

# Using Lego Spike Prime Sets to Teach Essential Coding Concepts Step-by-step Guide

# Part 1: Aiming the Catapult

## Using Lego Spike Prime Sets to Teach Essential Coding Concepts Step-by-step Guide

- 1) Go to the Lego Spike Website: <https://spike.legoeducation.com/>. Make sure you are using Google Chrome for your browser
- 2) Click on “Spike Prime”

### Select your SPIKE™ solution



SPIKE

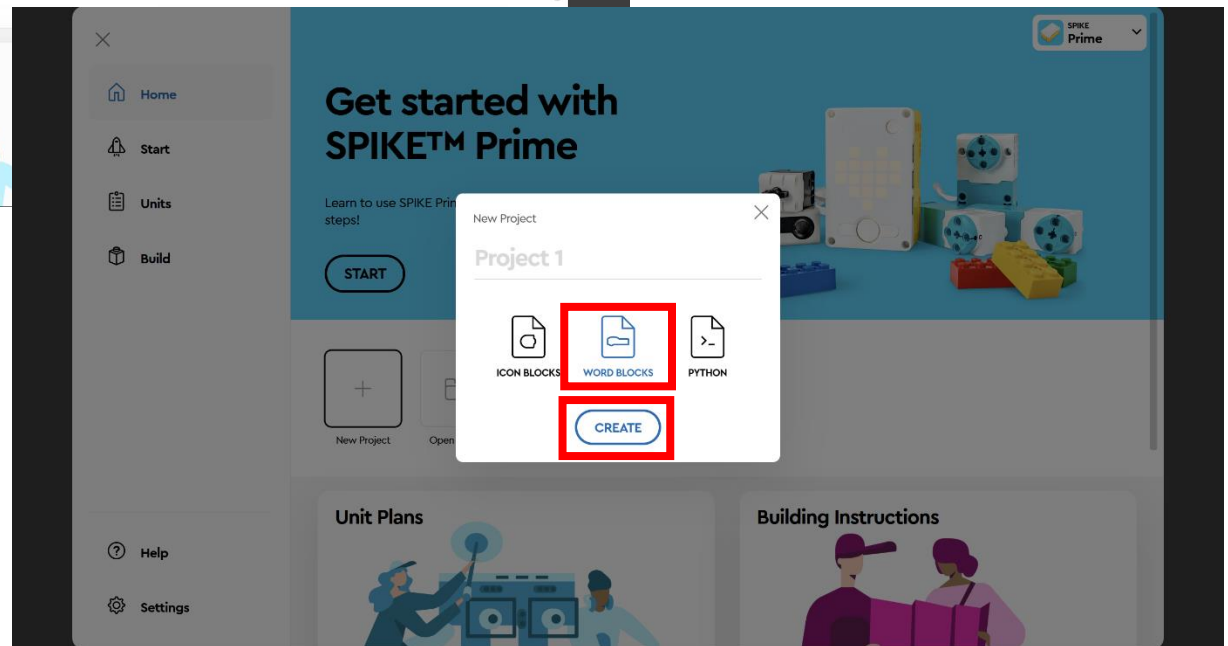
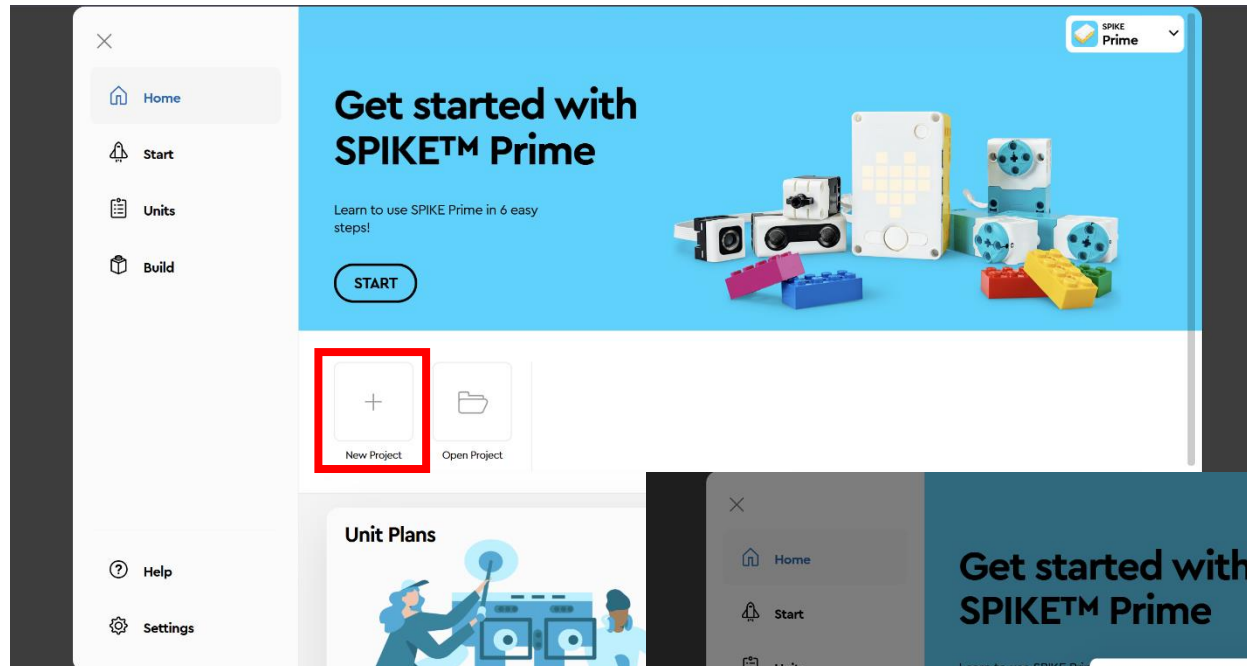
**Essential**

