

*Chick*TECH

Robotics Workshop

WELCOME!

Expectations

- Be respectful of your classmates and volunteers.
 - Do not talk over each other or the volunteers.
 - Respect each others space.
- Help each other! Use each other as a resource.
 - Teaching is learning.
- Mistakes are OK. Mistakes mean you're learning.
- Have fun!

Volunteer Introductions



- Your facilitator!
- Graduated from Louisiana Tech University
 - BA Computer Science, Minor in Mathematics
- Worked as a System Administrator, QA Analyst, Software Engineer
- Currently a Lead Instructor at Galvanize
- I like skateboarding and making music

Agenda

Day 1

- Ice Breaker
- What is a Robot?
- What is an Arduino?
- What is soldering?
- Solder Motors
- Assemble Robot

Day 2

- What is code?
- Program Robot
- Customize/Decorate Robot
- (Stretch) Add sensor/LEDs
- Present at Showcase

ICE BREAKER

ICE BREAKER

- Pair up!
- Take 4 minutes to introduce yourself to your pair
 - What's your name?
 - One thing about you (hobby, favorite food, favorite color etc.)
- We will go around and YOU will introduce your partner

what is a Robot?

- Define and Describe Robot
- List the many different types of Robots
- Explain why robots are useful

Define and Describe Robot

- Spend 2 minutes searching the web and reading about what is a robot.
- Write down in your own words "What is a robot?"

Define and Describe Robot

Define and Describe Robot

A Robot is a machine designed to accomplish a task.

- ATMs
- Vending Machines
- Washing Machines

Define and Describe Robot

A machine capable of responding to its environment to automatically carry out complex or repetitive tasks with little, if any, direction from a human being.

- An Autonomous Car - a car that drives itself
- A Washing Machine that senses the clothing to adjust the cycle
- A thermostat that learns it's users preferences and automatically adjusts
- A roomba vacuum cleaner - learns and senses the floor layout to automatically clean the floor

List the many different types of Robots

- Medical Robots
 - Designed to mimic a surgeons precise movements/actions
- Military Robots
 - Drones
 - Bomb defusers
 - Search through debris
- Automation/Manufacturing
 - Assembly line robotic arms
 - Automated Vacuum Cleaners
 - Autonomous Cars
 - Smart Dishwashers/Dryers/Washers

Explain Why Robots are Useful

- Spend 2 minutes thinking about "Why are robots useful?".
- Write down in your own words "Why are robots useful?"

**Explain why
Robots are Useful**

what is an Arduino?

- Define and Describe MicroController
- Define and Describe an Arduino
- Identify an Arduino as a MicroController
- List the many uses of an Arduino

Define and Describe MicroController

- A single purpose computer
 - Similar to a desktop/laptop computer but only serves a single purpose
- Typically dedicated to a single task
 - Can only be programmed to do 1 thing at a time
- Contains:
 - CPU (Central Processing Unit)
 - Memory
 - Clock

Define and Describe an Arduino

- A single purpose computer
- Has inputs and outputs
- Can be programmed to do many different things
 - Robots
 - Home Automation
 - Internet of Things
 - MUCH MORE!
- A rapid prototyping tool
 - An easy way to get started with electronics
 - In the past you had to source the materials and build something similar from scratch!
- Open Source hardware platform

Identify an Arduino as a MicroController

An arduino is a MicroController! There are many other types of MicroControllers, but arduino is very popular one.

what is soldering?

- Define Soldering
- Describe why soldering is necessary
- List the ways to stay safe while soldering

Define Soldering

A process in which two or more items (usually metal) are joined together by melting and putting a filler metal (solder) into the joint.

Describe Why Soldering is Necessary

- Materials used in electronics require electricity to pass through them
- When working with electronics, we typically want to connect 2 components together
 - A wire and a motor!

List the ways to stay safe while soldering

- Always wear safety glasses.
- Grip the soldering iron by the safety grip. NEVER touch the metal.
- Solder in a well-ventilated space
 - Do not inhale the fumes! Blow them away.
- Always put your soldering iron back in its stand when not in use
- Never, ever try to catch a hot soldering iron if you drop it. Let it fall, buy a new one if you have to — just don't grab it!
- Give any soldered surface a minute or two to cool down before you touch it.
- Never leave flammable items (such as paper) near your soldering iron.

How to Solder Safely

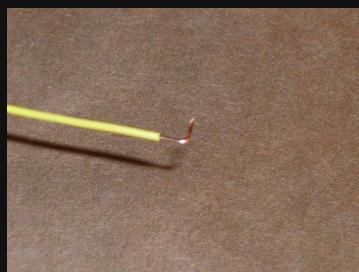
Safe Soldering Checklist

ROBOT TIME!!!

