Robotics

Allie Sauppé | Google CS4HS
April 22, 2017

Outline

Introduction to robotics

Activity: navigating a maze

Q&A with FRC students

Activity: navigating around a wall

Q&A with FLL coach

Programming with Mindstorms

Programming with Finch

HS CS Curricula and Robotics

AP CSP: Does not mention robots specifically as a learning objective, but as a tool to achieve the learning objectives

ECS: Examines applications of robots, ethical considerations, interplay of hardware and software

Robots for Education

Enables interactive feedback

Allows students to test ideas in a familiar environment

Inherently interdisciplinary

   including many social science/humanities elements too!

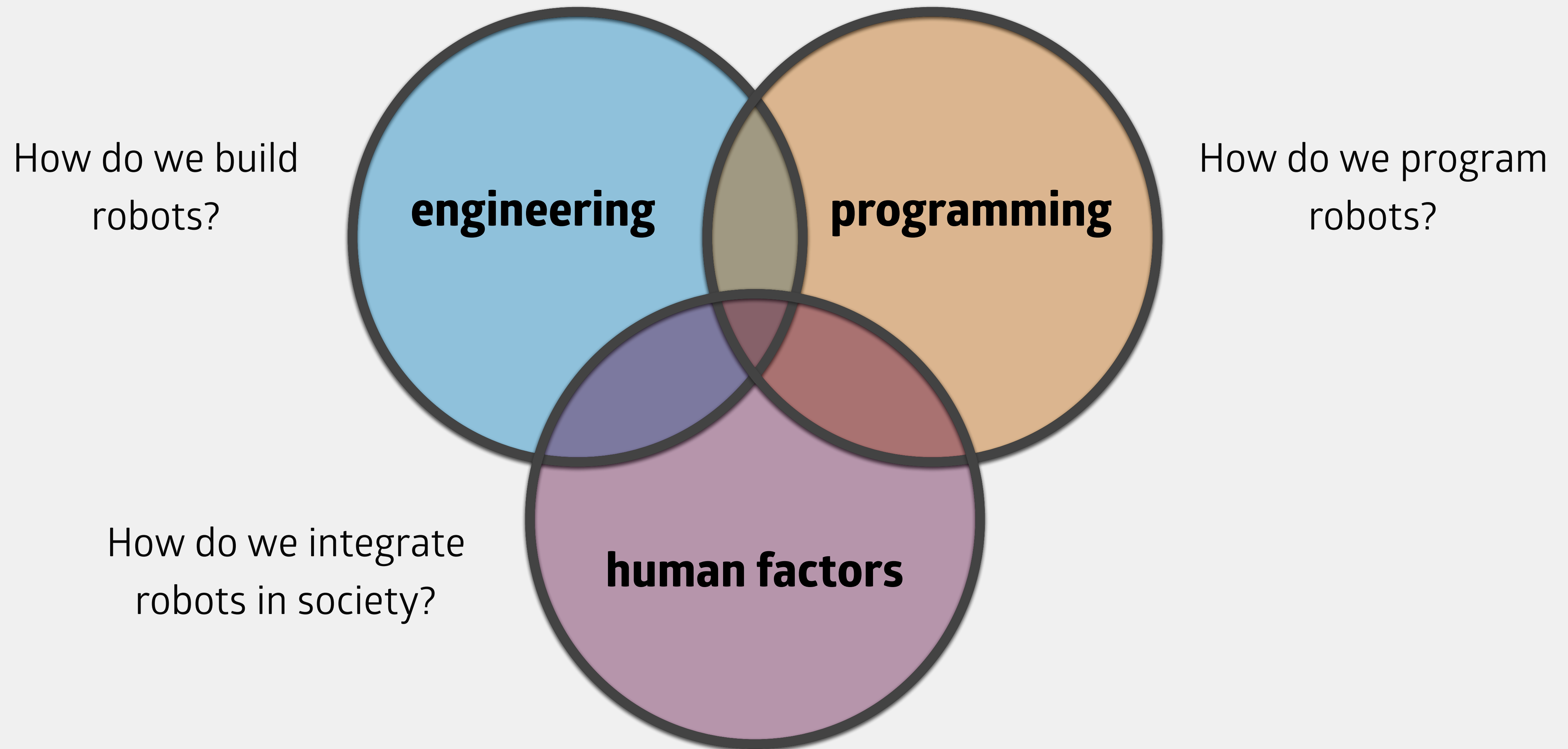# Unique Challenges

Interacting in a noisy environment

