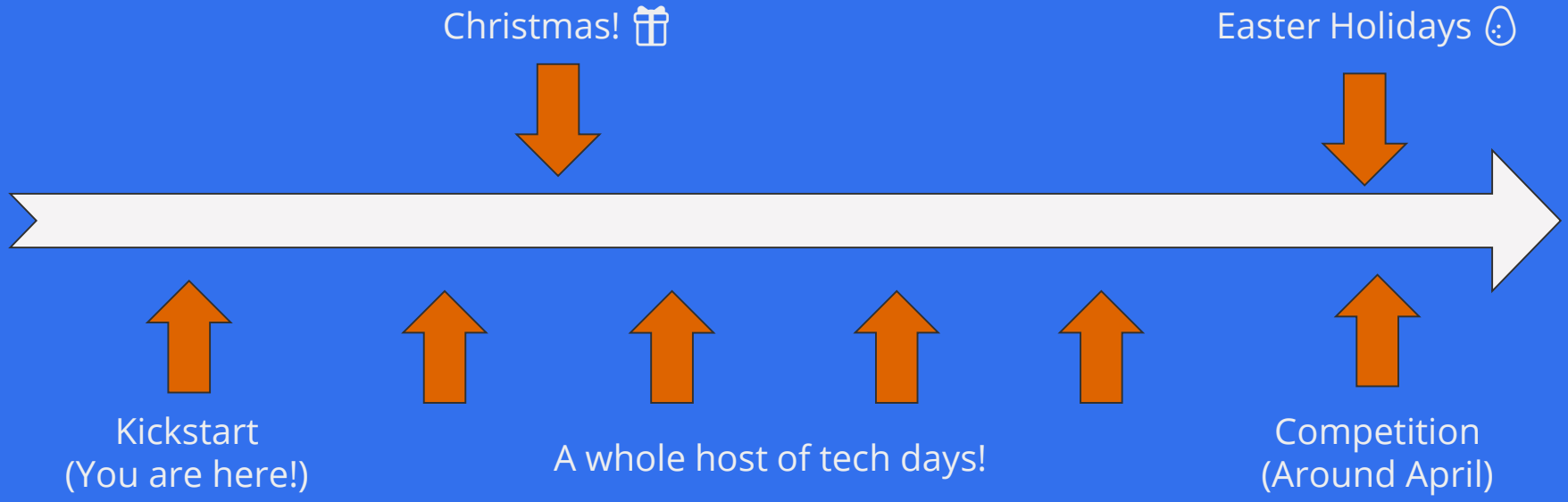
Have fun!