Solder Motors

Attach Wires

Create a hook/bend in the end of the wire with pliers



Hook the wire into the motor terminal

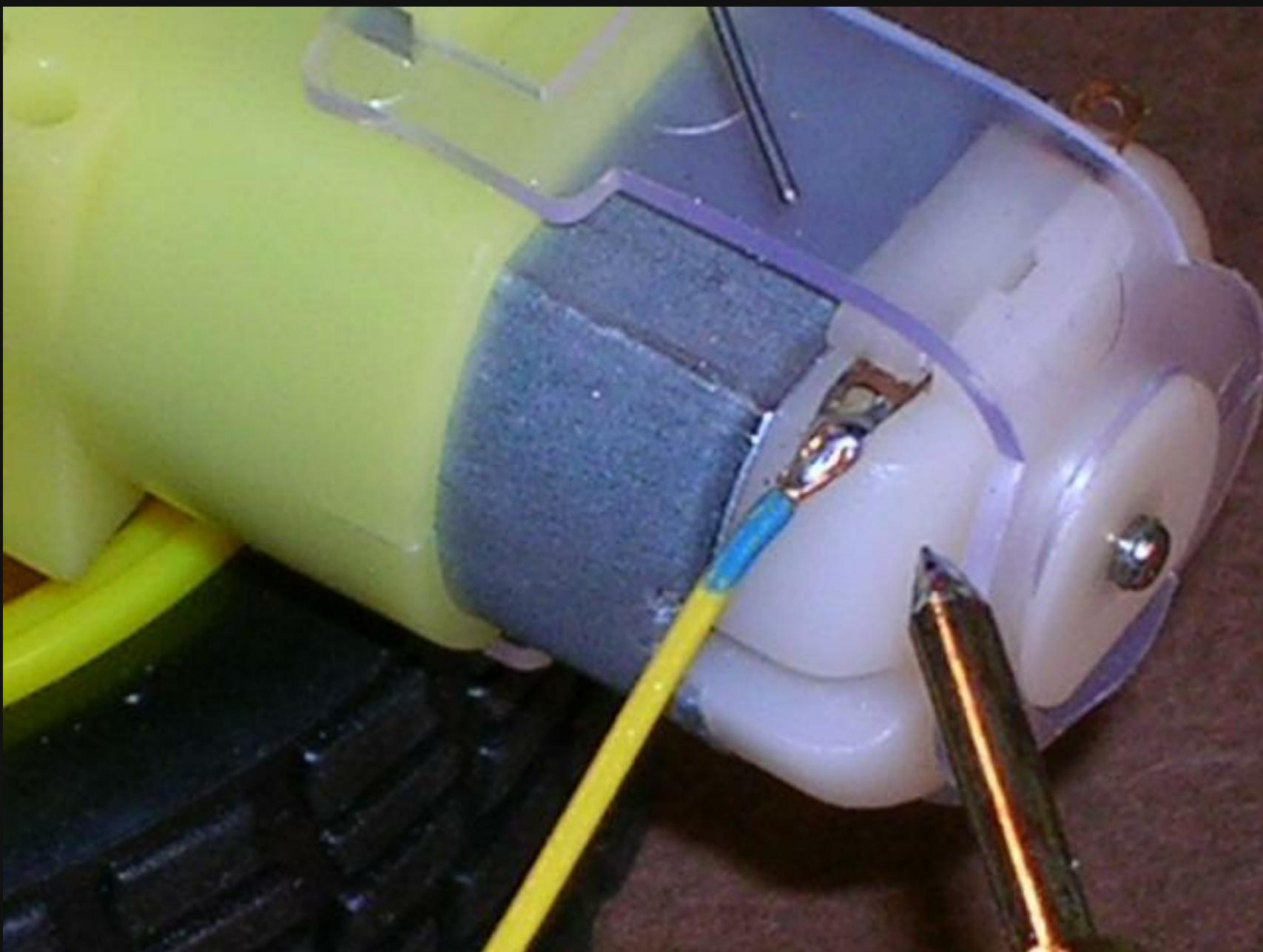


Squeeze wire closed with pliers to ensure a secure connection



Solder Wires to Motors

- Place the soldering iron on the wire/terminal to heat it up
 - Don't hold for too long, the plastic will melt! (Avoid touching the plastic with the iron)
- Apply the solder
- Remove soldering iron and check that you have a secure connection

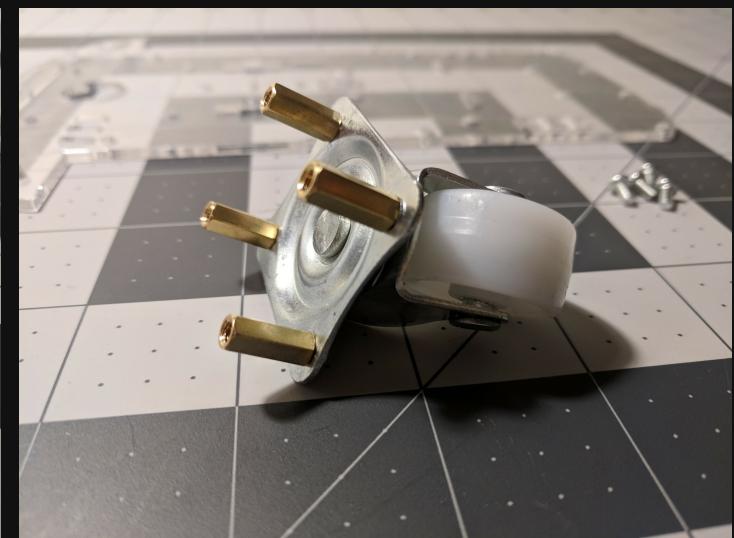
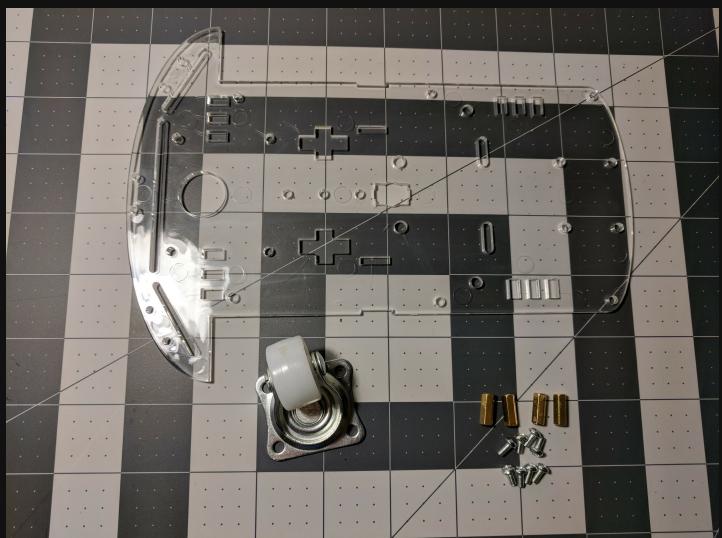


