A Browser-Based IDE For The Modified ECS Curriculum

Jason Arnold, Omokolade Hunpatin, Casey O'Hare, and Dr. Dennis Brylow

Marquette University | Mathematics, Statistics, and Computer Science

Motivation

The Exploring Computer Science (ECS) curriculum intends to give underrepresented portions of the high school population quality computer science education. Our team hopes to further this goal by implementing an operating system independent Integrated Development Environment (IDE).

This tool uses a custom block-based language to assist student learning without overwhelming them. To achieve this we have created a web-page IDE and cloud compiler.

Current MUzECS

The currently implemented version of MUzECS (Marquette University z Exploring Computer Science) uses a modified version of Ardublocks which is a block-based IDE running on Java. This software transfers blocks into Arduino code (a specialized version of C) which is then compiled on the computer and uploaded to the Arduino. The software is accompanied by a well thought-out curriculum which replaces the final module in ECS courses. No hard survey data has been collected from teachers who have piloted this curriculum yet, but initial impressions are promising.

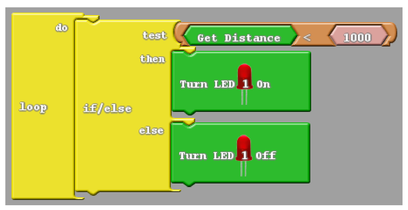

Figure 1: Example MUzECS dialect in Ardublock

References

- http://www.exploringcs.org/
- http://block.ardublock.com/
- http://arduino.cc/en/Main/arduinoBoard Leonardo
- https://developers.google.com/blockly/

Proposed Enhancement

Even though the current MUzECS installment has received positive feedback some issues have arose regarding software. This comes from a variety of reasons including schools switching to Chromebooks, administrator issues, and outdated computers.

Schools are beginning to switch to the cheaper Chromebooks which run Chrome Operating System. These Chromebooks are unable to download and install Java programs which MUzECS is currently based around. This means these schools are no longer to create block-based code, compile, or upload to an Arduino. Additionally, some schools do not have administrator access to their computers which means it is impossible for them to install MUzECS and so reach the same fate.

On the other hand, high school computers are often not top of the line and this can make compiling code take longer. Taking longer to test ones code may reduce time spent learning or discourage a prospective student from pursing computer science.

Due to these problems we want to upgrade the current version of MUzECS to do the following:

- Develop a platform independent version of MUzECS
- Compile in the cloud
- Accessible from anywhere

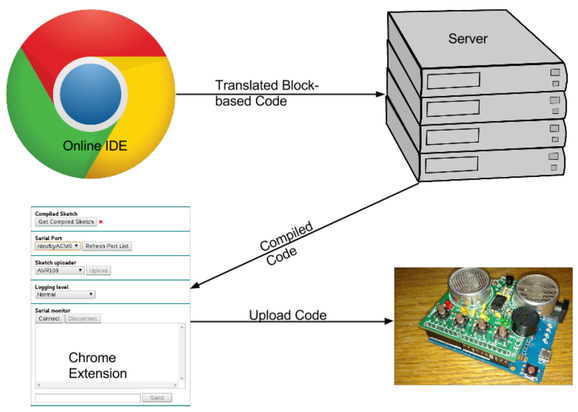

Figure 2: How Chrome version of MUzECS works

Our Solution

To create blocks that can control Arduino Leonardo's pins, we have added on to a version of Blockly, a Google developed visual programming environment on the web. We have modified it to be compatible with the MUzECS curriculum in its control of LEDs, speakers, sensors, and buttons. It also allows for the saving and loading of code on the user's local machine. Most importantly, this webpage can be accessed from anywhere without any downloads and can still be used to its full extent, even from a student's home computer.

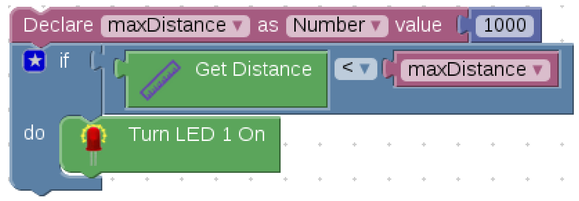

Figure 3: Example of web-page based MUzECS code

Code created on the web-page is then sent to an Ino server we created which is hosted at Marquette University. This server uses an Arduino compiler on the code and sends back an 'okay' message to the user.

Next, we modified a Chrome extension to take the compiled code and upload it to an Arduino Leonardo. The compiled code is fetched from the Marquette server. Uploading is done by using Google's Serial Application Programming Interface (API) and AVR109 protocol. It can also use serial monitoring to send and receive characters to and from the Arduino.

Acknowledgements

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