SPIKE

**Prime**

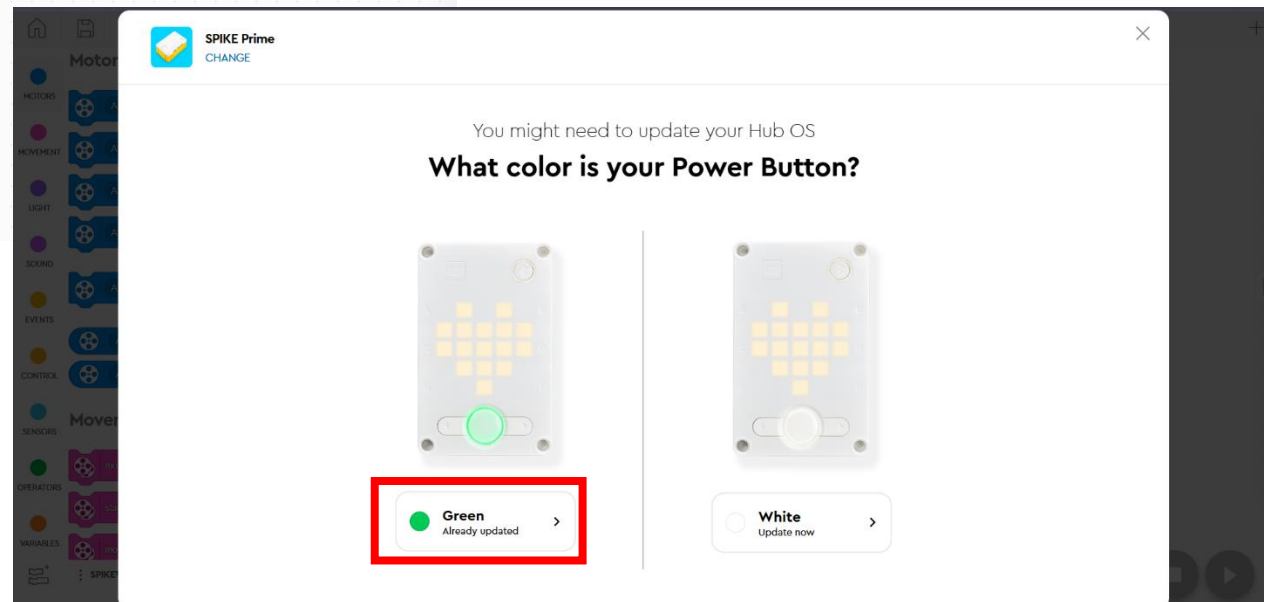
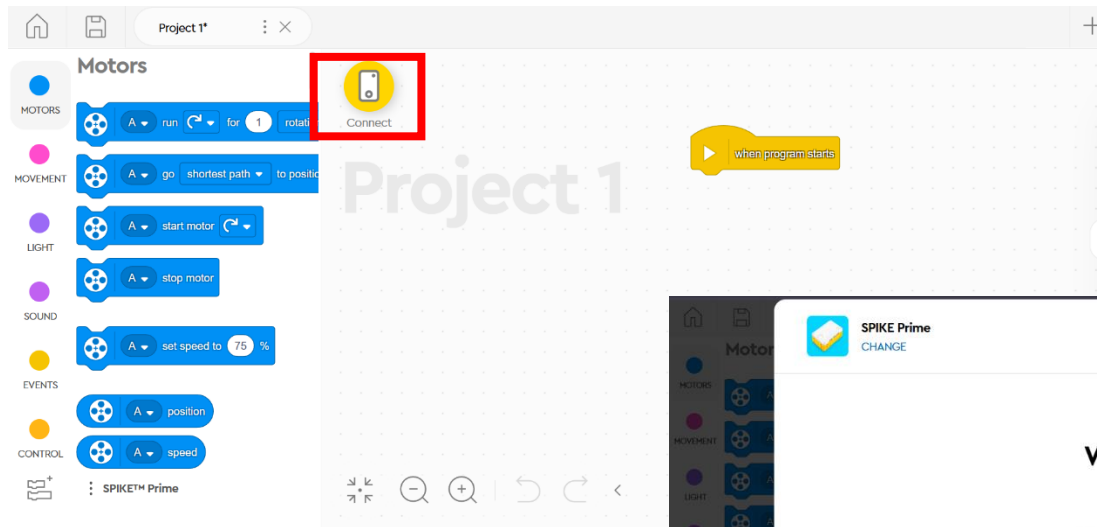
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- 3) For the first 2 sections of the workshop, students will build their own code from scratch. Click on “New Project”, then click on “Word Blocks” and “Create”.