Assemble Robot

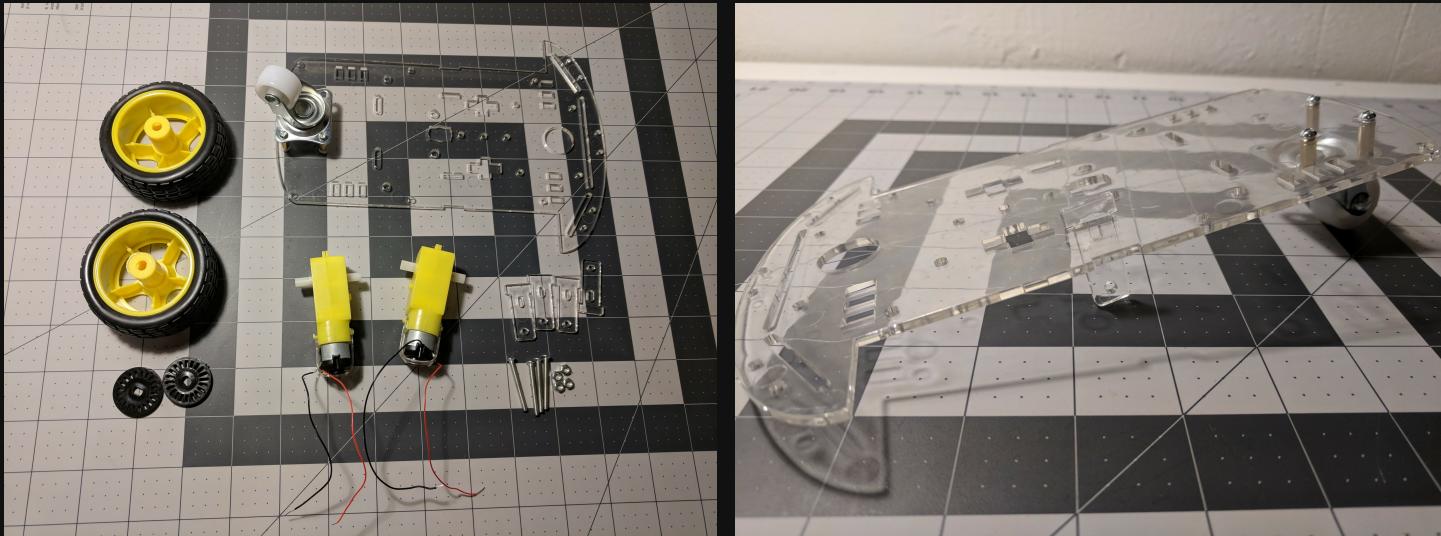
Assemble Robot

1. Attach pivot wheel
2. Attach Motors
3. Attach battery pack
4. Attach Motor Controller to Arduino
5. Attach Arduino to robot
6. Connect battery wires
7. Connect motor wires