Utilizing information from many sensors

Understanding the world using math
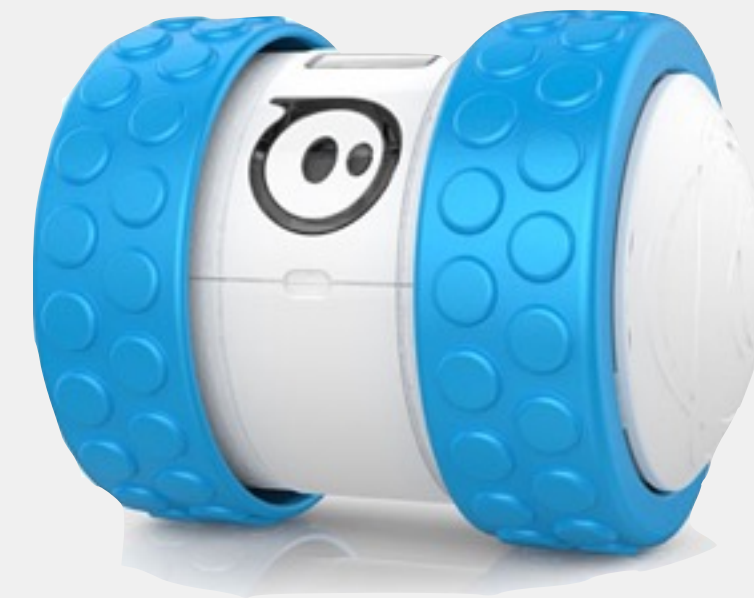
event-action architecture

"move forward until…"

Interdisciplinary Use

How do we build robots?

engineering

programming

How do we program robots?

How do we integrate robots in society?

human factors

Platforms

Lego Mindstorms ($350)

Sphero ($100)

Dash and Dot ($200)

Edison ($50)

Sphero ($119)

Finch ($99)

Platforms

CESA 4 has 40 EV3 Mindstorms

Finch has a loan program[1]

Many offer educational or bulk discounts
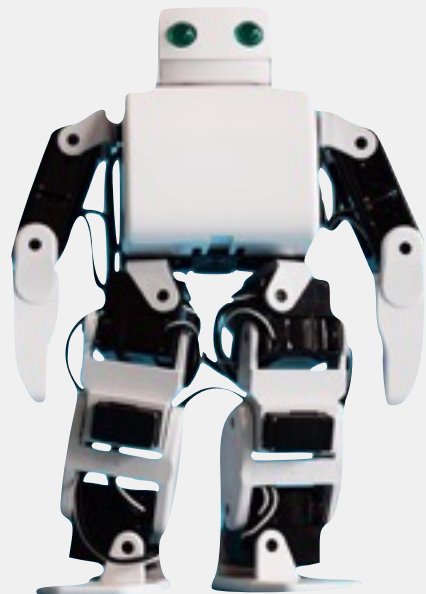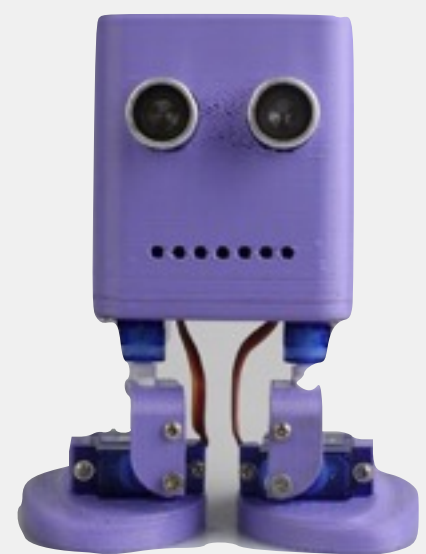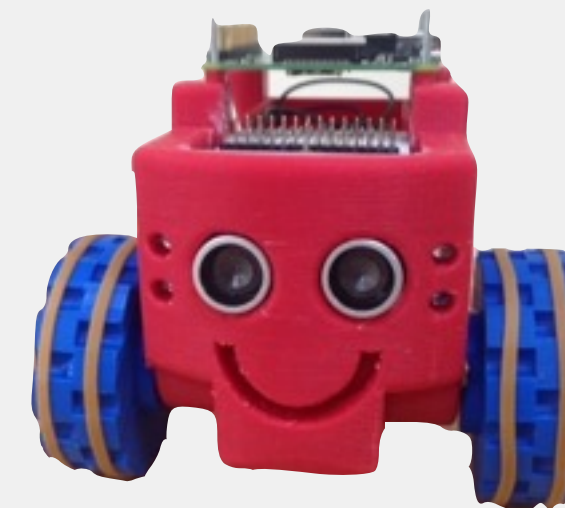
Platforms: DIY/3D Printed

BQ Zowi[1]

PLEN2[2]

Bob the Biped[3]

The 21st Century Robot[4]

Maki[5]

Apogee[6]

