Make Wonders

Integrating Wonder Workshop's Cue Robot with BBC's Micro:bit

Tufts University School of Engineering

Dylan Portelance, Product Manager

Ashish Neupane (EE) **Vincent Bett (CE)** **Fallon Shaughnessy (HFE)**
Bhushan Suwal (CS) **Kate Roland (HFE)** **Raiyan Ishmam (EE)**

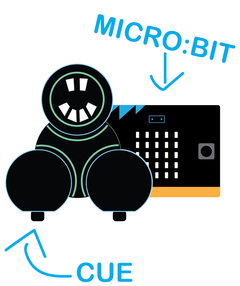
Wonder Workshop

Introduction

Our project sponsor, Wonder Workshop, is the company behind the the Cue Robot.

The Cue Robots are interactive programmable robots that are intended to enhance the computer science learning experience for younger learners.

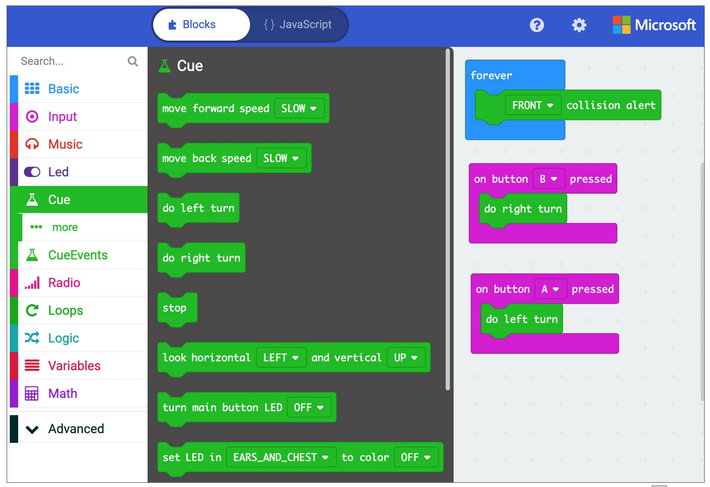
The Micro:bit is an open source embedded system designed by the BBC that is widely used in the UK for early computer science education.



Goals

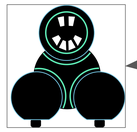
- To implement an interface between the Cue Robot and the Micro:bit.
- To design a curriculum module, geared towards middle school students, that uses our designed interface.

Implementation



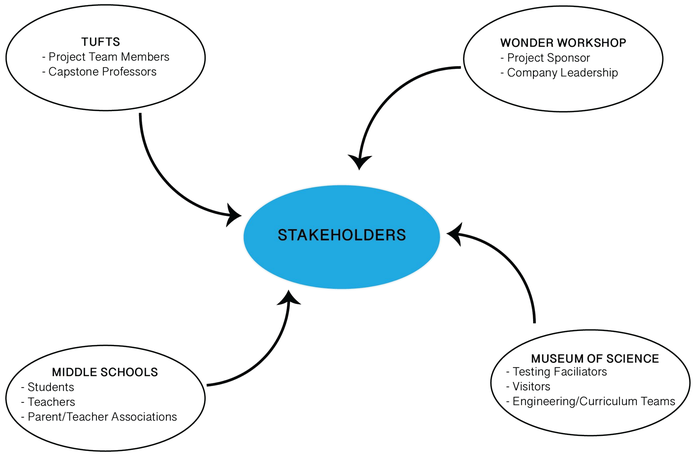
When the program interacts with Cue, the Micro:bit sends instructions to our router via a serial connection

Download program as compiled instructions into the Micro:bit



The router then communicates these instructions to the Cue Robot. When an event goes off on the Cue, for example, it detects something within a distance. It communicates this back to the router.

User Research



Takeaways from Interviews with Educators

- Need for **inclusivity**: technology has to have varying levels of difficulty to account for diverse developmental abilities.
- Need for **collaboration**: often multiple students will work with same robot/iPad/hardware at a time.

Takeaways from Usability Testing

- Users want **immediate feedback**: students were excited to see the robot respond to their commands, and got impatient if there were any lag.
- Users want constant **visual stimulation**: the faster/brighter/cooler the colors, lights, and movements, the better.

User	Need	Requirement
Facilitators (Educators & Parents)	- To have a clear grasp of the device's capabilities in order to aid students	- An easy to use interface with explanations & descriptions when necessary
Middle Schoolers	- To be interested and engaged in the robot - To learn computational thinking & computer science	- A clear and concise script and protocol that introduces and shows off the robot's capabilities

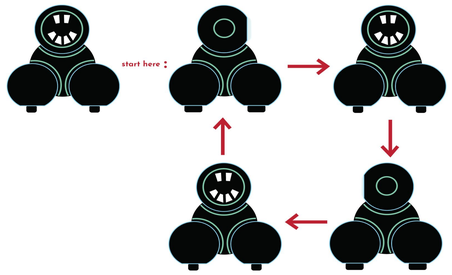
Testing

Two types of tests:
1. Exploratory: user makes a self-chosen program without guidance.
2. Directional: user is told to make a program that performs an assigned task.

Sample Directional Tests:

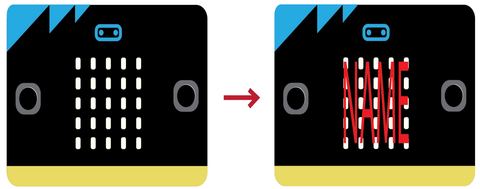
The task is to:

1. Make a square using the Cue blocks available on the laptop.
2. Have the A button on the Micro:bit start the movement.
3. Have the B button on the Micro:bit stop the movement.



The task is to:

1. Have Micro:bit spell your name by using the LED lights.



Future Directions

- Implement the project using the Javascript API to allow the Cue to directly communicate with the Micro::bit without the need for the router script.
- Integrate the project with the Wonder Workshop mobile app to allow users to use the product on mobile devices.