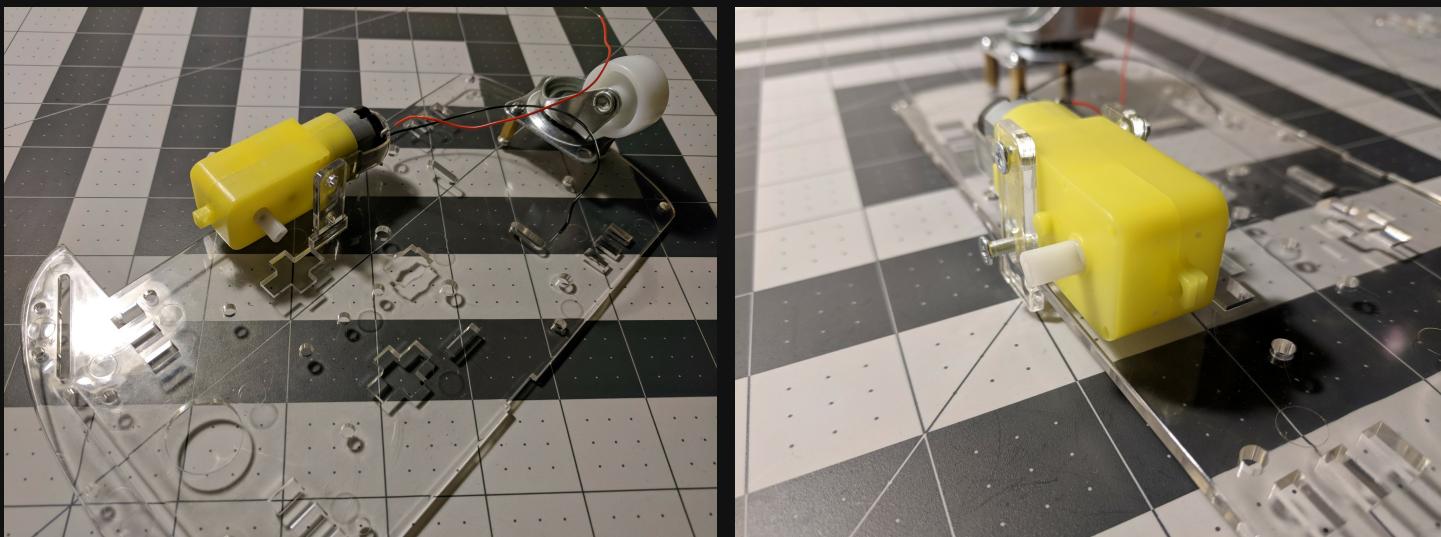
Attach pivot wheel



Attach Motors

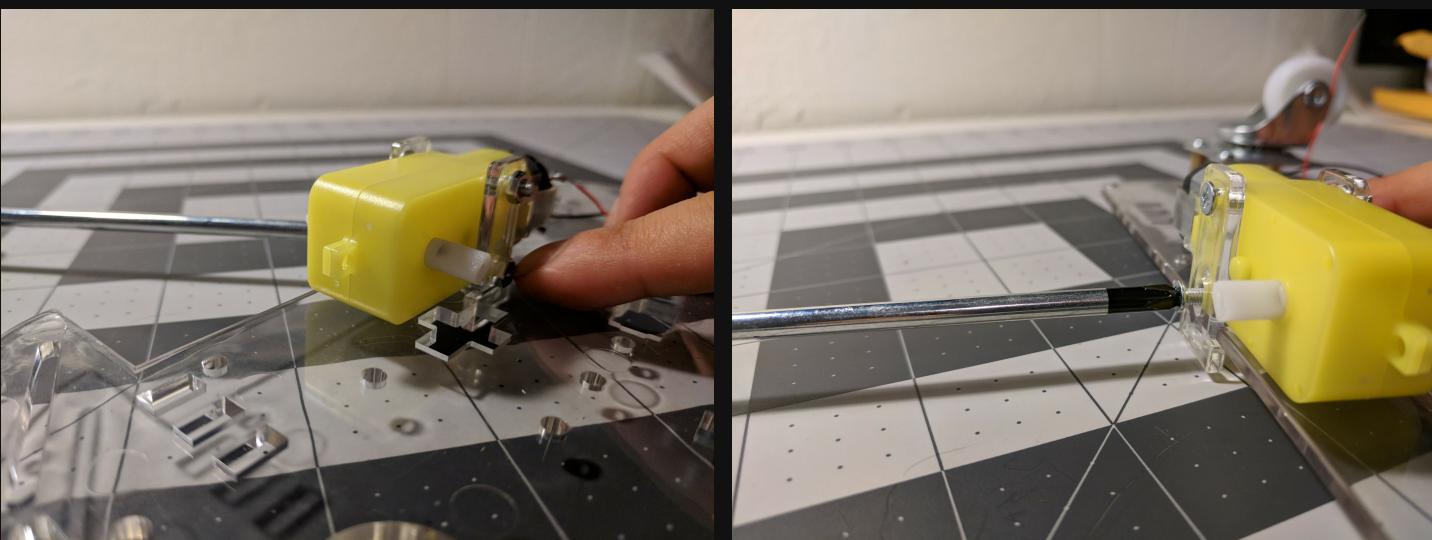


- The wires should be facing the pivot wheel

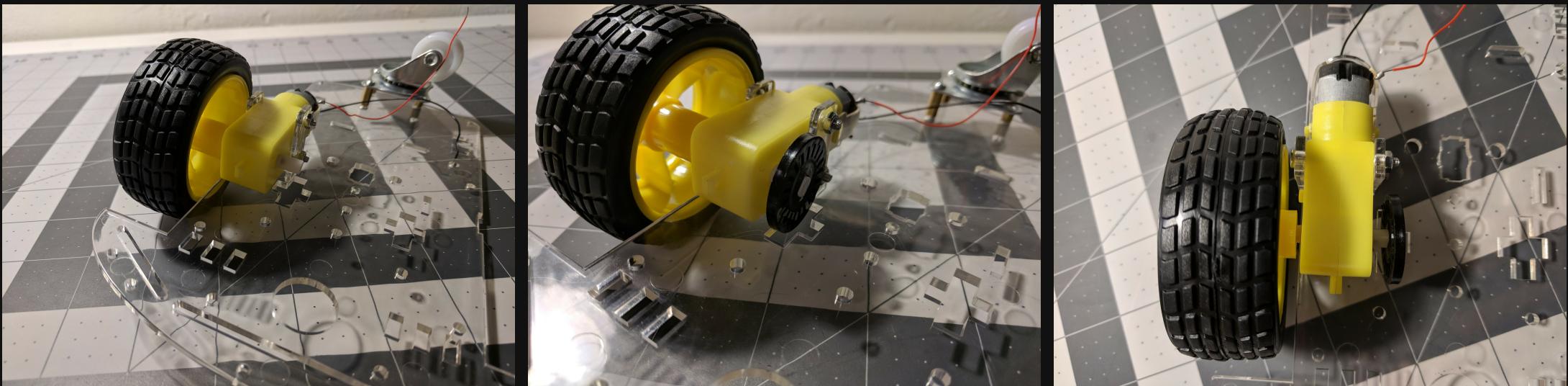


