Accessible Blockly Plugin

Authors: Rachael Bosley, Luna Meier

# Overview

## Goal

Allow for people with any level of vision to work with Blockly, whether they have no vision, full vision, or somewhere in between. The program must also stay user friendly so that children can use it effectively. In order to allow Blockly to be used by blind users, the entire interface must be hotkey accessible and easily readable by a screen reader.

## About Blockly

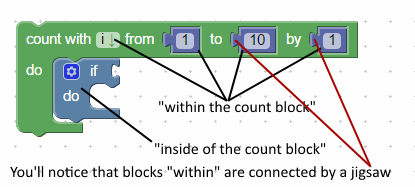
Blockly is a visual coding interface. It allows users to create code by placing blocks together. New blocks can be easily created by developers to enable more functionality within the interface. Blockly code can be exported to XML, Python, Javascript, PHP, and Dart. Basic Blockly does not have the ability to run code, so these exports are necessary to see the final product.

## Glossary

**User**: Person who is interacting with the finished version of the program, after everything has been put together.

**Developer**: Person or group responsible for integrating our plugin into their own Blockly implementation.

**Within vs. Inside of**: A block or field is considered “within” another block if it is an integral part of the block itself. A block is considered “inside of” another block if it is part of a statement that is run by a block. This concept is rather confusing, so see the picture below for a visual example:



From a coding standpoint, child blocks that are within a parent block output directly into the parent block, while child blocks that are inside of a parent block are code that is run according to the parent block.

## Features

### Navigating Between Blocks in the Scene

Using the WASD keys the user will be able to navigate throughout the scene. They can move up and down between blocks in a chain, as well as go inside of blocks that are contained by other blocks, and pull out of child blocks to outer blocks.

The user can also move between blocks that aren’t connected to one another by switching between the different containers via a hotkey or by pressing down when already at the bottom of a block.

### Navigating Within a Block

The user will sometimes need to navigate within a block to child blocks that are inputs. Since this can get confusing, instead of just pressing a single navigation button to handle all of these cases we allow you to switch into an edit mode for a block. This allows you to select any of the connections that go off of the block, ensuring you can always get to whichever block you need. From this edit mode you can also choose to add a block to the currently selected input, as well as connect two blocks together.

### Adding Blocks to the Scene

The user will be able to press a key to initiate menu mode. In this mode, you can select a category and then select a block from that category. Alternatively, you can click on a category and click on a block and drag it into the scene.

### Moving Blocks around on the Scene

The user will be able to use hotkeys within a block to select a connection, select another block, and move the new block to that connection. This is already done with ability to drag with a mouse, but we need it to be able to be done with hotkeys as well.

### Tree Diagram Representing Scene

The user will have a box on the side of their screen that reads them their comments in a tree view. The tree view will be updated automatically, it will be displayed in the format of the blocks to keep the structures looking the same. All the blocks in the workspace have their own prefixes assigned to them and the comment tree view will display the block prefix followed by that blocks comment if it has a comment. They will also have an info box which tells more information about the block they are currently on in a larger font for a better understanding of where they are in the structure. The user will be able to jump between a comment they have highlighted and a block in the workspace.

### Ability to Use both Hotkeys and Mouse

In order for this product to be accessible to blind people, everything must be accessible for use with hotkeys. People that are unable to see the screen cannot use a mouse, so they need to be able to use hotkeys instead. This does not mean that mouse control can be disabled, because this product also needs to be available to sighted people. Hotkeys cannot conflict with mouse control or other hotkeys.

### Accessibility for Screen Readers

The Accessible Blockly plugin is designed with the use of screen readers in mind. WAI-Aria attributes are utilized throughout the program to enhance the semantics of every item on the page. Users are able to navigate and interact with Blockly using verbose audio information. The user will always know their location on the page or within the workspace as well as how to interact with their current selection. The following screen readers have been tested to work with our plugin: Voiceover, NVDA, JAWS.

### Use of Hooks for Developer Ease

Our plugin follows the convention of Blockly by using hooks throughout the entirety of our codebase. This means that if a developer wants to hook into one of the functions we’ve written in order to accomplish something for their custom version of Blockly, they can do so while supporting all future updates of our code.

### Quick Reference Guide

The user will have the ability to access an accessible link for each block to find out more information about the block. Each block will have a basic explanation of how and where it can be used. The guide will also include a page that provides information on hotkeys that are available to Blockly.

## List of Hotkeys:

Alt Shift C: toggle collapse/expand  
Alt Shift D: duplicate  
Alt Shift E: toggle enable/disable  
Alt Shift H: navigate to help page for selected block  
Alt Shift I: toggle inline  
Ctrl Y: redo  
Ctrl Z: undo  
Delete: delete a block  
Enter: leaves editing a field and saves the field  
Escape: exit current field or menu  
A: traverse out  
C: add a comment to selected block  
D: traverse in  
G: jump to associated block or comment  
R: jump to top of section  
S: traverse down  
W: traverse up

# Technical

## Libraries Used

We are using the Google Closure library for Javascript. This is necessary, because in order to keep our code up to Google coding standards, we need to use Closure.

## Coding Standards

Link to the coding standards can be found here: <http://google.github.io/styleguide/javascriptguide.xml>

# Future Plans

## QA Testing

## Building an educational module for students

# Additional Examples