ChickTECH

Robotics Workshop

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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, Full Stack Instructor and Content Creator
- Currently I live stream myself teaching how to code on Twitch and YouTube
    - https://www.twitch.tv/codinggarden/
    - https://www.youtube.com/@CodingGarden
- I like programming, skateboarding and making music

Cass

- Graduated from University of Northern Colorado
    - Bachelor of Music Education
- Worked as an Elementary School Teacher, Software Engineer, Front-end Engineering Instructor
- Currently a Front-End Engineering Instructor at Turing School of Software and Design
- I like making art, making music and hanging out with my dog

Agenda

Part 1

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

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Part 2

- What is code?
- Basics of programming the robot with C++
- Arduino IDE Setup
- 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

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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

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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

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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

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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

ROBOT TIME!!!

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Step 1: Build an Arduino Powered Robot

Next Step

Next Step

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ROBOT COMPLETE!

Review

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What is a robot?

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What are some types of robots?

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Why are robots useful?

What is an Arduino?

What is soldering?

What are the ways to stay safe when soldering?

Coding

- What is code?
- Basics of programming the robot with C++
- Arduino IDE Setup

What is code?

- Define and describe computer code
- Explain why computer code is required
- List at least 3 computer coding languages
- List at least 5 things computer coding is used for

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

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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!

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List at least 5 things computer coding is used for

- Spend 2 minutes searching the web and reading about what coding (programming) languages are used for.
- List at least 5 things you find

List at least 5 things computer coding is used for

Arduino IDE Setup

1. Open the Arduino IDE
2. Go to Tools->Board and make sure "Arduino Uno" is selected.
3. Download the CTRobotSimple file
4. Go to File->Open and open the CTRobotSimple.ino file.
5. Download the TwoMotorGearbox.zip library file
6. Go to Sketch->Import Library->Add Library and select the TwoMotorGearbox.zip library file

Basics of Programming the Robot with C++

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C++ comments

```
// This is a comment
// this compiler ignores things that begin with
// Programmers use these to leave themselves
// and others notes about the code
```

```
/*
This is also a comment.
Anything between
*/
```

Control the robot

```
// move forward .5 seconds
CCTTwoMotorControl(500, 'F', 250, 'F', 250),
CCTTwoMotorControl(
  500, // time in milliseconds
  'F', // direction M1A - can be 'F' or 'R'
  250, // speed M2A - maximum value is 255
  'F', // direction M1B - can be 'F' or 'R'
```

Sleep 😴 zzz

```
CCTTwoMotorControl(100) // sleep for 0.1 seconds
```

Create a list of Commands

By changing the commands and sequence of commands, you can make the robot do anything you want!

```
CCTTwoMotorControl commandList[] = {
  CCTTwoMotorControl(500, 'F', 250, 'F', 250),
  CCTTwoMotorControl(500, 'R', 250, 'R', 250),
  CCTTwoMotorControl(500, 'F', 250, 'R', 250),
  CCTTwoMotorControl(500, 'R', 250, 'F', 250)  /
};
```

Sending the program to the robot

1. Plug the USB cable into your Arduino and into the computer.
2. Click on the check mark ✅ "Verify" button in the top left of the Arduino window.
3. Check to make sure it says "Done compiling" at the bottom of the window.
4. Click the arrow "Upload" ➡️ button next to the Verify button. This will load the program onto the robot.
5. If there are errors, go to Tools->Serial Port and choose a different serial port.

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!

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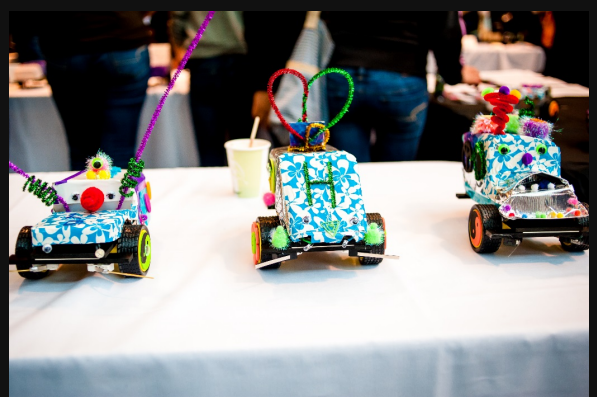
Customize and Decorate Robot

- 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.)



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Showcase!

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Thanks!

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