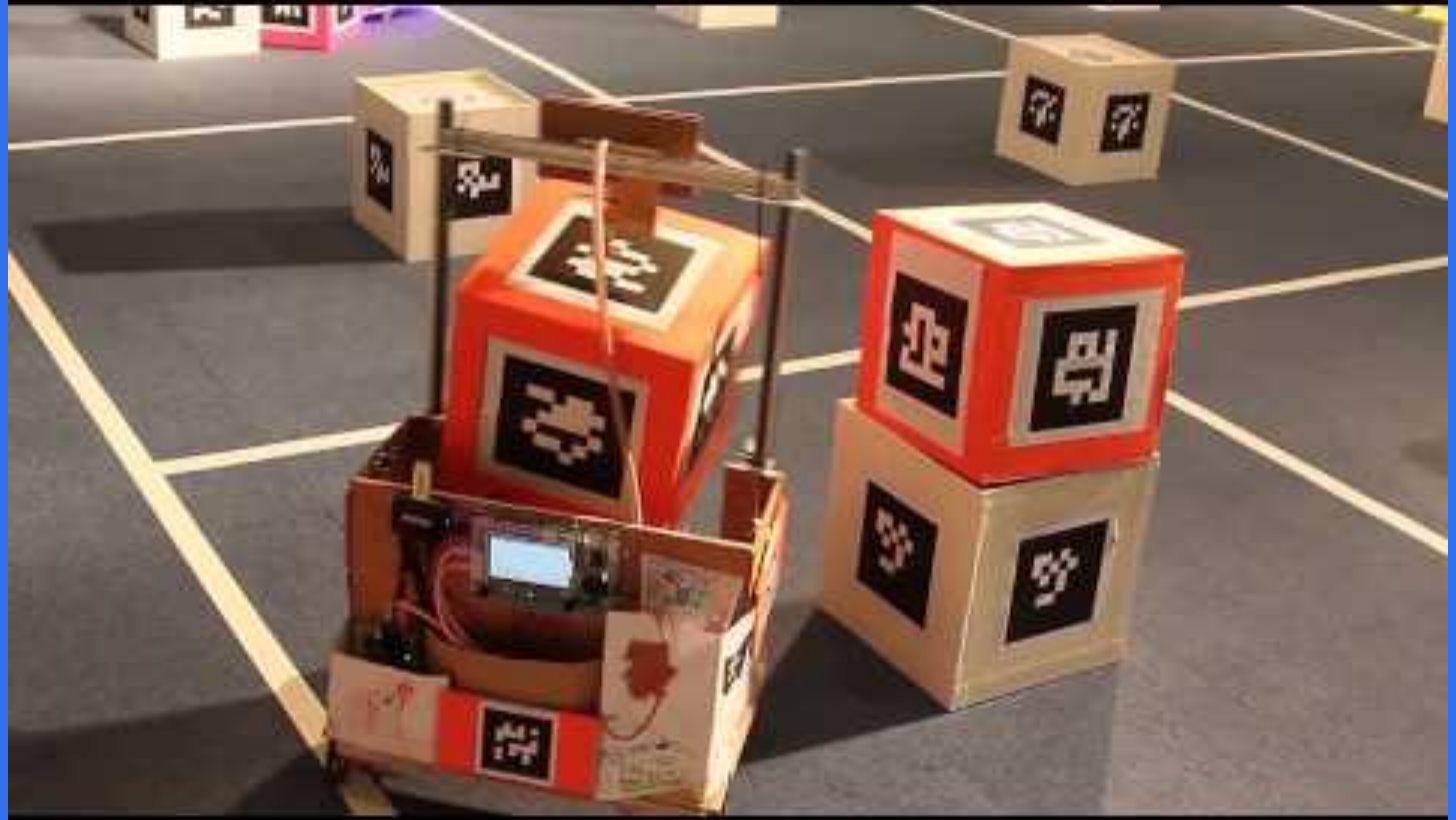




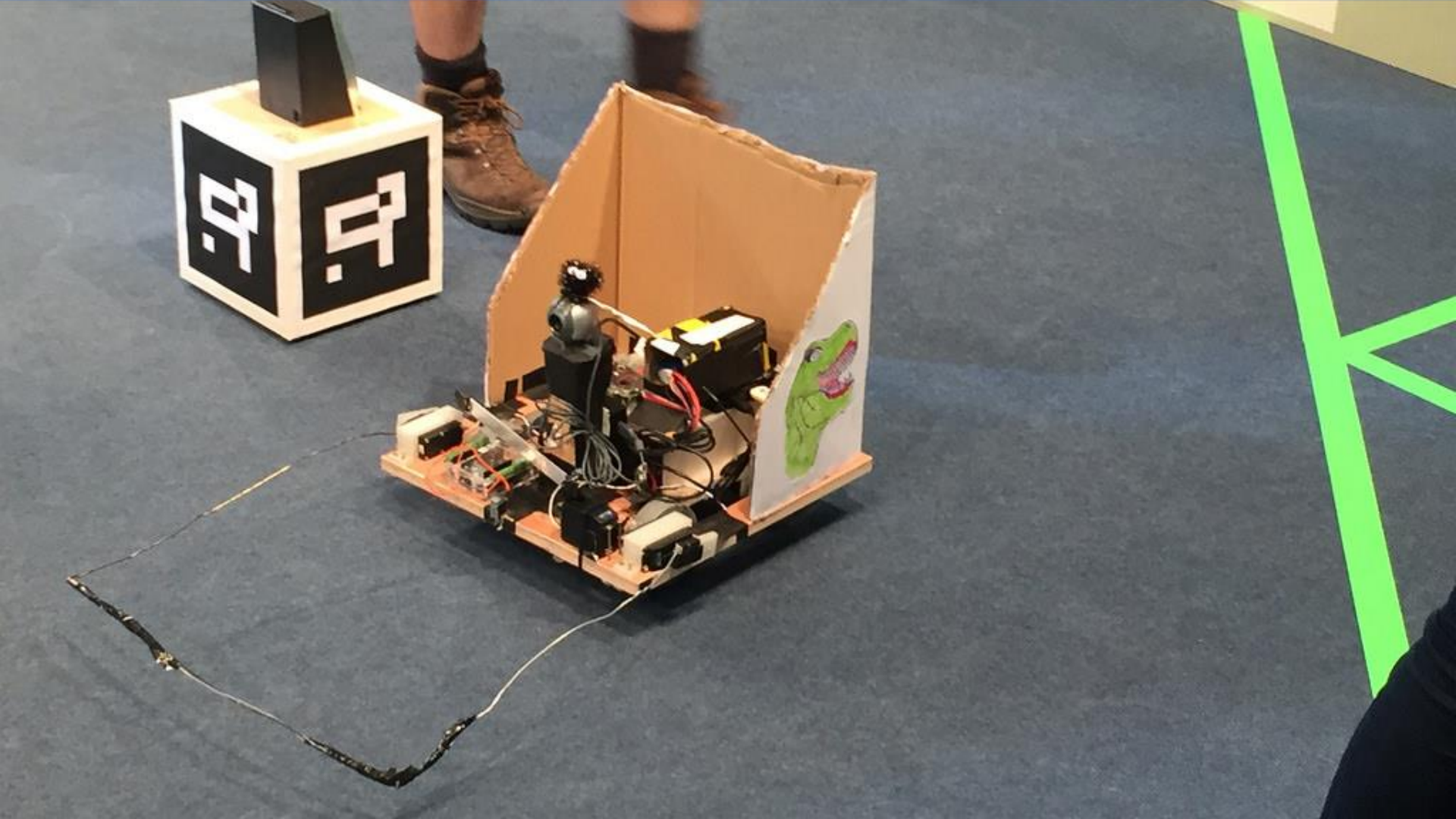


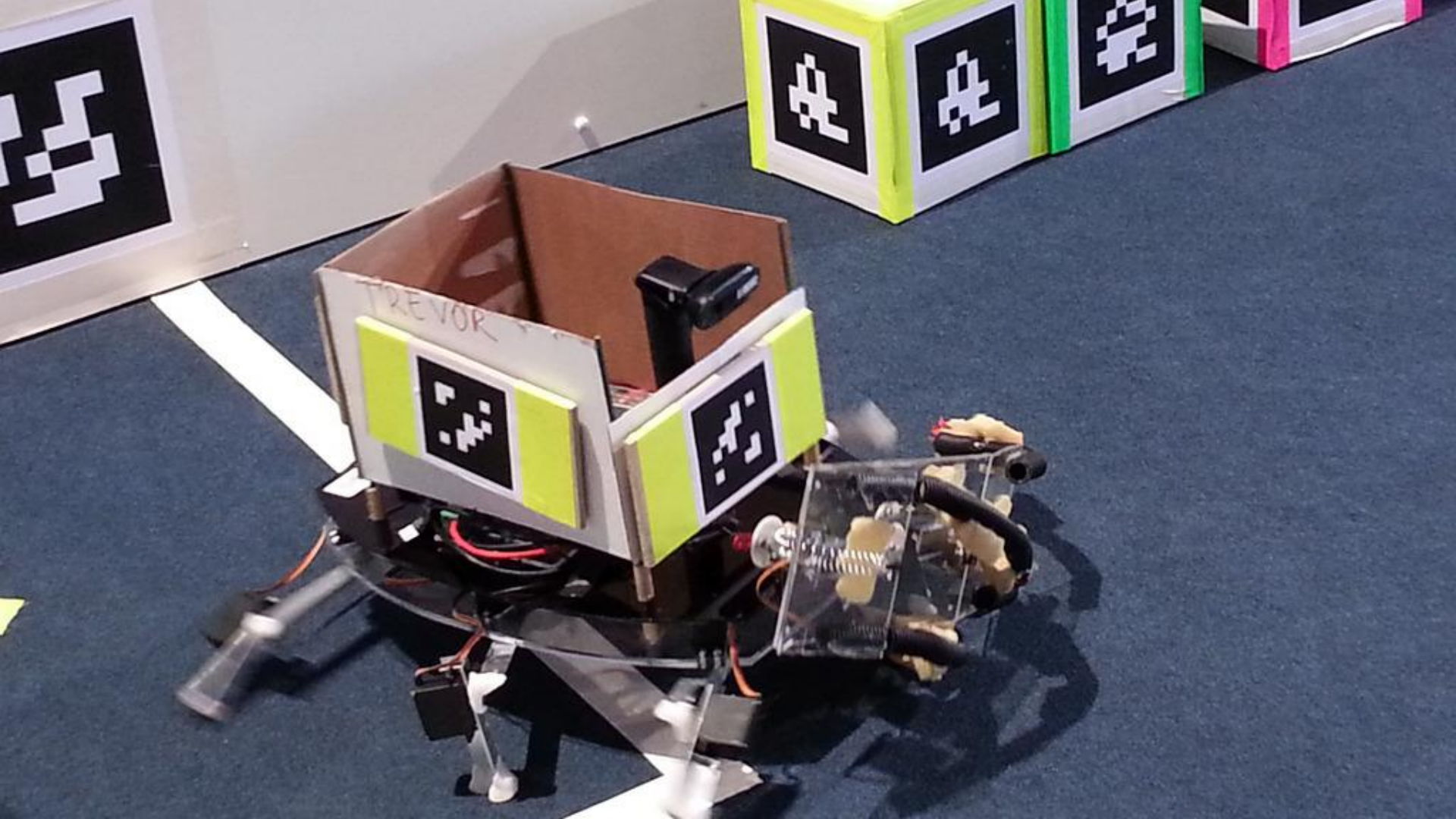
Schedule for the year

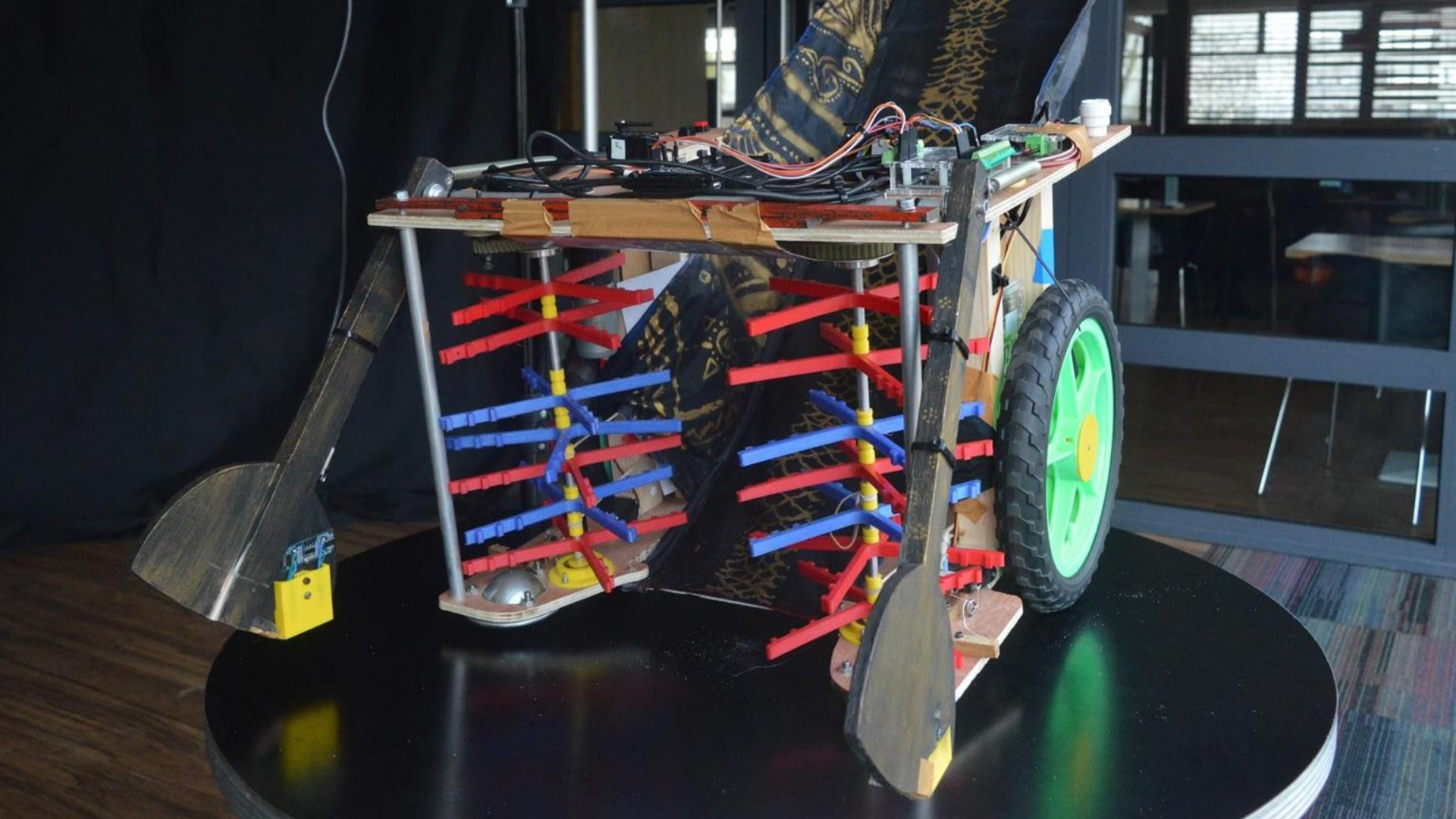




WHAT DOES A ROBOT LOOK LIKE?




TREVOR



Design Tips

Read the rules first!

- Movement
- Exposed Mechanisms
- Servos
- Couplings
- Sensors
- Size
- Tooling

FS5106B

Design Tips

Read the rules first!

- Movement
- Exposed Mechanisms
- Servos
- Couplings
- Sensors
- Size
- Tooling

Design Tips

Sensors

- Camera
- Bump Sensor
- Light gates
- Potentiometer
- Wheel Encoders
- Accelerometer
- Gyroscope

Design Tips

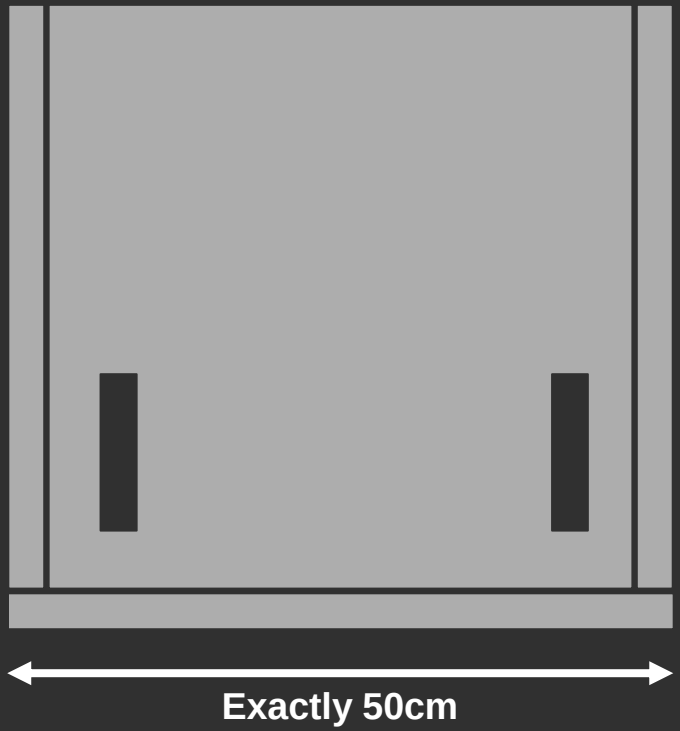
Size

From the rules:

“At the beginning of each match, robots must fit within a cube with 500mm internal sides.”

Design Tips

Size



Design Tips

Size

Design Tips

Read the rules first!

- Movement
- Exposed Mechanisms
- Servos
- Couplings
- Sensors
- Size
- Tooling

Design Tips

Electronics

- Where do your electronics go?
- How long should the wires be?
- Start/Stop button needs to be accessible
- USB stick needs to be accessible
- Battery needs protecting
- Servo cables

Recommended Steps

1. Make a test base ASAP
2. Think about
    - Mechanics
    - Sensors
    - Game strategy
3. Iterate
    - Small improvements
    - Keep it working
4. Testing, lots and lots of testing

Boston Dynamics

Dynamics

General Tips

Need some help?

- Volunteers
- Tech Days
- Forums
- Bus factor
- Keep it simple
- Prototype early, and often

THE KIT

Brain Board

The brains of the operation

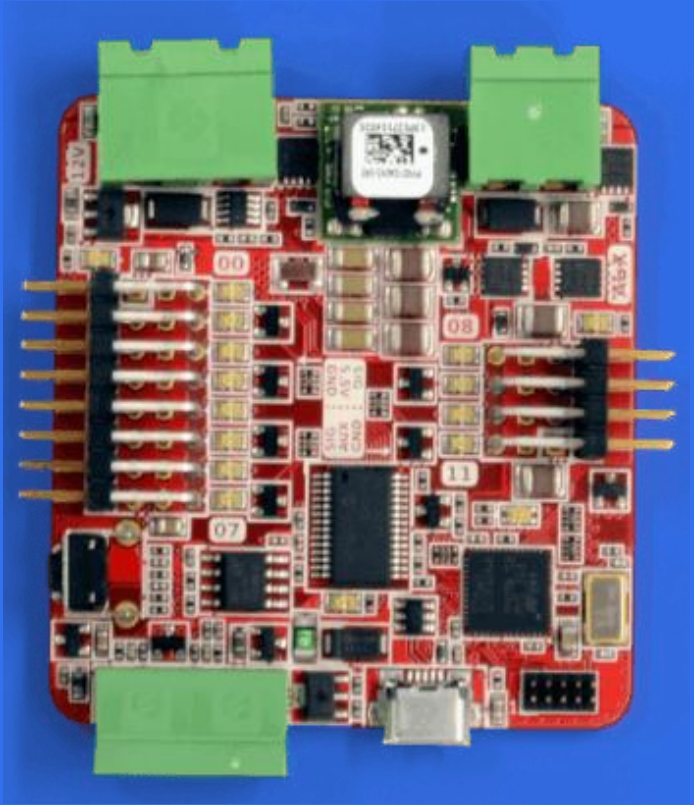
- Controls boards
- Code runs here

Motor Board

Controls motors

- **12V DC** motors, up to **10A**
- * motors not included

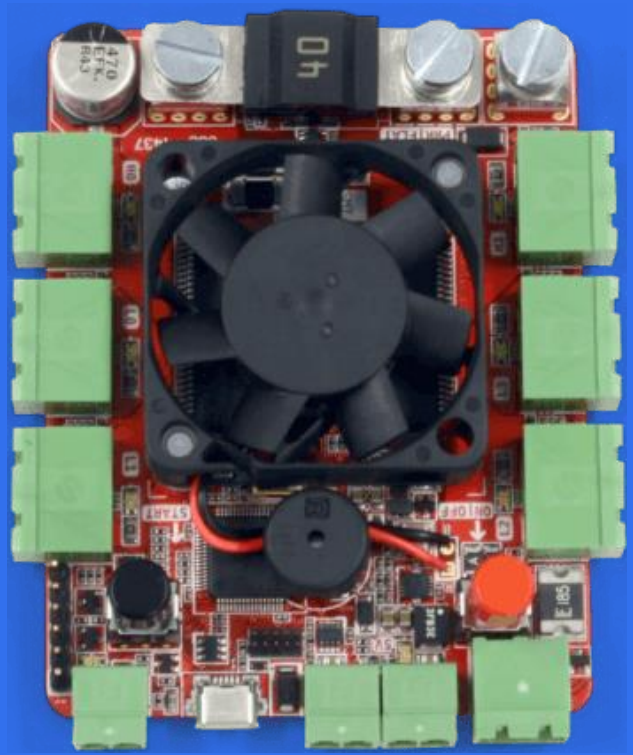
Servo Board



Controls servos

- Up to 12 RC servo motors
- Careful how you load them, though!
- *servos not included

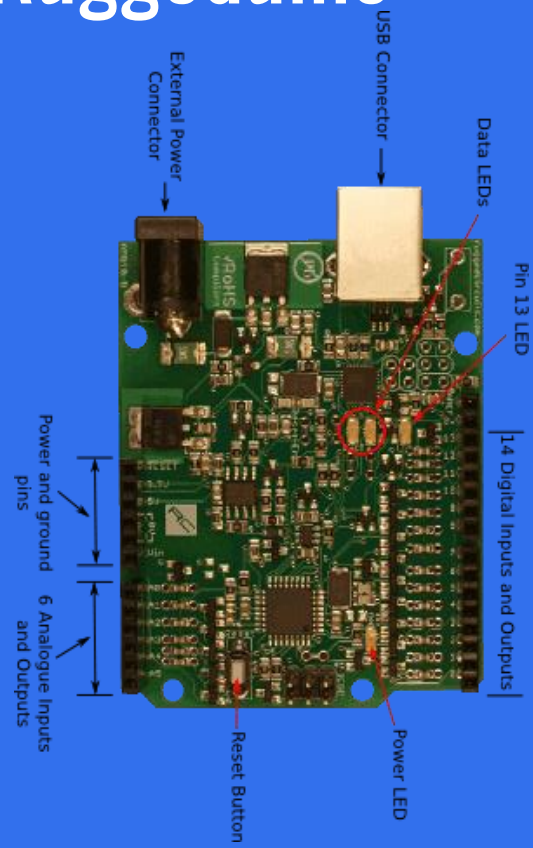
Power Board



POOOWWWWEEEEERRRR!

