Expanding the MUzECS Platform: A Scalable IDE

Omokolade Hunpatin, Ryan Thomas, and Dr. Dennis Brylow

Marquette University | Mathematics, Statistics, and Computer Science

Motivation

MUzECS is a project which seeks to improve and expand access to high school computer science education. An increasing number of school districts are adopting Chromebooks, which are unable to run many kinds of software.

In response to the evolving technological landscape, we have created a scalable, portable, and secure integrated development environment (IDE) for Arduino - a credit-card sized computer - capable of running on virtually any modern computing system, including Chromebooks.

System Design

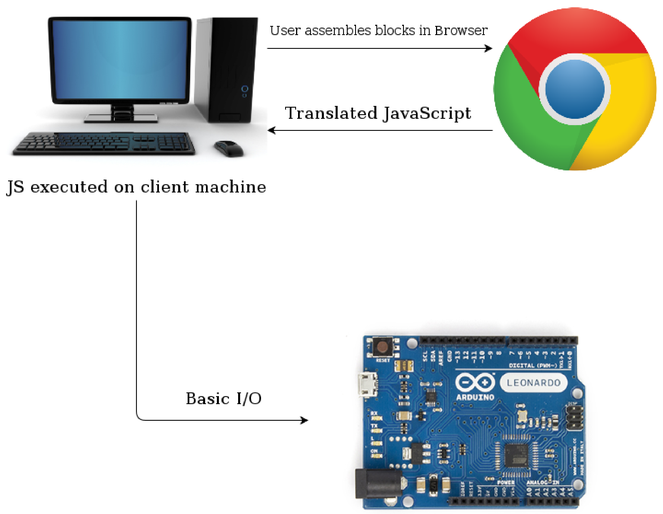

Figure 1: High-level overview of MUzECS Platform

- Students use our IDE to program circuit boards by assembling blocks, producing JavaScript code
- The JavaScript code is executed on each user's computer using the Johnny-Five robotics framework and Node.js
- Instructions are sent from the user's computer to the connected circuit board

Software

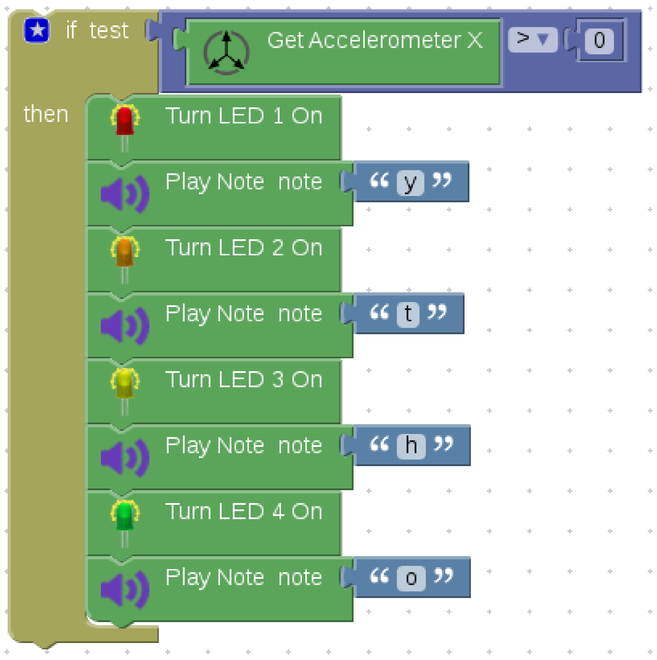

Figure 2: Our block-based interface for programming the Arduino

Our IDE, which runs inside Google Chrome, allows the user to assemble blocks, instead of typing code, to write their programs. Since all code is executed on each user's individual computer, this system is:

- Scalable - many students can use it at once
- Portable - anyone with Google Chrome can use it
- Secure - students will only be able to execute their own programs

References

- adafru.it/3000
- johnny-five.io/
- developers.google.com/blockly

Hardware

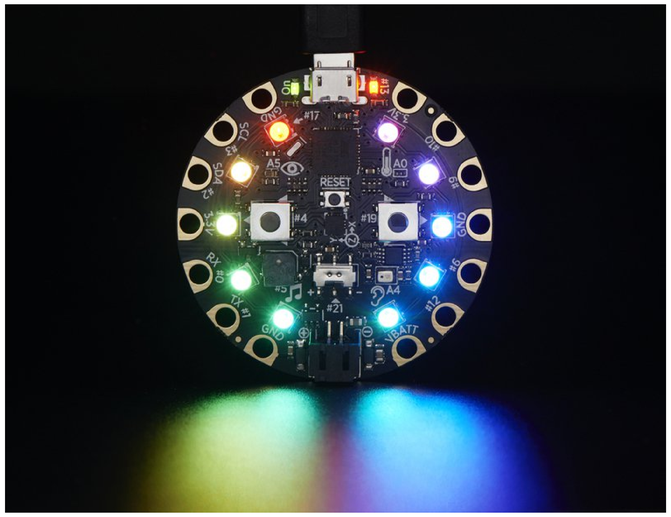

Figure 3: A new hardware platform for MUzECS

We designed our systems so that we are able to program different circuit boards using the same IDE. The Adafruit Circuit Playground (pictured) is another board we can use, and it's hardware is directly built-in to the board. With our IDE, we are able to manipulate the board's:

- Accelerometer
- Light, sound, and temperature sensors
- LEDs and Speaker

Acknowledgements

The MUzECS project is supported by the National Science Foundation, grant CNS-1339392. This work was funded by a supplement to that grant. Our software was built on a variety of platforms, and we would specifically like to thank Rick Waldron, Luis Montes, and the developers of Blockly for their contributions to the underpinnings of this installment. We also owe a special thanks to Robert Juranitch and Gail Chapman, our curriculum consultants.