- Leave the bottom screw sticking out

- Hold the nut in place and screw the screw in

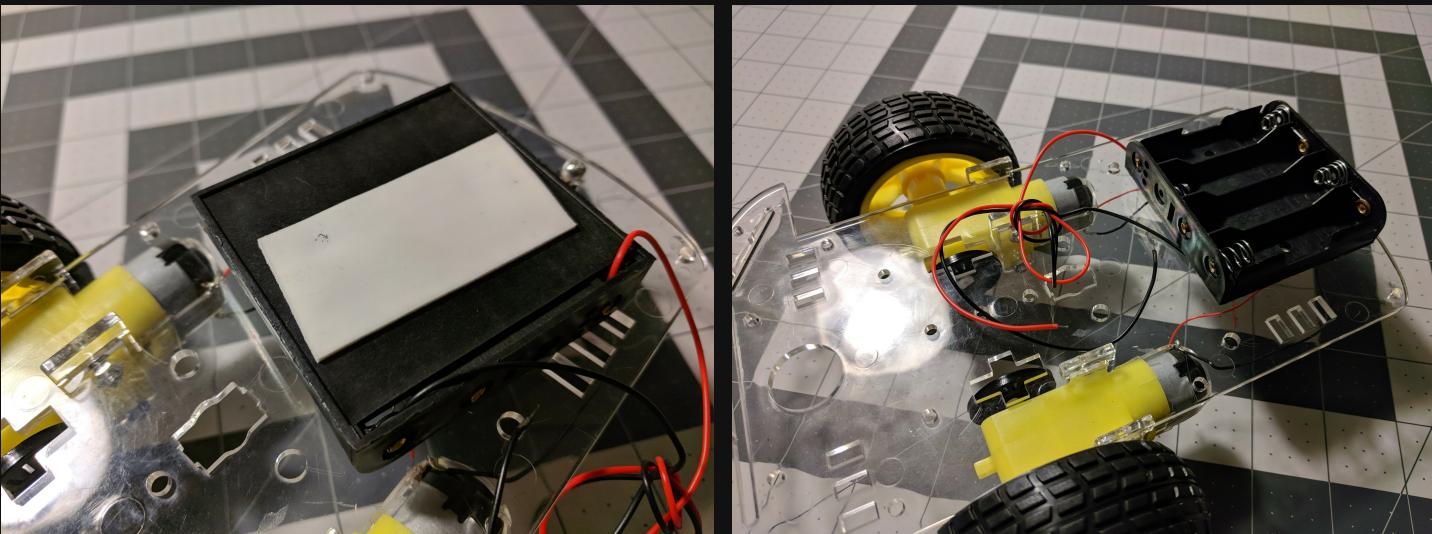


- Attach the wheel to the outside of the motor
- Attach the plastic disk to the inside