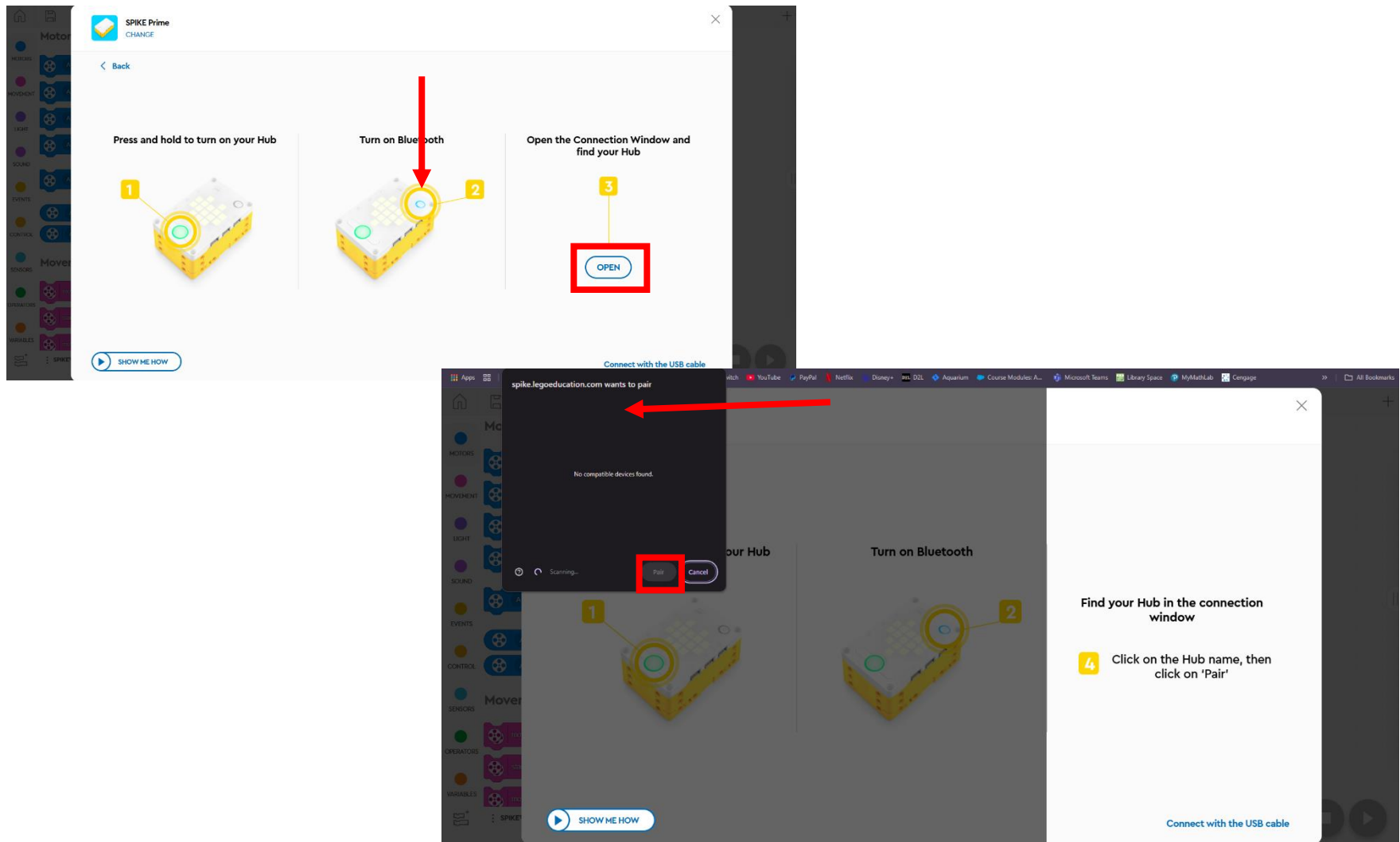
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- 4) To connect to the main hub, click on “Connect”.
- 5) Grab your hub press the main button. If is updated click on “Green”, otherwise click on “White” to update and then come back to this step.