- Power distribution
  - High-current 12V
  - Low-current 12V
  - 5V
- On|Off button
- Start button

Ruggeduino



General Purpose IO

- Bump switches (Have I hit something?)
- Pressure sensors (How hard have I hit it?)
- Light gates (Have I captured something?)
- Ultrasound (How far away is something?)
- * sensors not included

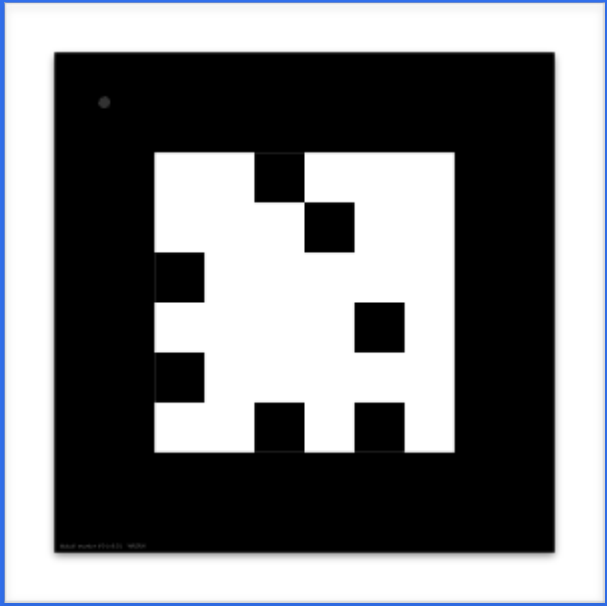
Batteries

==

Batteries

- Should be respected
- Follow battery charging procedure to the letter, every time (one of the microgames)
- Only ever connect to:
  - power board
  - supplied battery charger
- Protect it from mechanical damage
- Do not over-discharge
- If you’re unsure, **read the docs**!

Vision



- On Arena walls & tokens
- Properties:
  - Type
  - Number
  - Distance from webcam
  - Position relative to webcam
  - Rotation

YOUR CODE

Your Code

- Python 2.7
- The IDE
  - Collaborative development
  - History of changes
- `robot.zip`

Read The Docs!

They're really useful!

STUDENT ROBOTICS

IDE DOCUMENTATION COMPETE VOLUNTEER

DOCUMENTATION

- Introduction
- IDE
  - Code Checking
  - Code a Project
  - Finding Things
  - Getting Code on the Robot
  - Good Commit Messages
  - Shortcuts Menu
  - Version Control
- Kits
  - Assembly
  - Batteries
    - HKE4 Charger
    - IMAX B6 Charger
  - Brain Board
  - Motor Board
  - Power Board
  - Ruggeduino
  - Servo Board
  - WIFI
- Programming
  - Python
    - Functions
    - Libraries
  - sr
    - Motors
    - Power
    - Ruggeduinos
      - Custom Firmware
    - Servos
    - Vision
      - Markers
  - Git Repositories
  - Simulator
- Rules
- Troubleshooting
  - Python
  - Interactive Troubleshooter
- Tutorials
  - Basic Motor Control
  - Python
- Team Admin
  - User Accounts
  - Kit Shipping

INTRODUCTION

There are a number of sections in the documentation, offering help for the IDE, the kit and programming. Under the tutorials section, a number of these things are combined to help you understand what you can, or need, to do. Navigation of the documentation can be done using the column to the left, where everything is arranged alphabetically in the aforementioned sub-sections.

Within this documentation, you will come across a number of boxes like this:

```
# code example
```

These are code examples provided to help you.

From time to time, you may come across some warnings such as the following:

Charge Your Batteries!

It would be advisable to take note of these, especially that one! You will also come across some blue boxes providing information, similar to the following:

Some useful information... like the information given in the information box above.

studentrobotics.org/docs

Our documentation

The Forum

- Communicate with us and your fellow teams
- Get support
- Share tricks
- Brag about how good your team is!

HEALTH AND SAFETY

Health and Safety

- How easy is it to turn off
- If we pick it up, can it hurt us?
- Is the wiring messy or loose?
  - Colour code your wiring!
- Is the kit loose?
- Is the battery protected?

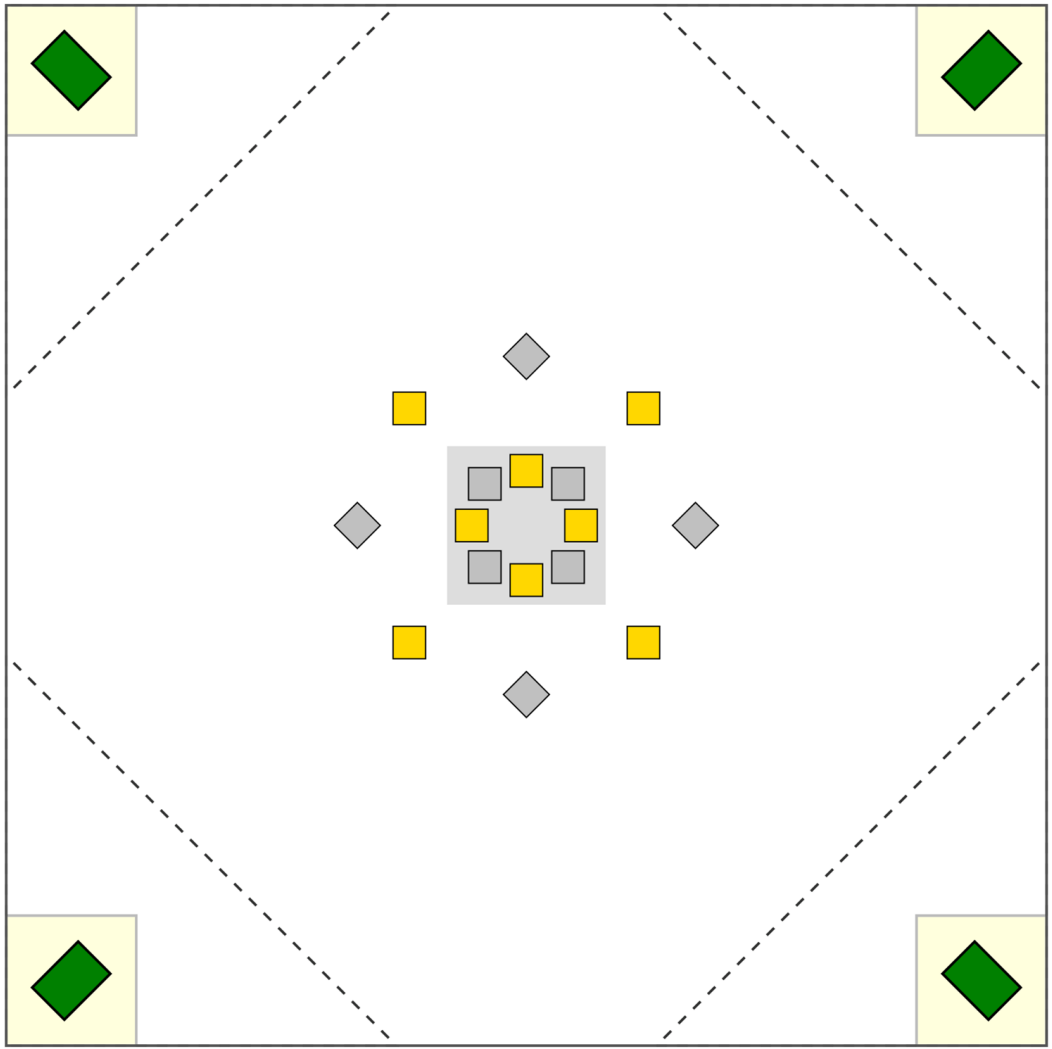
Any questions so far?

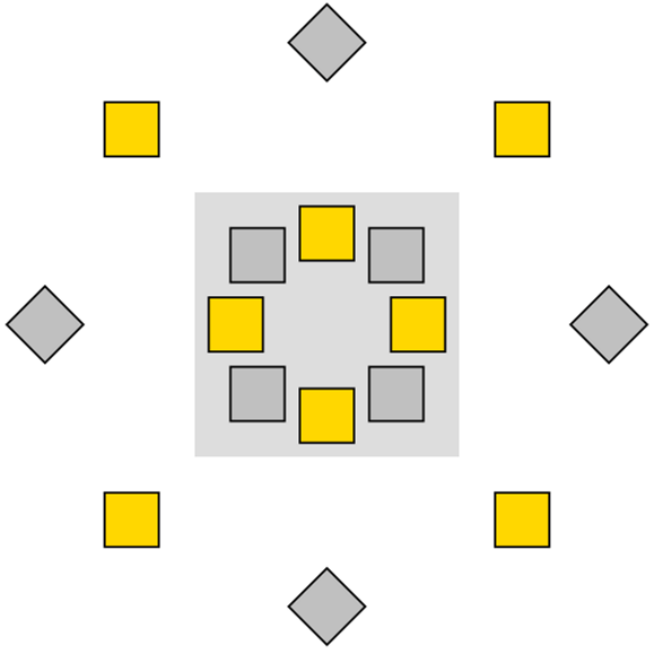
Before we get onto the main event...