- Make sure the wheel and disk can spin freely

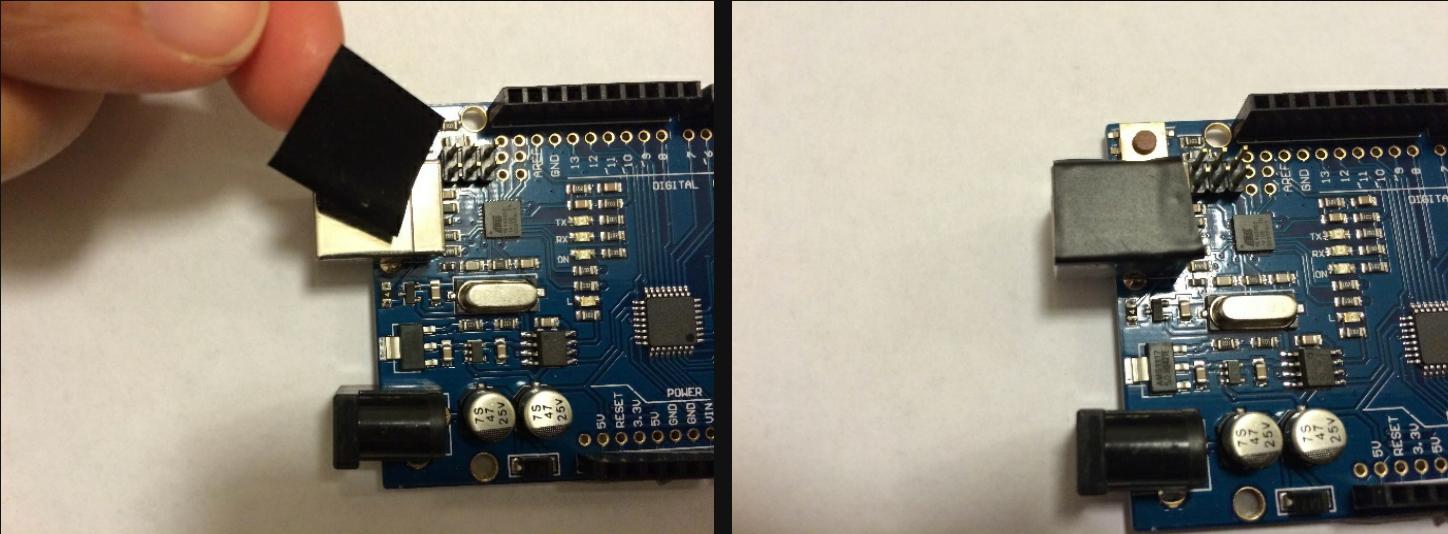
Attach Battery Pack



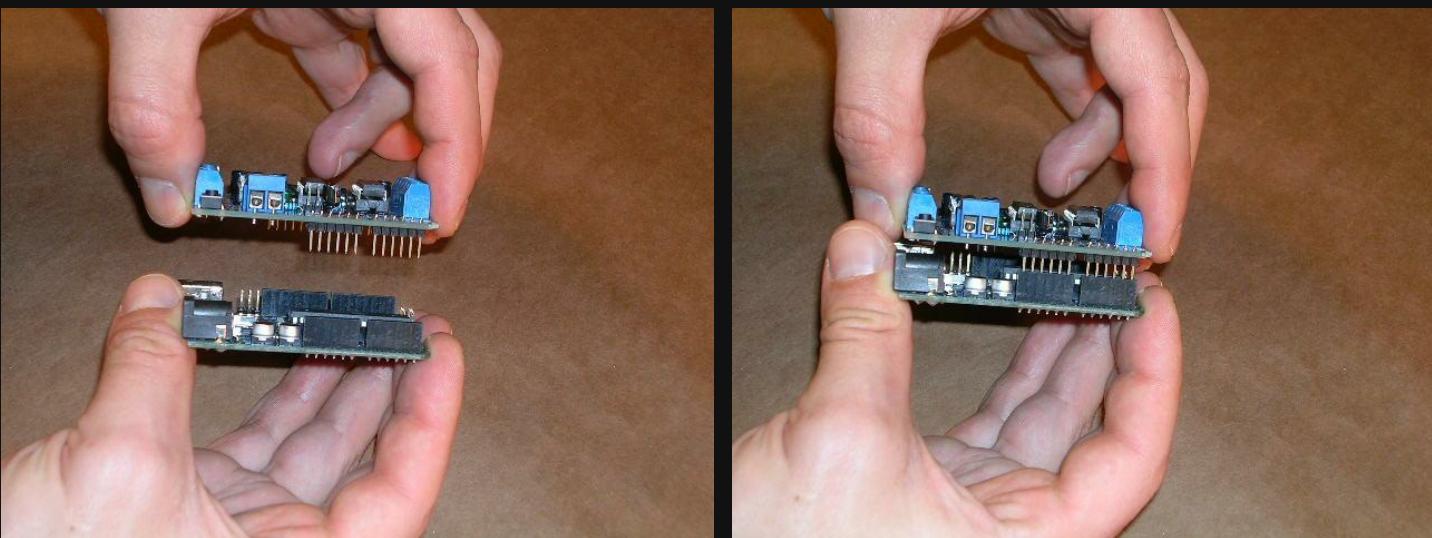
- Place some foam tape the the back of the battery Pack
- Place the batter pack at the back of the robot (above the pivot wheel)
- Make sure the wires are facing towards the front of the robot.

Attach Motor Controller to Arduino

- Place a piece of electrical tape on the USB connector

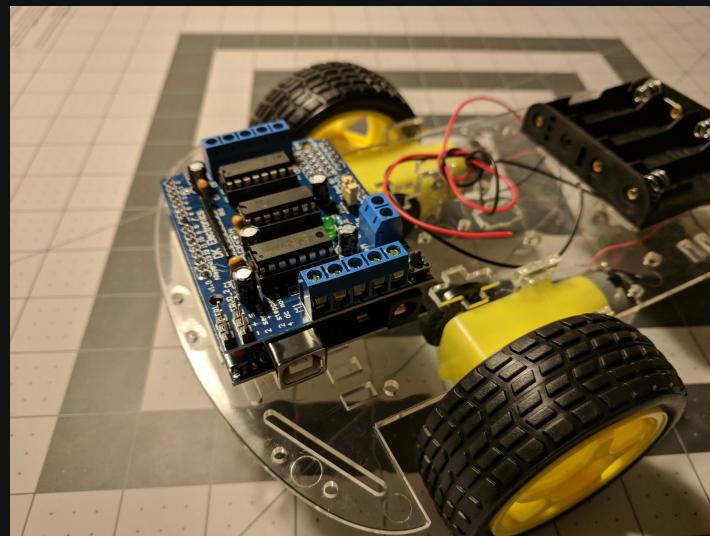


- Make sure it is lined up correctly
- Slowly press down! Do not bend the pins!