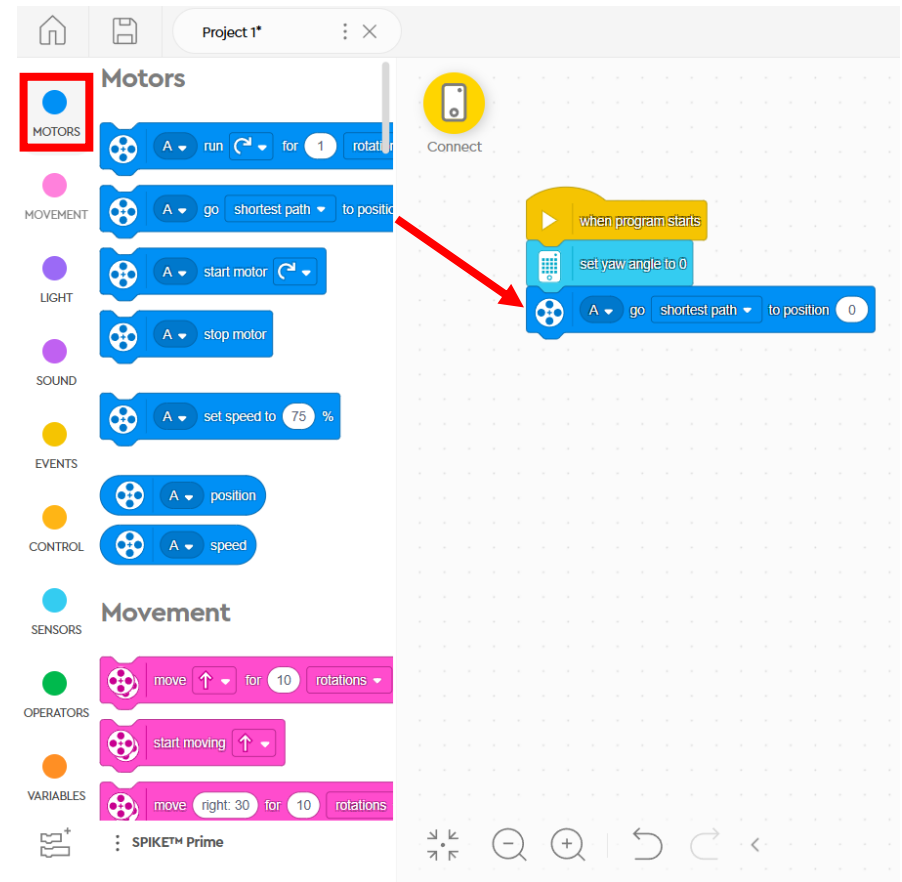
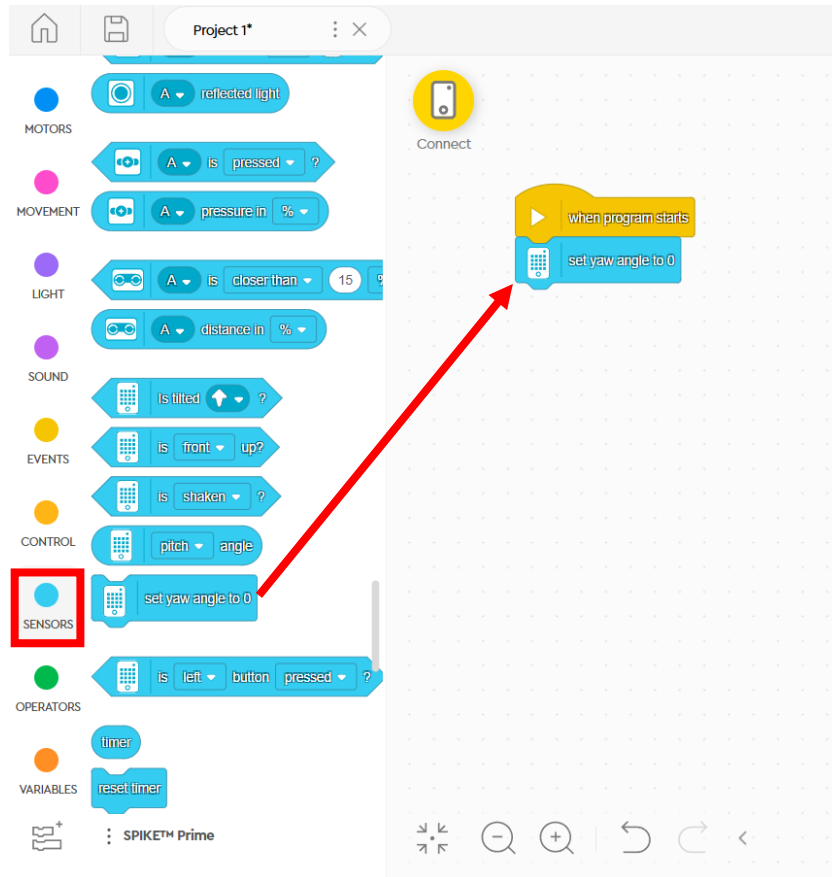
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- 6) Make sure to turn on Bluetooth on your computer. Then press the Bluetooth button on the main hub located in the top-right corner.
- 7) Once Bluetooth is turned on for both devices, click on “Open”.
- 8) On the pop-up window, select the hub and click on “Pair”.