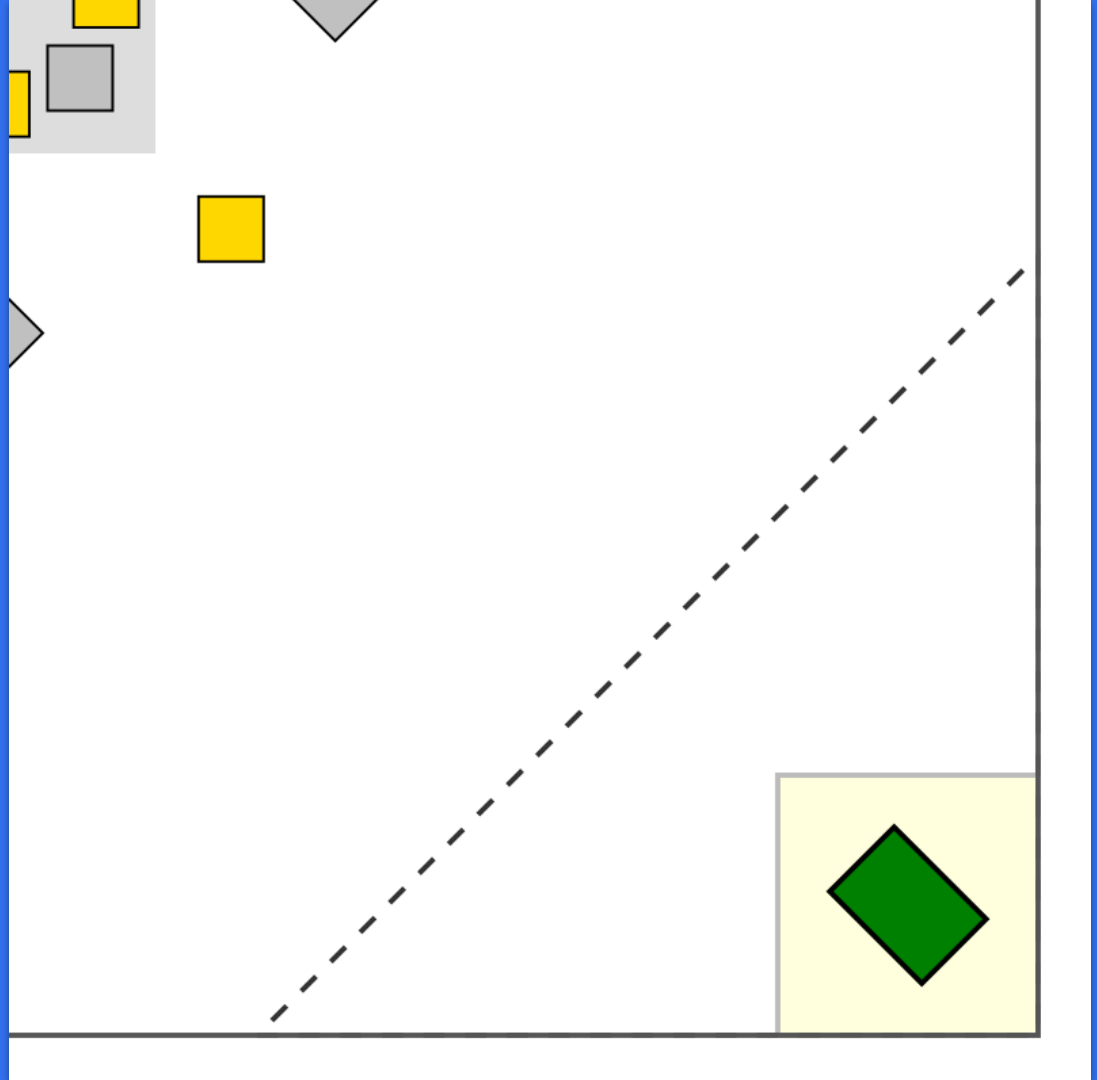
THE GAME

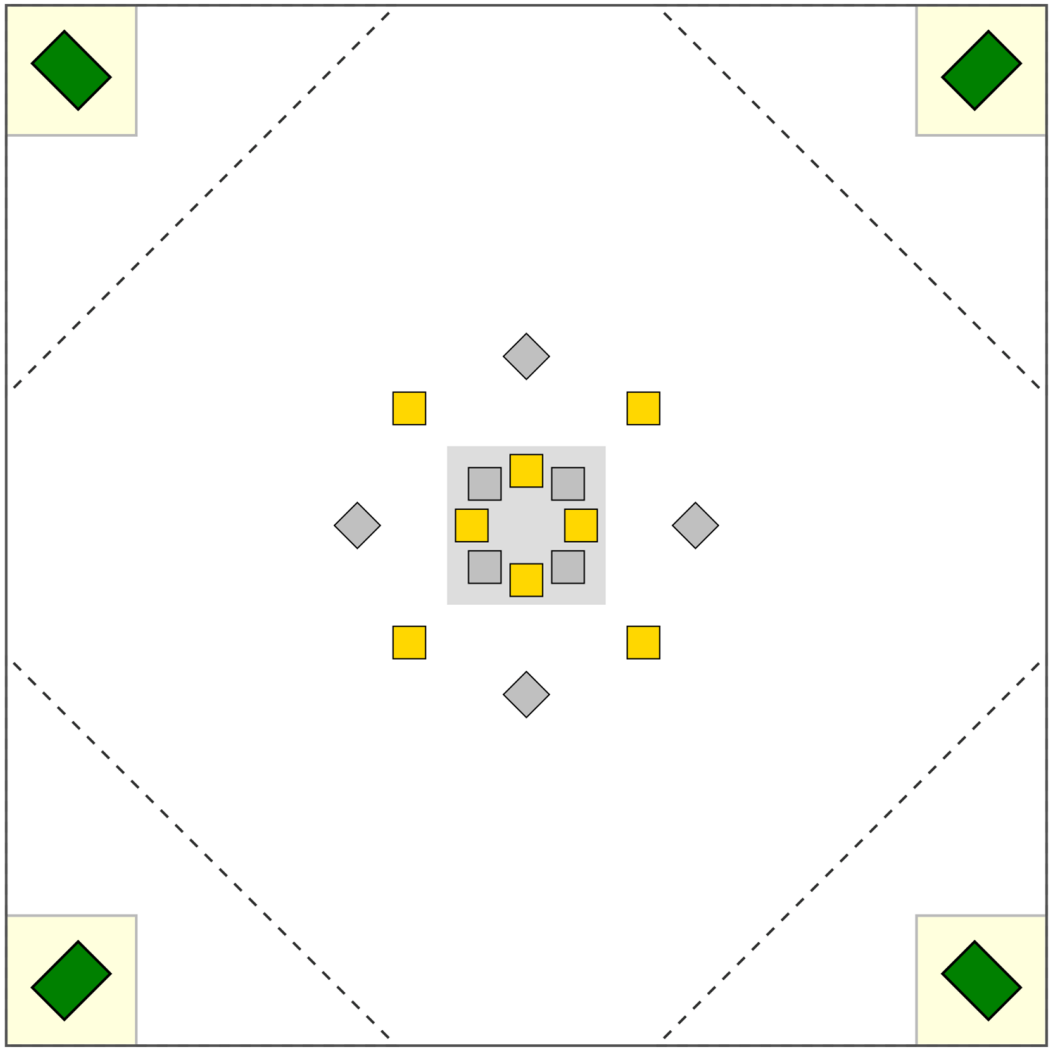
The moment you've all been waiting for!