Attach Arduino to Robot

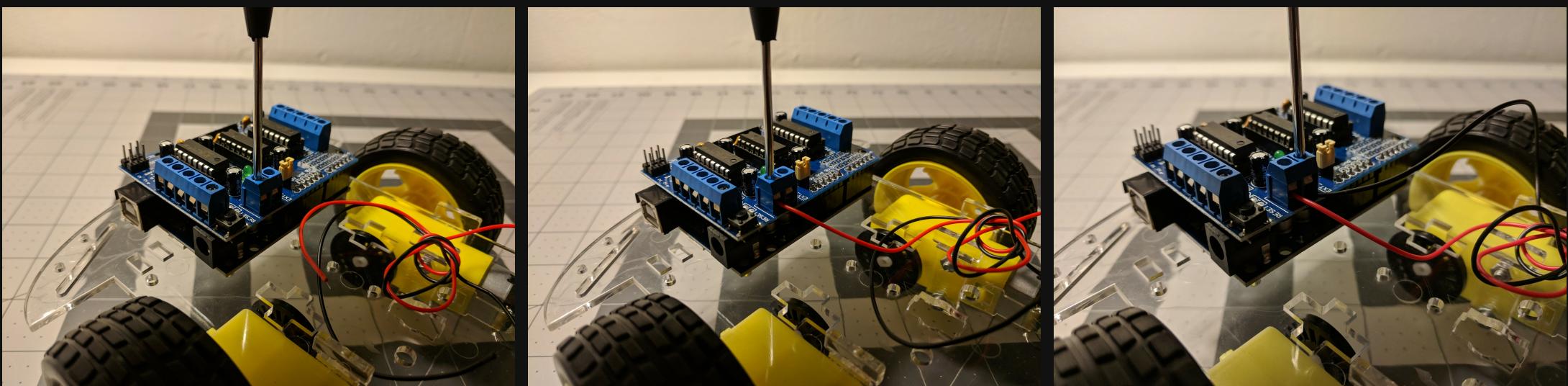
- Place foam tape underneath the Arduino
- Place the arduino at the front of the robot



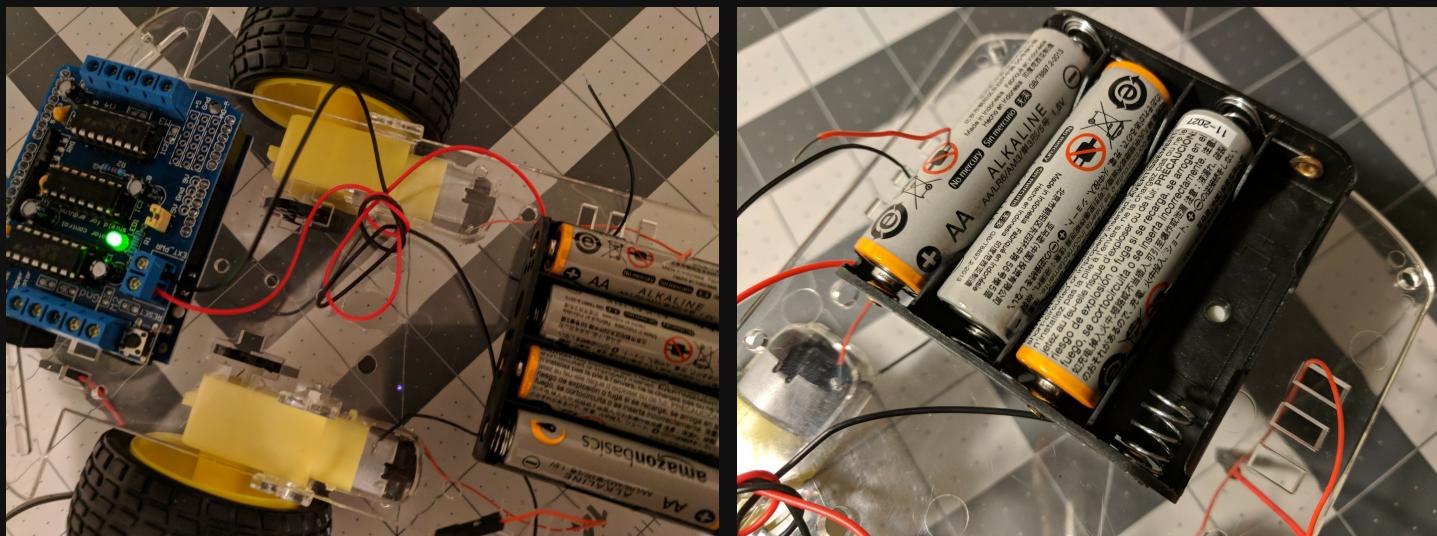
- Make sure the USB port is facing outwards

Connect Battery Wires

- Loosen the screw to the connector marked M+
- Insert the red wire from the battery pack into the connector and tighten the screw
- Repeat with the black wire (connect to GND)