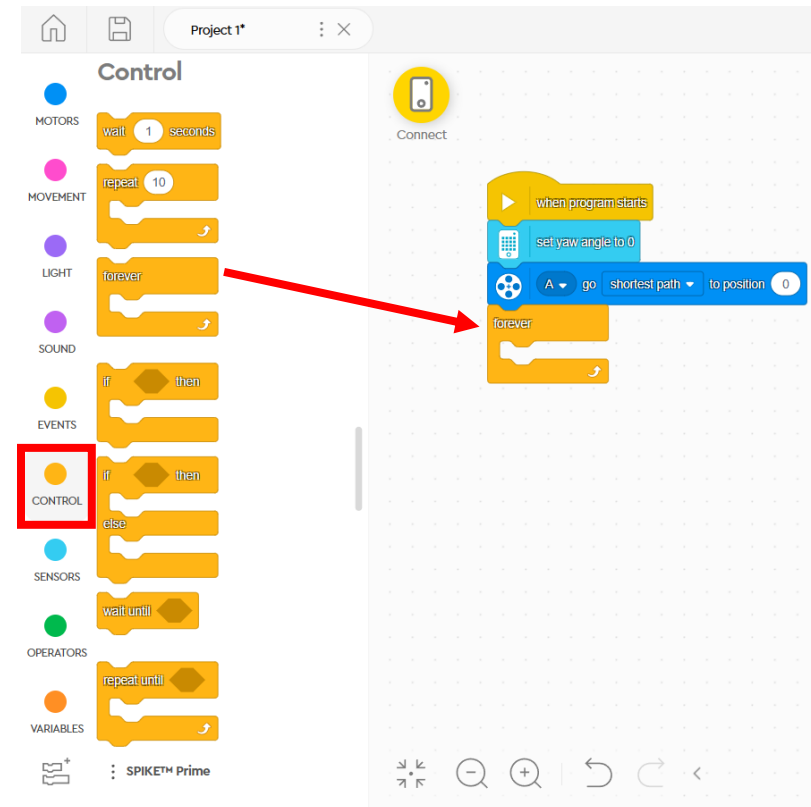
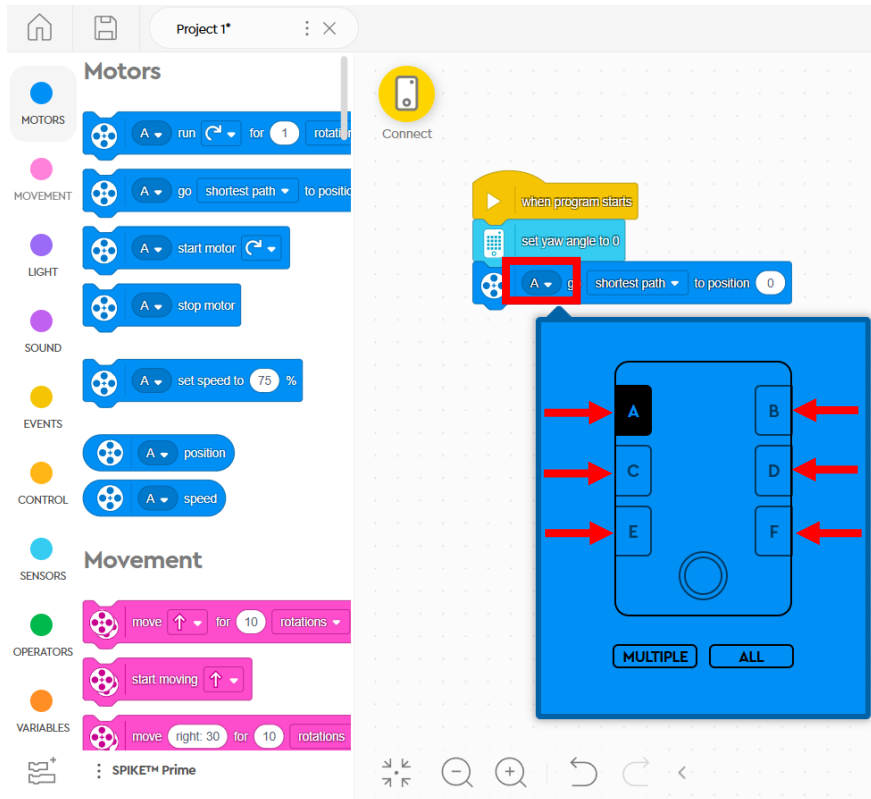
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- 9) To build the code for the first section, start by dragging a “set yaw angle to 0” block into the “when the program starts” event block. It is located under the sensors category.
- 10) Next drag the first motor block to reset the direction. Drag a “go shortest path to position 0” block into the main event block. It is located under the “motors” category.