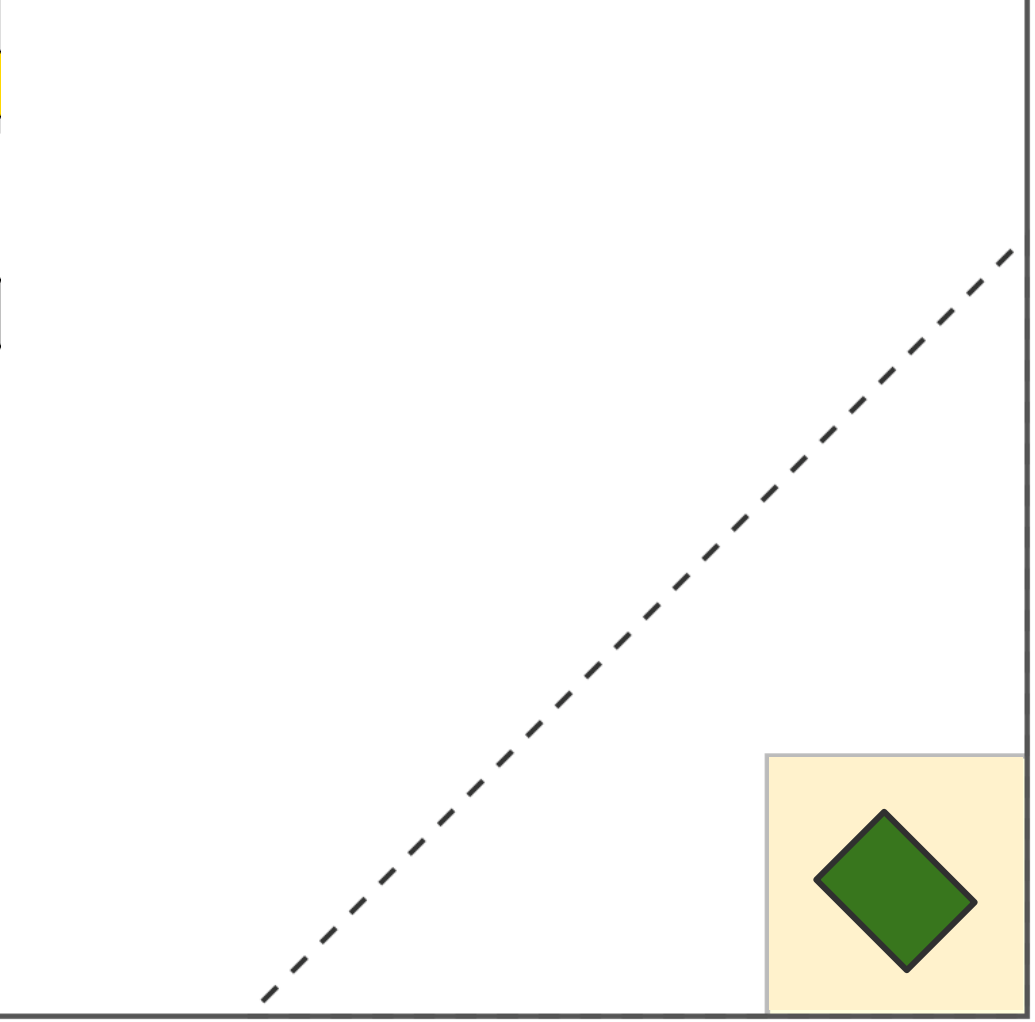
TWO COLOURS



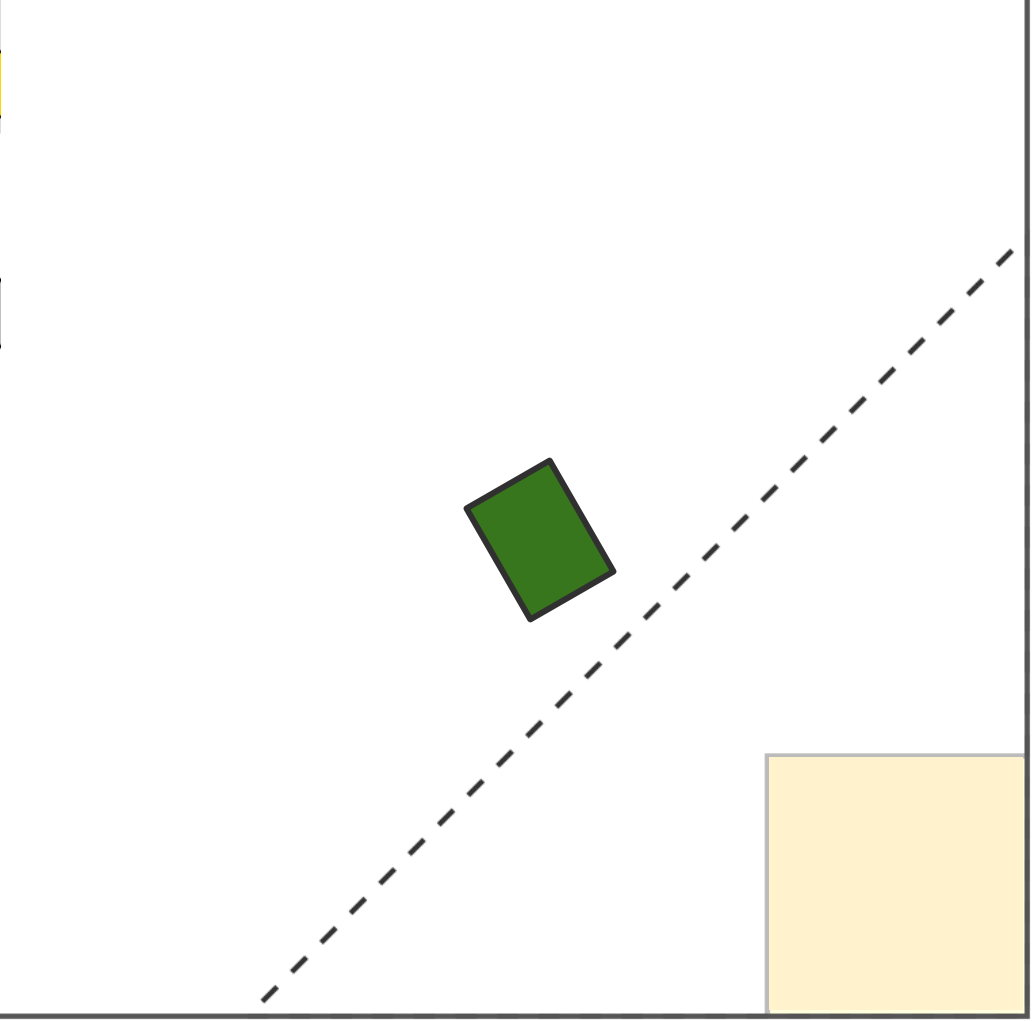






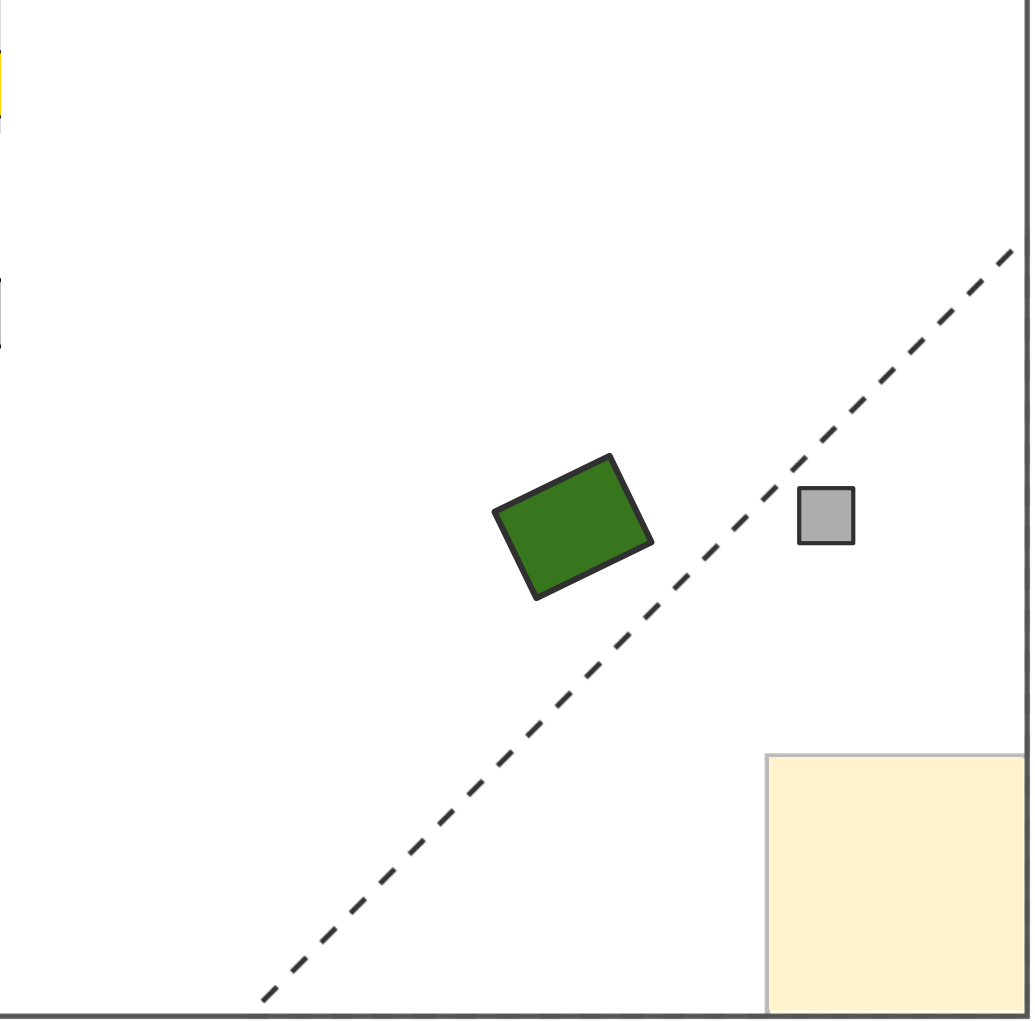


0 Points



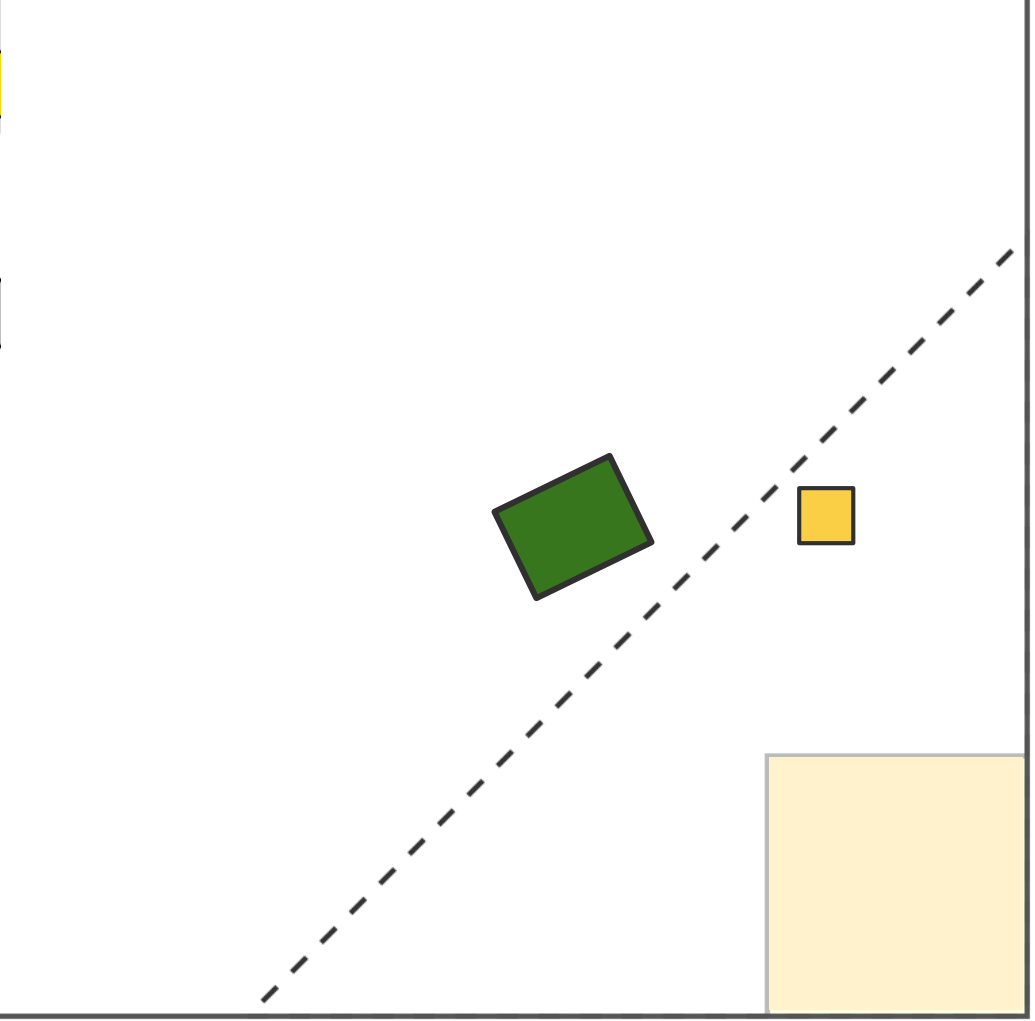
1 Point

Robot left scoring zone



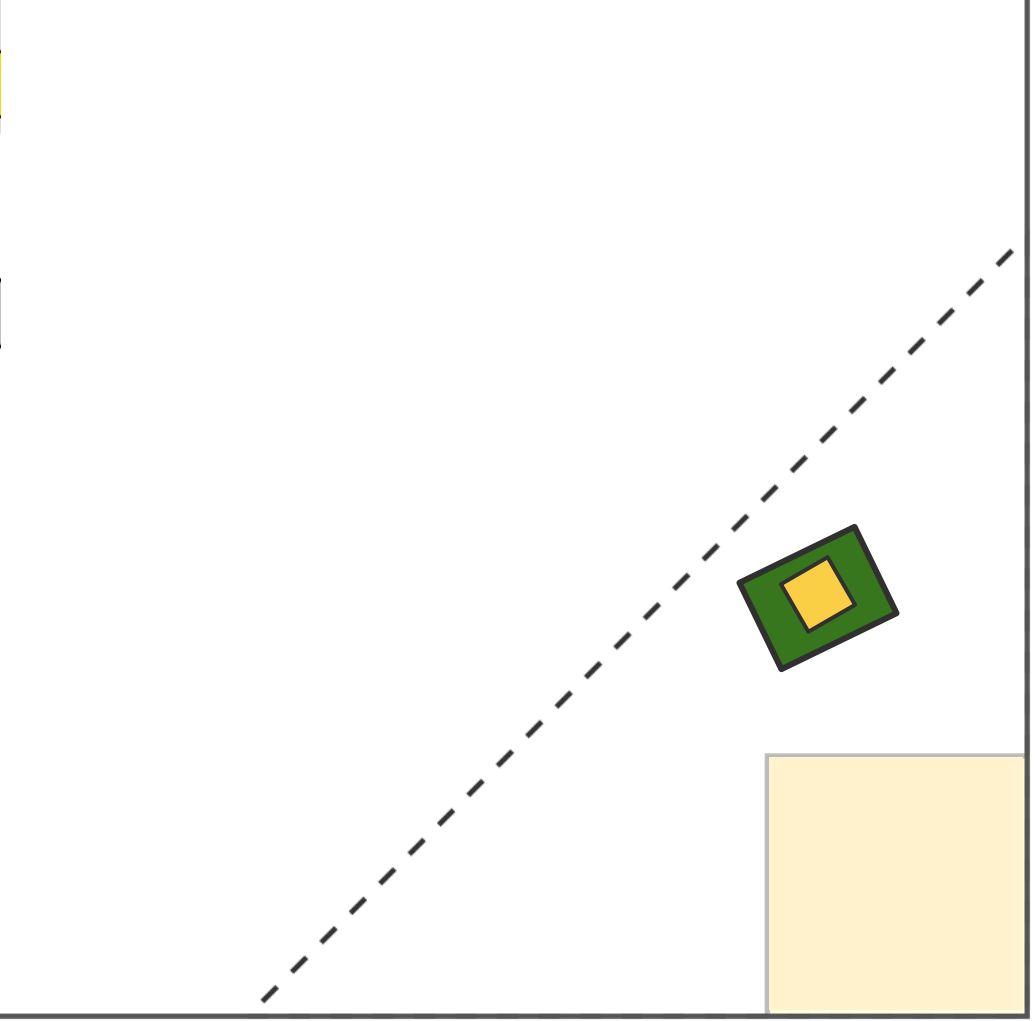
3 Points

(+1 for robot leaving zone)



3 Points

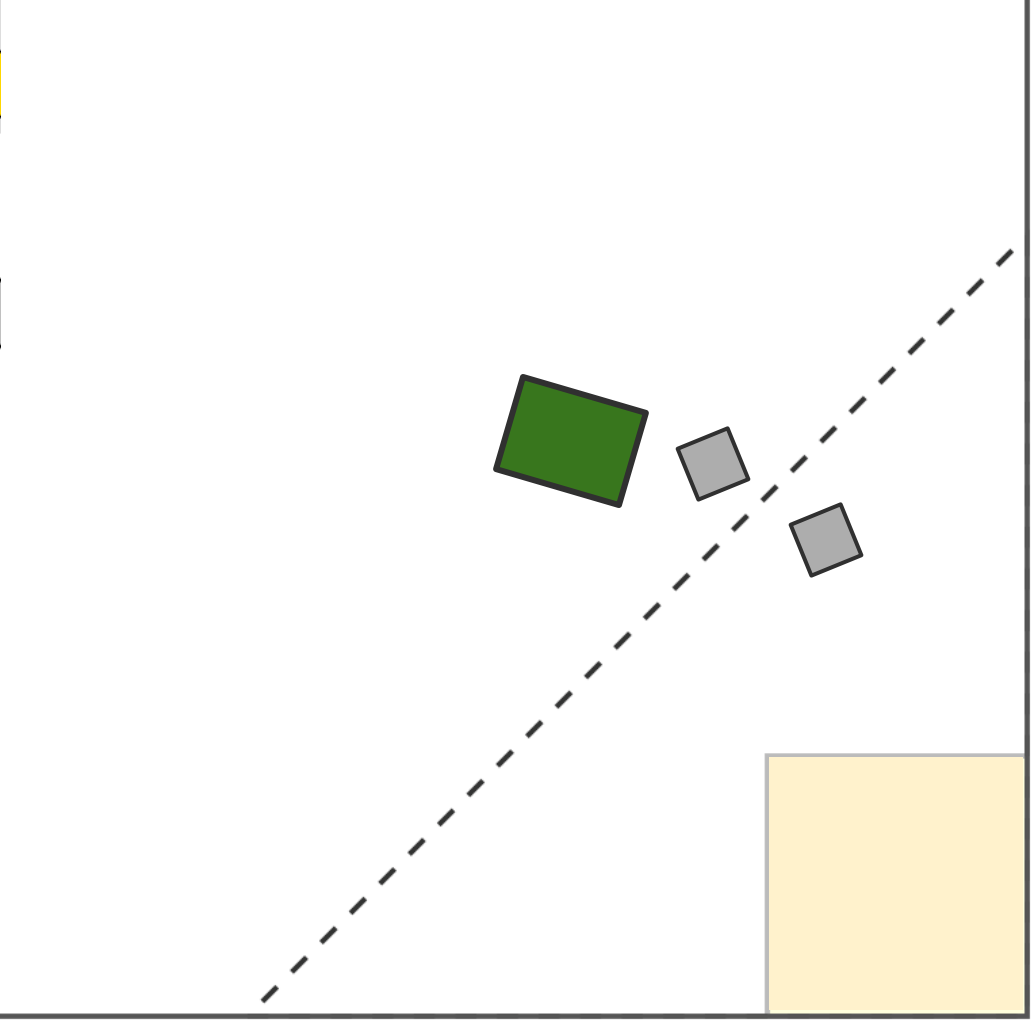
(+1 for robot leaving zone)