1: https://github.com/bq/zowi

2: https://github.com/plenprojectcompany/PLEN2

3: http://www.instructables.com/id/BoB-the-BiPed/

4: http://www.21stcenturyrobot.com/

5: https://www.hello-robo.com/maki

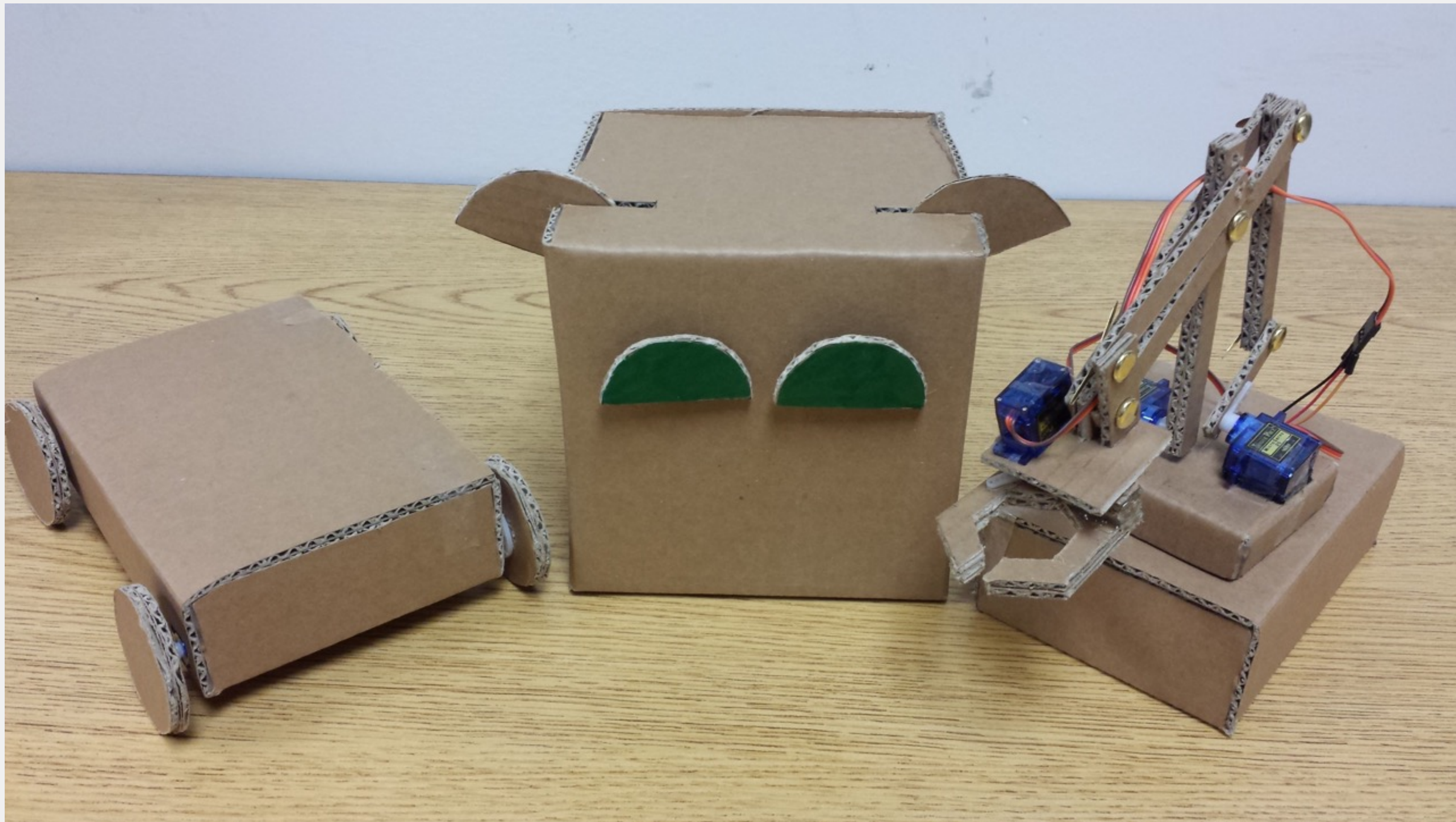6: http://www.thingiverse.com/thing:648394

Platforms: Pypr Bots (Shameless Plug)

Contact Allie Sauppé if you're interested in this cardboard robots!

Platforms: Pypr Bots (Shameless Plug)

Contact Allie Sauppé if you're interested in this cardboard robots!

Platforms: Pypr Bots (Shameless Plug)

Component	Quantity	Cost
Raspberry Pi Zero	1	$5
9g Micro Servos	4	$8 ($2 each)
Wi-Fi Adapter	1	$6
Micro USB Power Supply	1	$3
Mini Breadboard	1	$1
Jumper Cables	14	$1
Hot glue, tape, velcro strips		free
Cardboard		free
Total		**$24**

Robotics Competitions

Numerous competitions[1]

    BotBall

    FRC/FLL

    RoboCup

Large teams with multiple talents

7 Rivers Robotics Coalition (7RRC)[2]

1: https://en.wikipedia.org/wiki/Robot_competition
2: https://www.7rrc.org/

Maze

Groups of 3+

Will collectively program the robot

Then, swap the instructions

    one color sensor

        can communicate what color they are on

    one touch sensor/engine

        can communicate if there is a wall in front of them/how many blocks they have traversed

    one computer

        can communicate the instructions

Maze

When the robot runs into a wall, it stops and...

red —> turn right

blue —> turn left

orange —> turn 180 degrees and go until you see green; stop; turn left

yellow —> turn 180 degrees and go until you see purple; stop; turn right

Finch Anatomy