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- 11) At this point make sure to connect all the components to the main hub (2 motors and 1 pressure sensor). Change the port letter on the motor block by clicking on the letter “A”, then select the letter that corresponds to the motor that aims the catapult (the one located at the base of the catapult)
- 12) Go to the “control” category and drag an “forever” loop block.

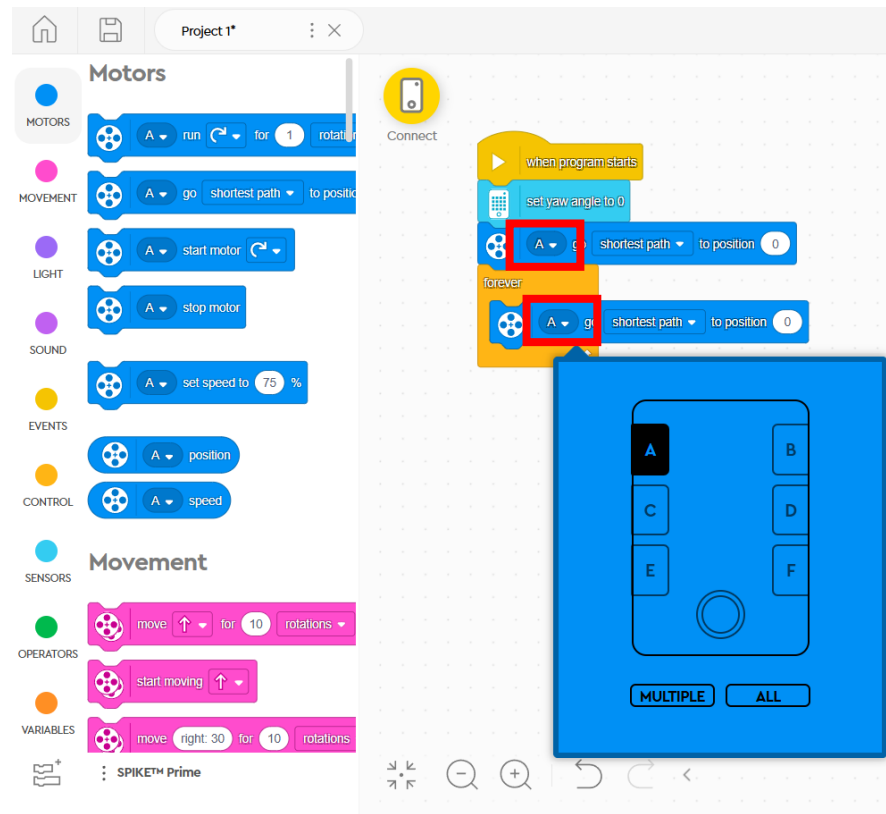
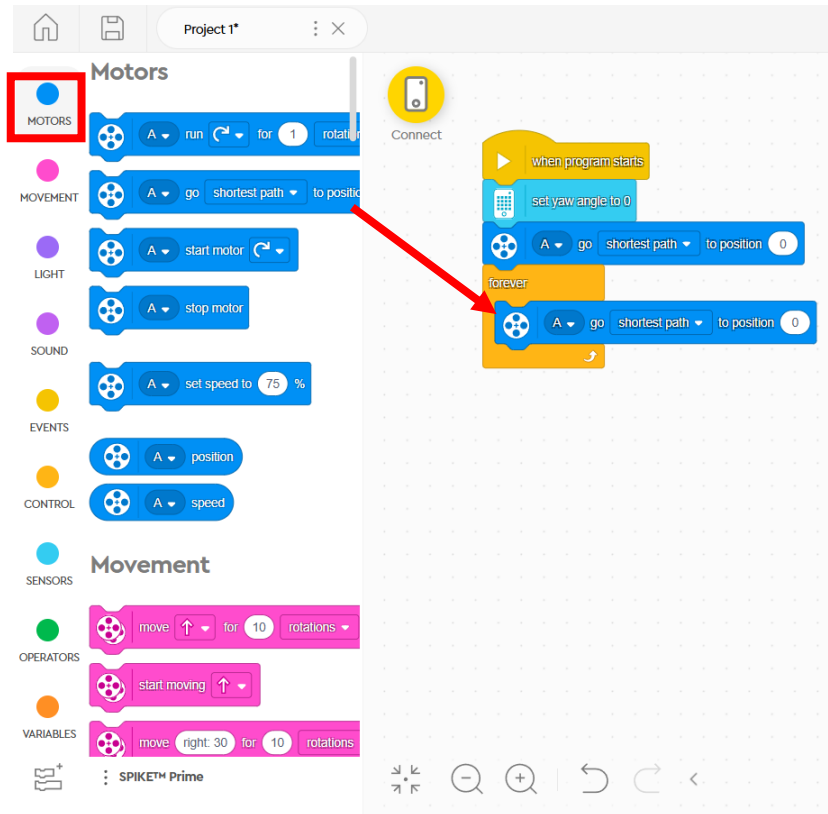




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13) Drag another “go shortest path to position 0” block, this time inside the forever loop.