0 Points

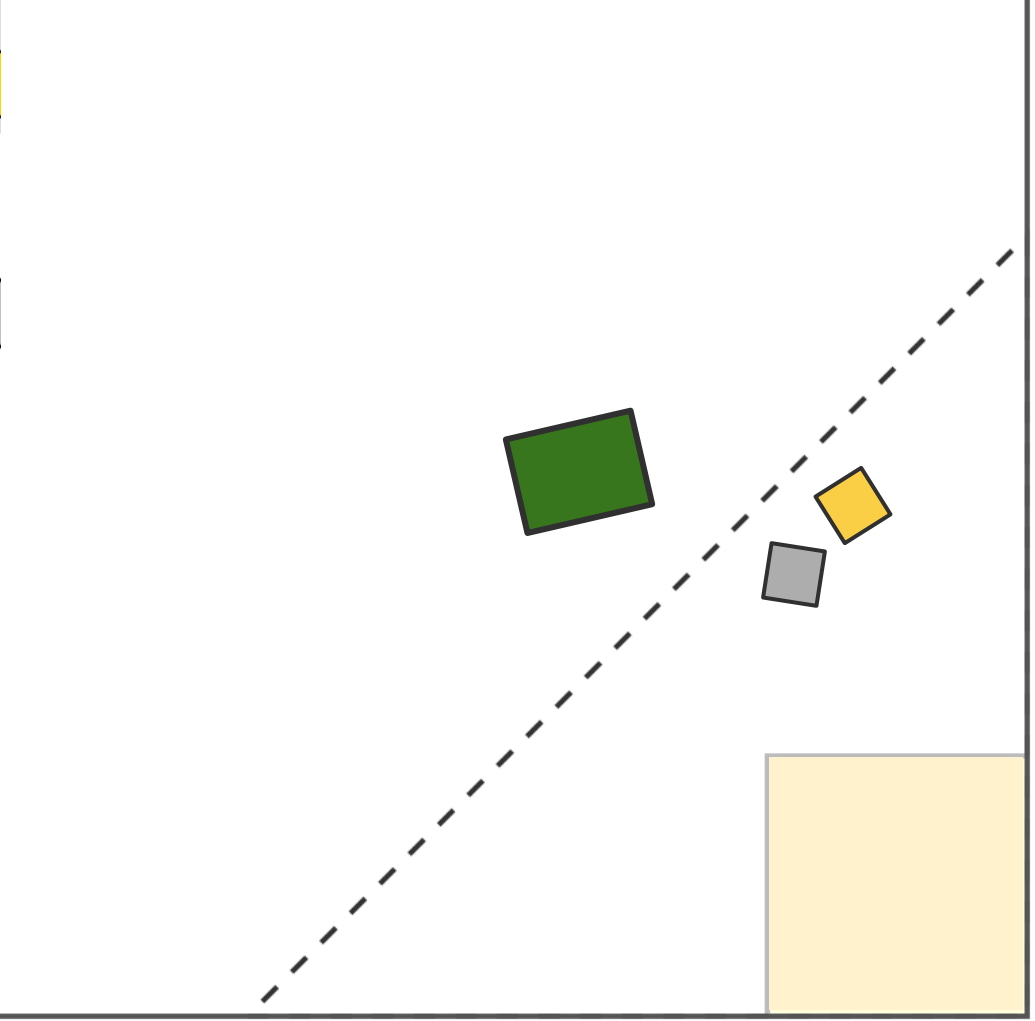
Cubes must be on floor

(+1 for robot leaving zone)



3 Points

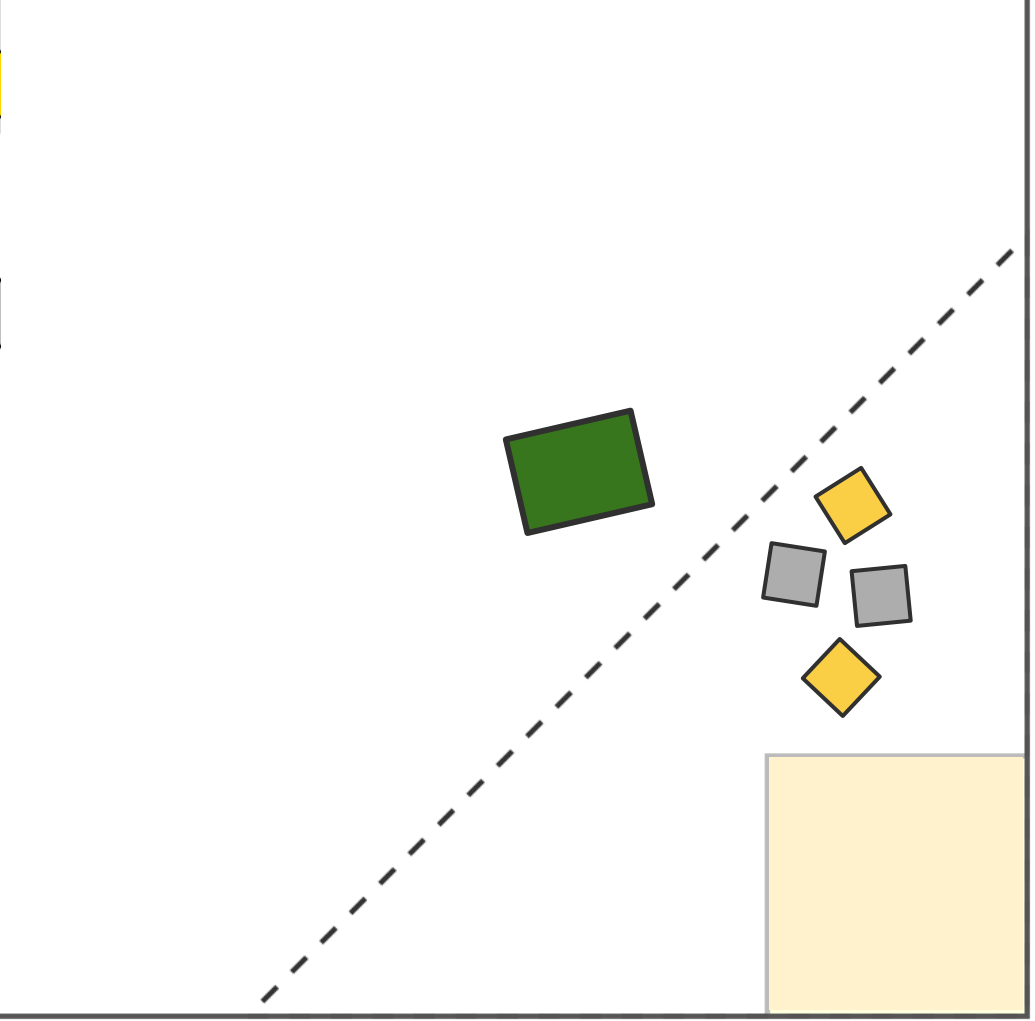
(+1 for robot leaving zone)



2 Points

TWO COLOURS
MEANS 1 POINT EACH

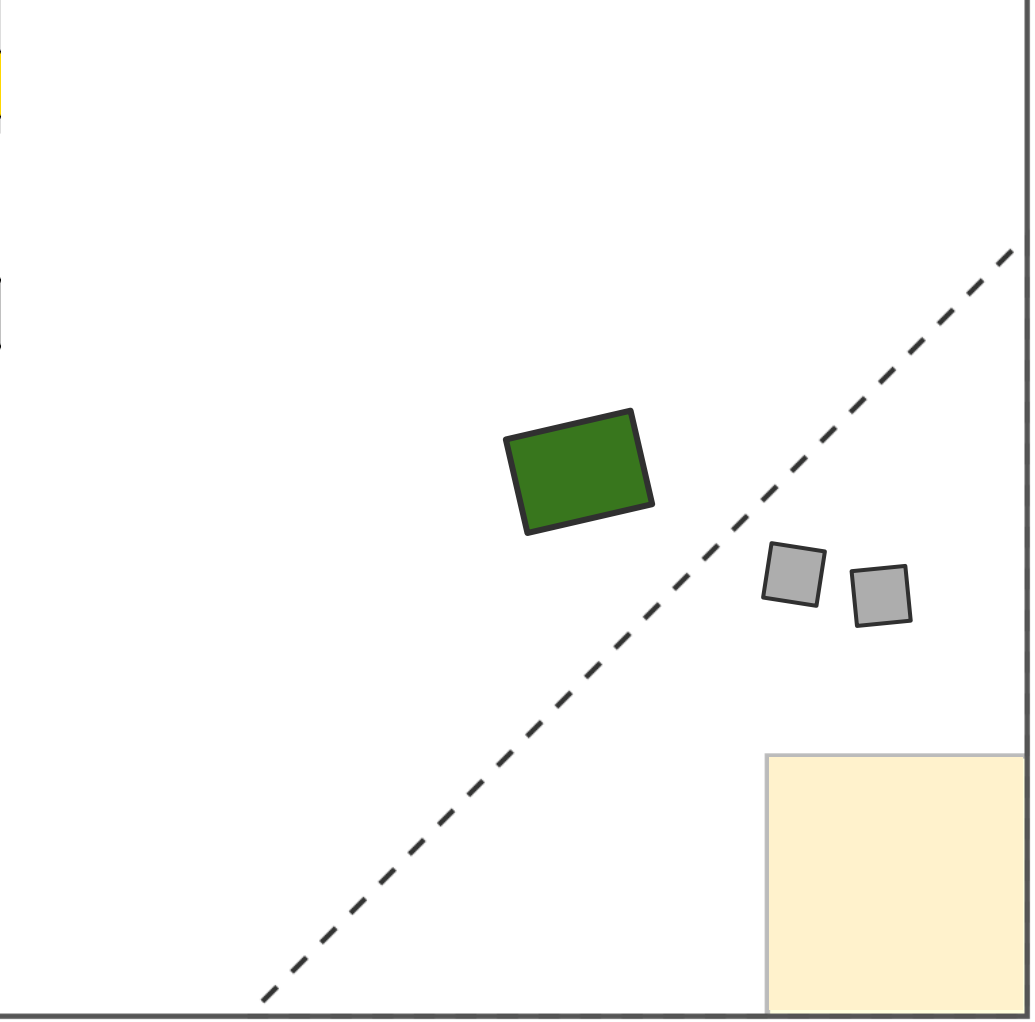
(+1 for robot leaving zone)



