Embedded Systems 101

Description

Interested in making a smart home device, game controller, robot, or embedded device? Attend Embedded Systems 101 to learn some of the fundamental software and hardware skills to create your own embedded device. This is a hands-on workshop where you will get to build a gesture recognition device using an Arduino Uno! Hardware will be provided.

Learning Outcomes

After this workshop, you will be able to:

- Use a breadboard to prototype an embedded device.
- Program an arduino to read data from an ultrasonic sensor.
- Understand what an embedded device can do and how you can integrate one into your project.

Prerequisite Knowledge

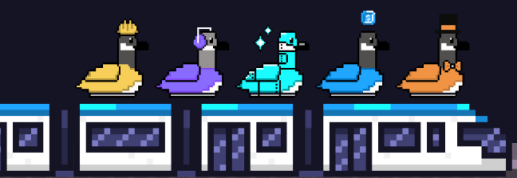
Please install the Arduino IDE. Link: https://www.arduino.cc/en/software

No hardware knowledge is needed. Some knowledge about basic programming concepts (variables, loops, functions, etc) is recommended.

Pre-Workshop Checklist

Before the workshop, please make sure you complete the following items:

- Download the Arduino IDE. Link: https://www.arduino.cc/en/software

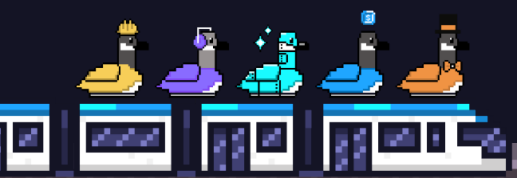


Technical Jargon and Definitions

- Microcontroller - A small computer chip that is used in an embedded device
- Uploading, flashing - The process of saving code to the microcontroller
- IDE - Integrated Development Environment
- Arduino Uno - A simple microcontroller used for learning embedded programming
- UART - Universal Asynchronous Receive Transmit, as known as Serial
- CPU - Central processing unit
- RAM - Random Access Memory
- I/O - Input/Output
- Bugs - Problems with the code
- OS - Operating system (Linux, Mac, Windows, ChromeOs, etc)
- Millisecond - 1/1,000 of a second
- Microsecond - 1/1,000,000 of a second
- Watt - Measurement of energy
- Ultrasonic sensor - A sensor that measures distance with sound
- Breadboard - A platform for prototyping electronic circuits
- Jumper cable/wire - Wire with connectors that connect to a breadboard

Timeline (~1hr 15min)

Time	Module	Description
10 min	What is an embedded device?	Explanation of how and where embedded devices are used.
5 min	Intro to the gesture recognition device	Brief introduction into the design of a simple gesture recognition device to learn some basic skills for embedded systems.
15 min	Hardware assembly	Assembly of the hardware for the gesture recognition device
30 min	Programming	Let's bring the device to life with code!
5 min	How to add embedded software into your project	Inspiration and advice on how to integrate embedded software into your hackathon project.



5 min	Topics beyond this workshop	Interesting and useful things to try or look into for your project.
5 min	Common pitfalls and troubleshooting for embedded software	Tips on how to fix embedded software related issues when they arise.

Workshop Lead Contact

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Linkedin

Additional Resources

Hack the North Resources

Hack the North 2023 Event Schedule

Check this out to stay up-to-date on activities, workshops, and other key happenings this weekend.

Workshop-Specific Resources

Arduino IDE Installation: https://www.arduino.cc/en/software

Gesture Recognition Code: https://github.com/mingyeeee/Embedded-101-HTN-2023