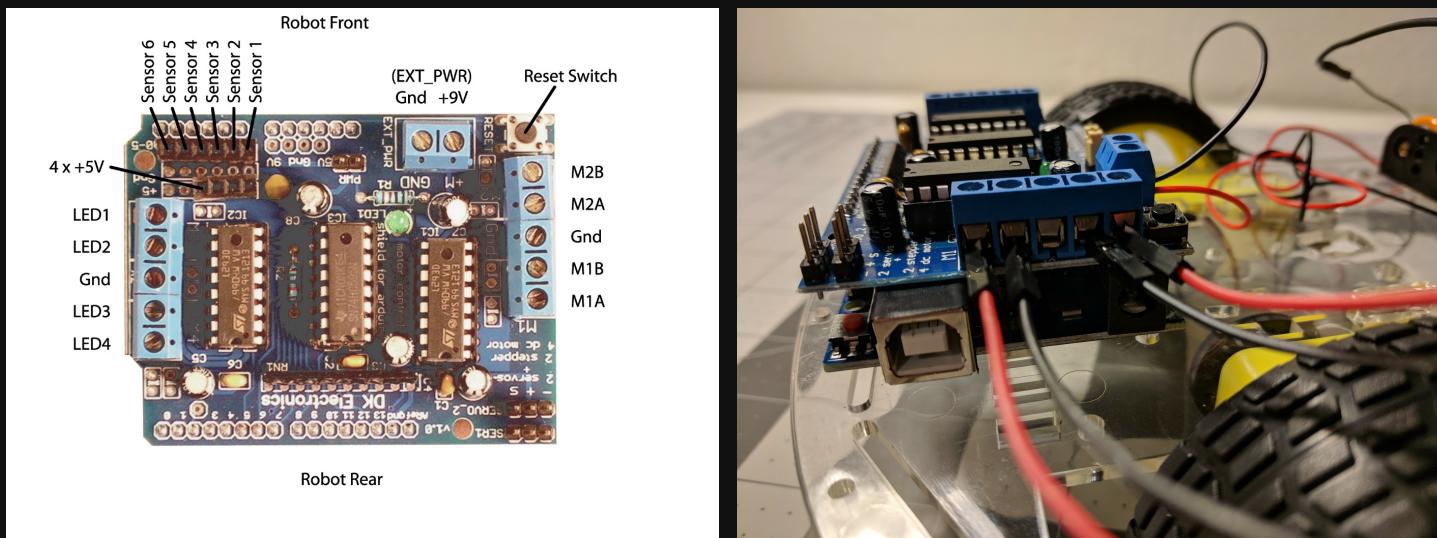


- Insert 4 batteries into the battery holder
- If the green light turns on its working!!!
- Remove one of the batteries for now



Connect Motor Wires

- The two wires from the left motor will connect to M1A and M1B
- The two wires from the right motor will connect to M2A and M2B



- Left motor top wire connects to M1A
- Left motor bottom wire connects to M1B
- Right motor top wire connects to M2A
- Right motor bottom wire connects to M2B

**ROBOT
COMPLETE!**

Review

What is a robot?

**what are some
types of robots?**

**why are robots
useful?**

**what is an
Arduino?**

What is soldering?

**What are the
ways to stay safe
when soldering?**

CODING

- What is code?
- Program Robot

What is code?

- Define and describe computer code
- Explain why computer code is required
- List at least 3 computer coding languages

Define and describe computer code

- Spend 2 minutes searching the web and reading about what is code.
- Write down in your own words "What is code?"

Define and
describe
computer code

Explain why computer code is required

- Computers (MicroControllers) only understand electricity
- 0s and 1s (binary)
 - 0 - no electricity (off)
 - 1 - electricity (on)
- Computer code can be written and understood by humans
 - Might look foreign, but its a lot easier to learn and code than just 1s and 0s
- The computer code that we write is translated into 0s and 1s so computers can understand it.

List at least 3 computer coding languages (programming languages)

- Spend 2 minutes searching the web and reading about what coding (programming) languages there are.
- List at least 3 coding languages you find

List at least 3
computer coding
languages

**We will use C++ to program the
Arduino!**

Program the Robot

(Write some code!)

- Open the Arduino IDE
- Download the **CTRobotSimple** example file
- Open the file inside the Arduino IDE
- Download the **TwoMotorGearbox.zip** library file

```
CCTTwoMotorControl commandList[ ] = {  
    CCTTwoMotorControl(100),  
    CCTTwoMotorControl(500, 'F', 250, 'F', 250),  
    CCTTwoMotorControl(100),  
    CCTTwoMotorControl(500, 'R', 250, 'R', 250),  
    CCTTwoMotorControl(100),  
    CCTTwoMotorControl(500, 'F', 250, 'R', 250),
```



Robotics Workshop - Day 2

Agenda

- ICE BREAKER
- Complete a challenge
- Customize/Decorate Robot
- LUNCH (12:00pm)
- Prepare for Showcase (1:00pm)
- Present at Showcase (2:30pm)

ICE BREAKER

ICE BREAKER

- Pair up!
- Take 2 minutes to introduce yourself to your pair
 - What's your name?
 - One thing about you (hobby, favorite food, favorite color etc.)
- We will go around and YOU will introduce your partner

CHALLENGES

- Program the robot to go in a circle
- Program the robot do a figure 8
- Setup an obstacle course (with cardboard boxes) and make the robot avoid all the obstacles
- Group up with others and perform a synchronized robot dance
- Program the robot to do anything else you can think of!

Customize and Decorate Robot

- Use duct tape on any part of the robot
- Use foam sheets, cardboard and felt to create a different chassis shape
- Options:
 - Add eyes or antennas with pipe cleaners to make the robot look alive
 - Make the robot look like a real robot (mars rover, autonomous car, humanoid etc.)



Showcase!

ChickTECH

Thanks!