4 Points

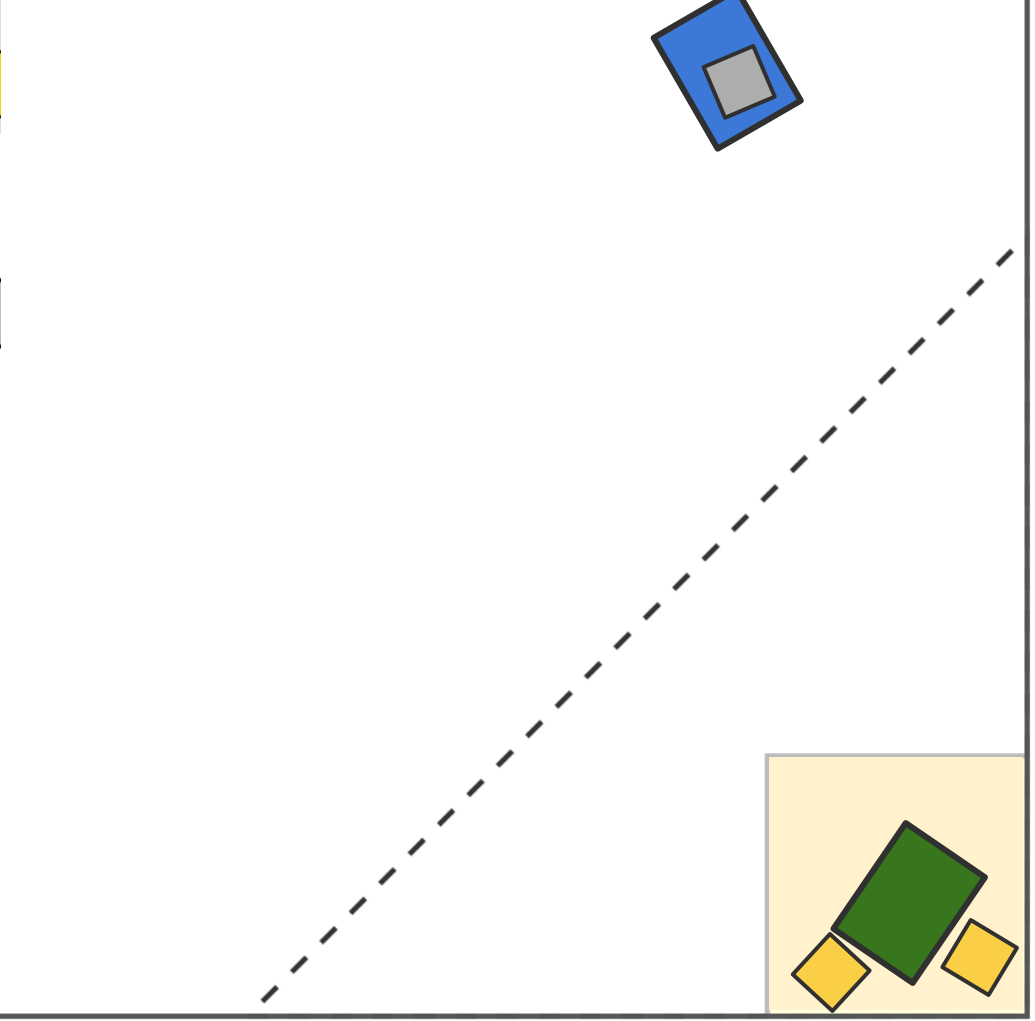
TWO COLOURS
MEANS 1 POINT EACH

(+1 for robot leaving zone)



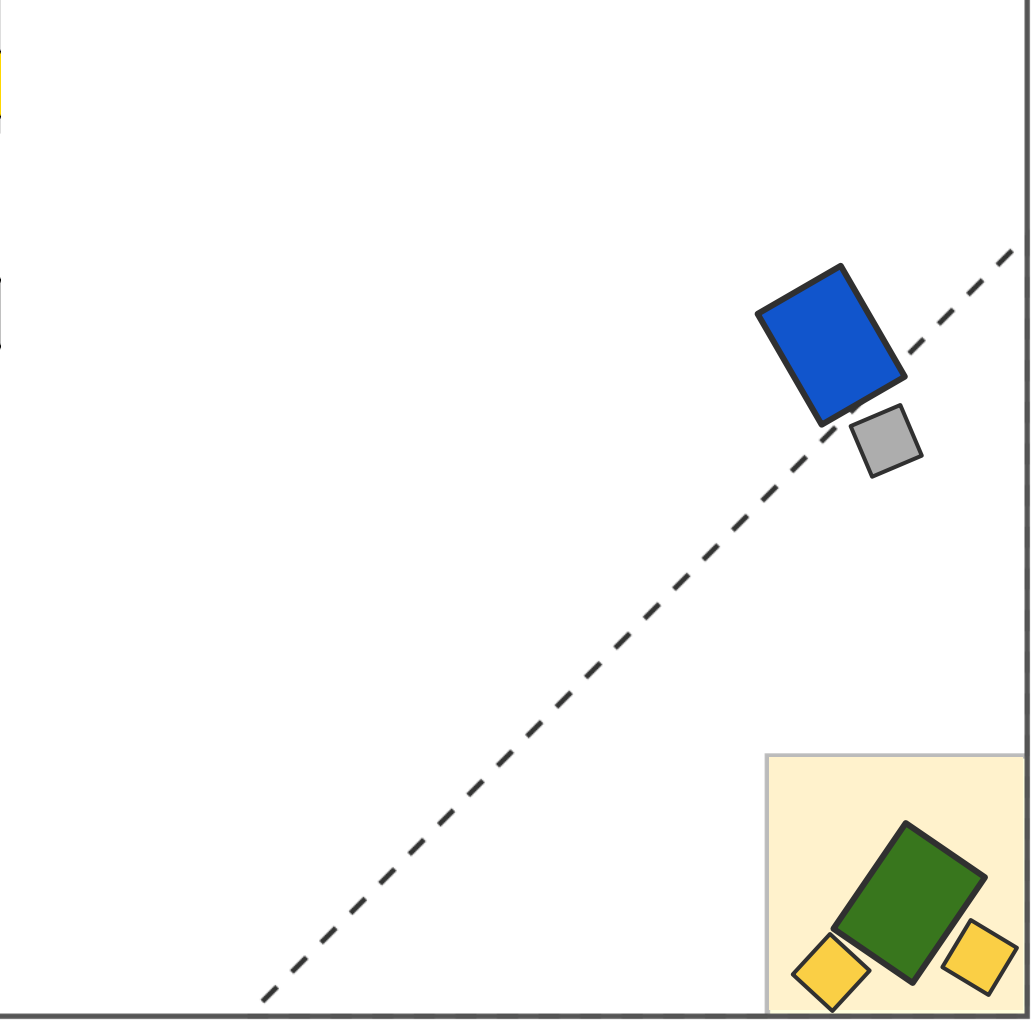
6 Points

(+1 for robot leaving zone)



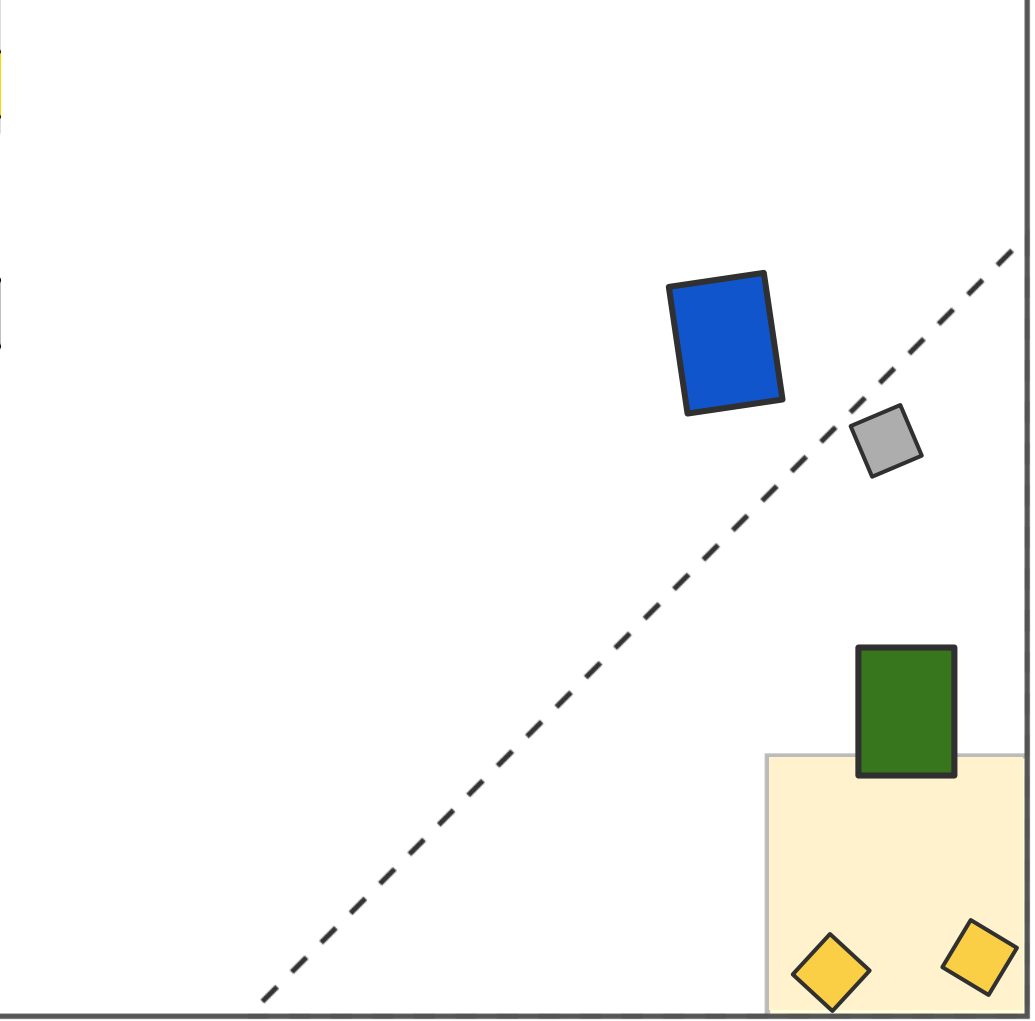
6 Points

(+1 for robot leaving zone)



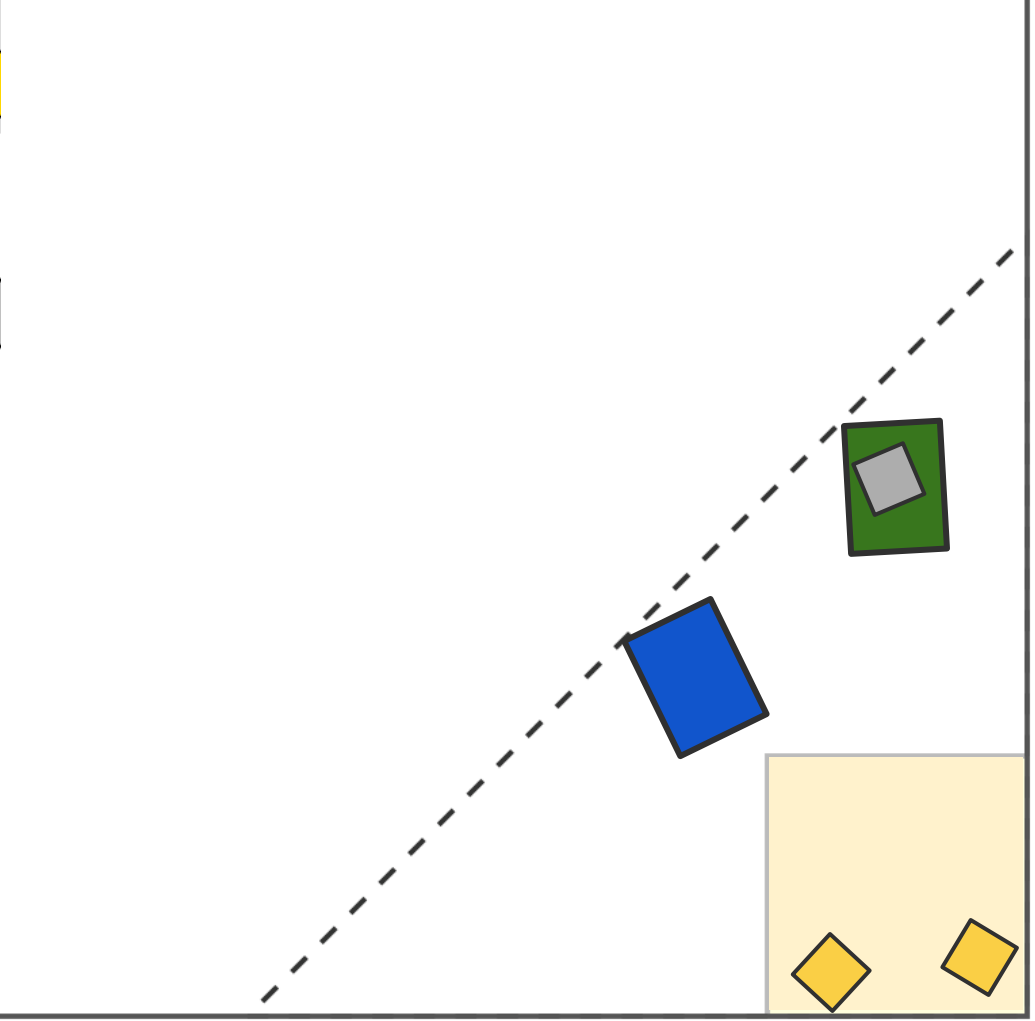
3 Points

(+1 for robot moving)



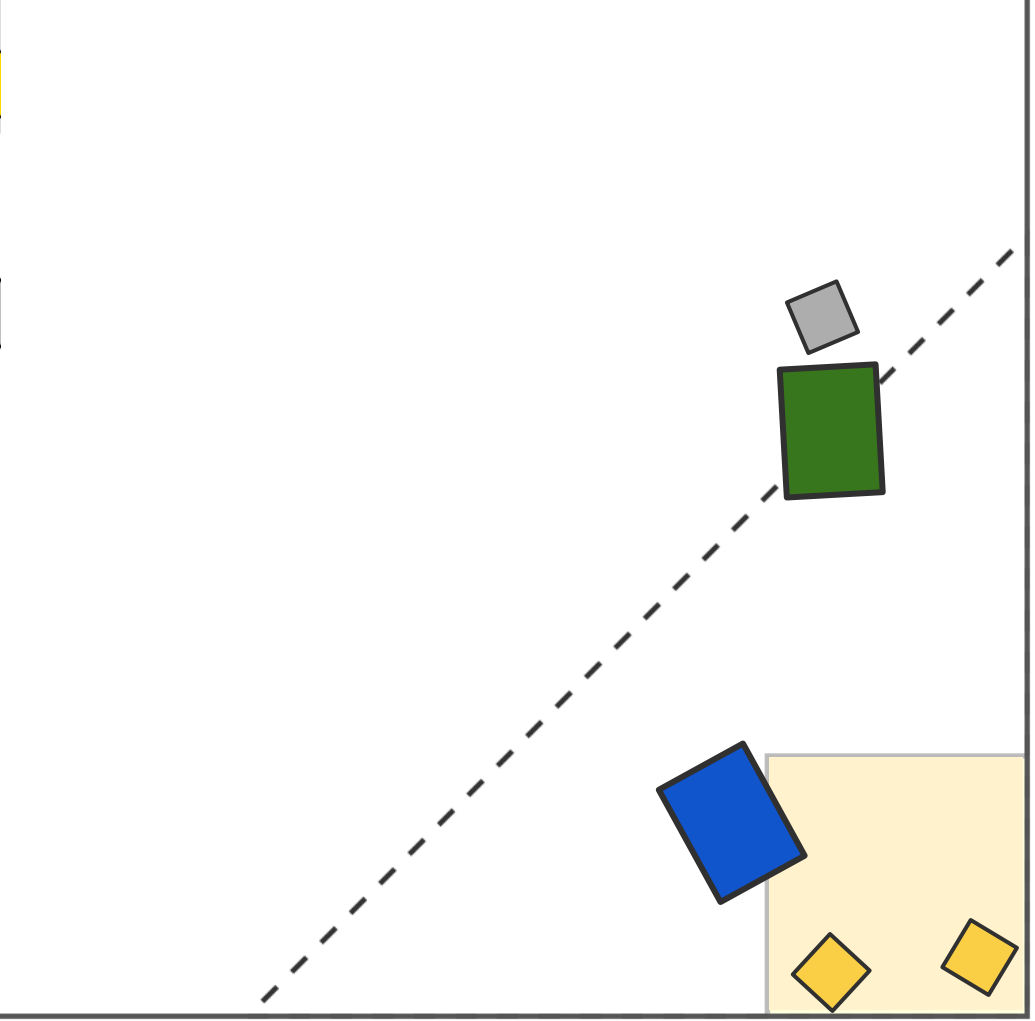
3 Points

(+1 for robot moving)



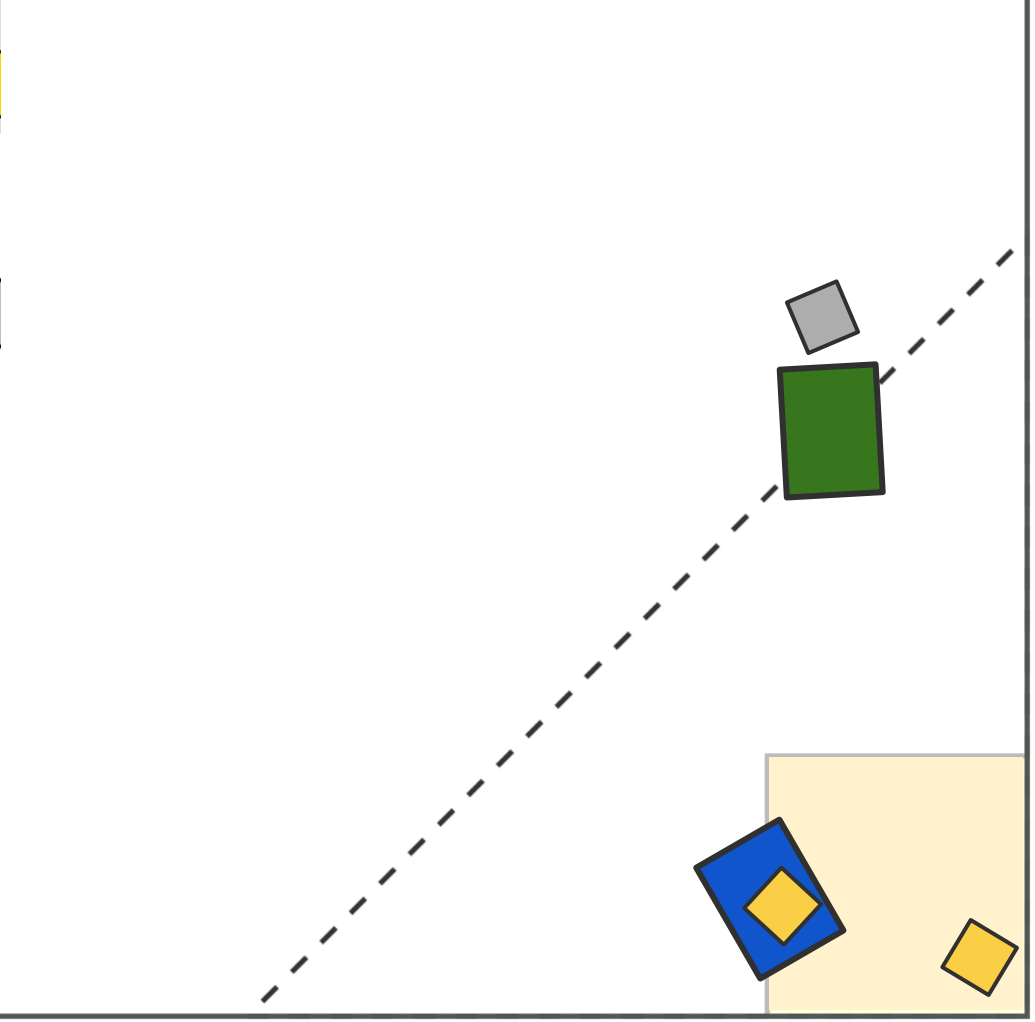
6 Points

(+1 for robot moving)



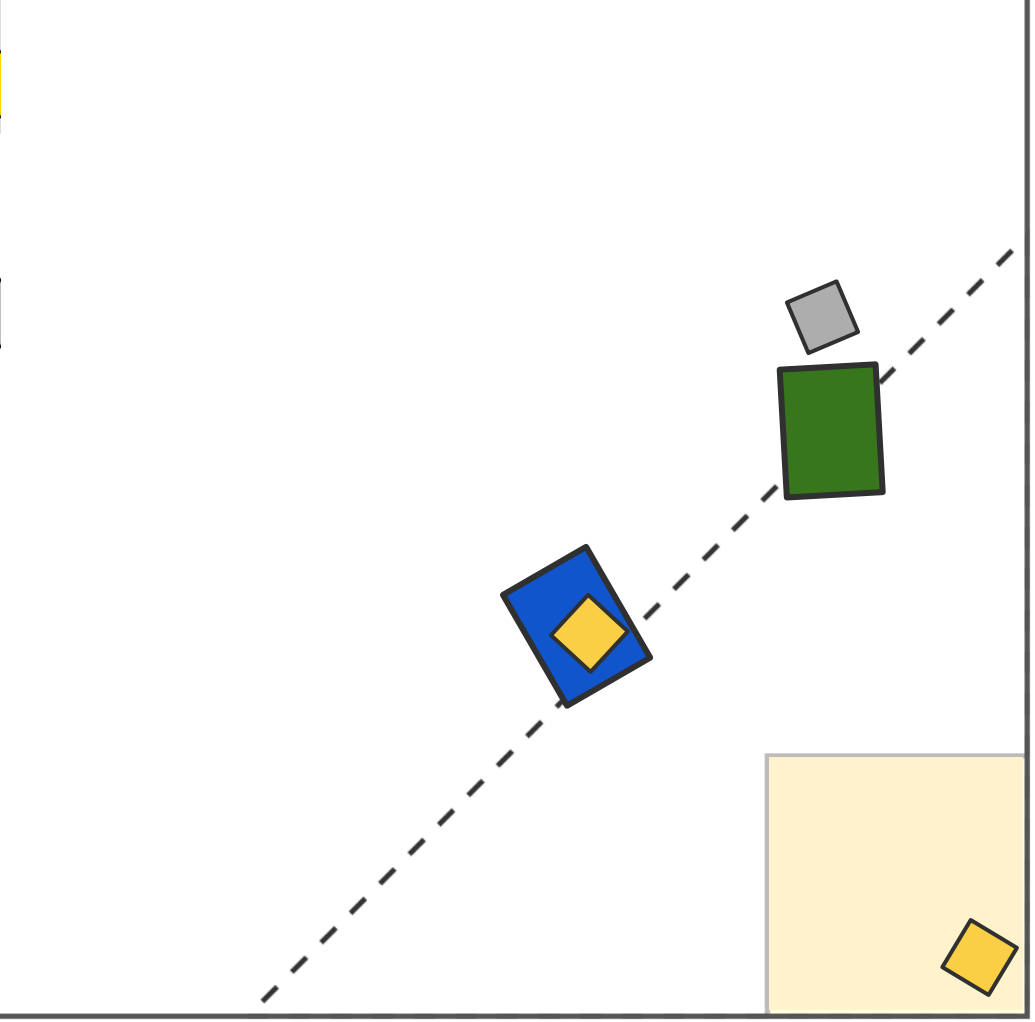
6 Points

(+1 for robot moving)



3 Points

(+1 for robot moving)



3 Points

(+1 for robot moving)

The Rules

Read them!

They're **very** helpful!

Student Robotics 2020 Rulebook

1st Revision

October 24, 2019

The following defines the rules and regulations of the Student Robotics 2020 competition. The latest version of this document can be found at https://www.studentrobotics.org/docs/rules/.

1. Game Rules

1.1 The game, called **Two Colours**, will be played in the arena defined in section 3.3. The objective of this game is to capture the most tokens, but without mixing the two colours.

1.2 Before a match begins, participating teams must:

a) Present their robot in the staging area, adjacent to the arena, before the scheduled close of staging time. The staging area will be clearly marked on the day.

b) Attach a robot flag. Robot flags will be provided by Student Robotics officials in the staging area. Section 3.2 provides more information about these flags, as well as their dimensions and mounting requirements.

c) Follow the directions of the match officials.

Teams that fail to comply with these rules–such as by arriving late–may forfeit the match, at the discretion of the judge.

1.3 A match lasts 150 seconds.

1.4 There will be a maximum of 4 robots in a match.

1.5 Robots will be started by, or at the direction of, match officials.

THE REST OF TODAY

NOW	Kit handout
NEXT	Introduction to Micro Games
THEN	Micro Games
12:30 - 13:00	Lunch + Robot Brainstorming
13:00 - 17:00	Micro Games (Continued)

ANY QUESTIONS?

GOOD LUCK!