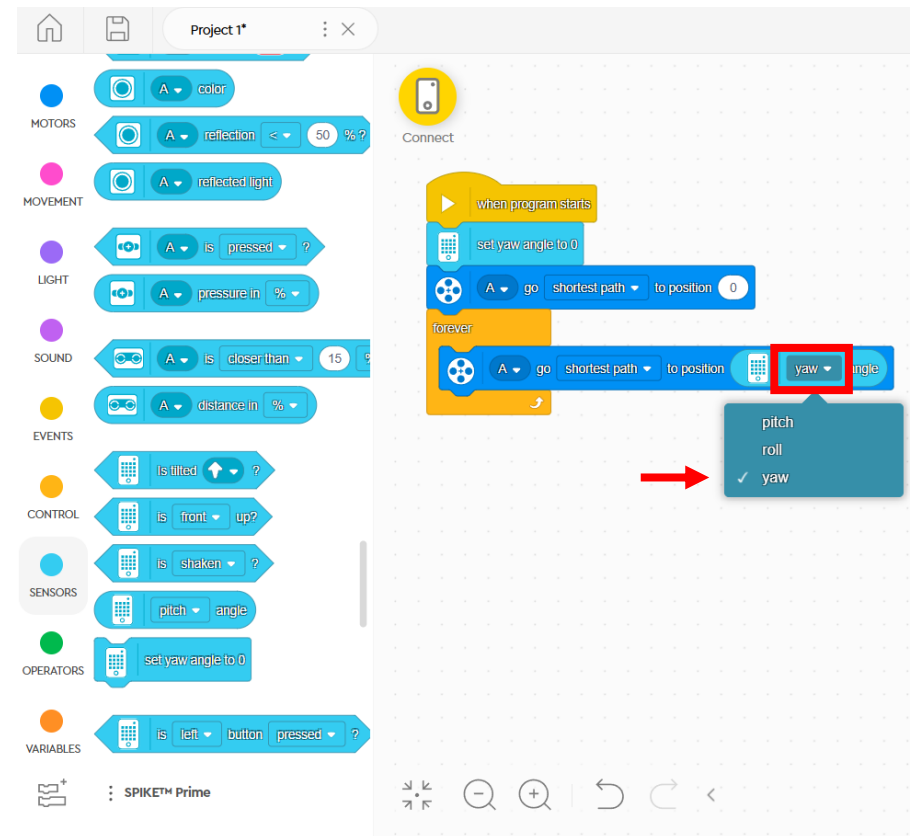
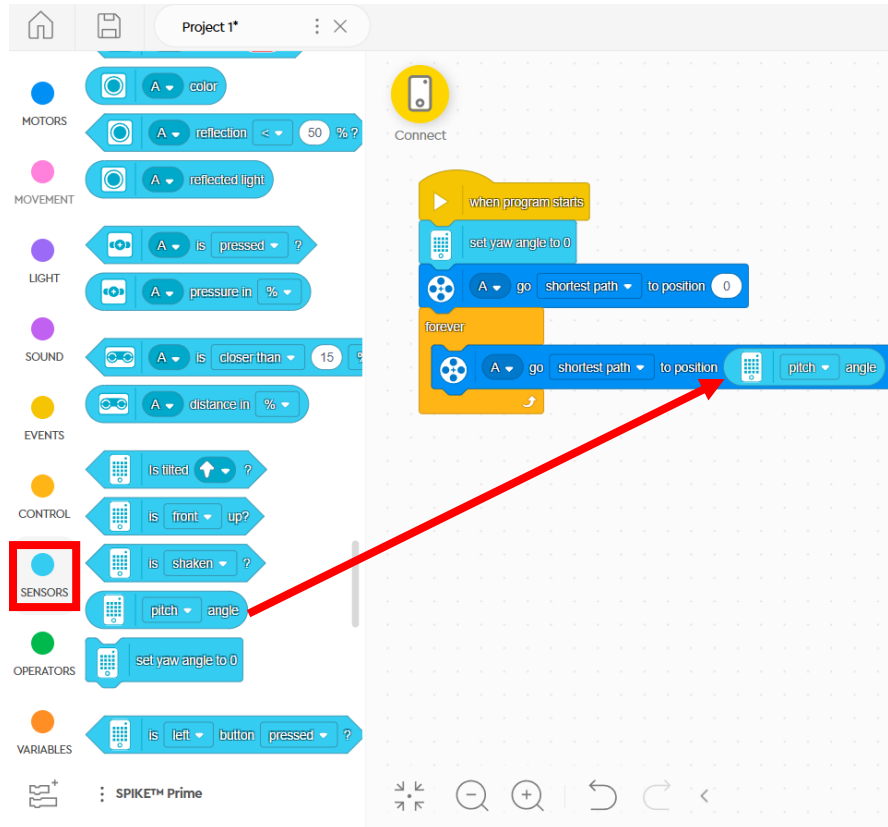
14) Make sure the port letter matches the port used on the previous block.



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15) Go the “sensors” category and drag a “pitch angle” bubble into the “0” on the second motor block.

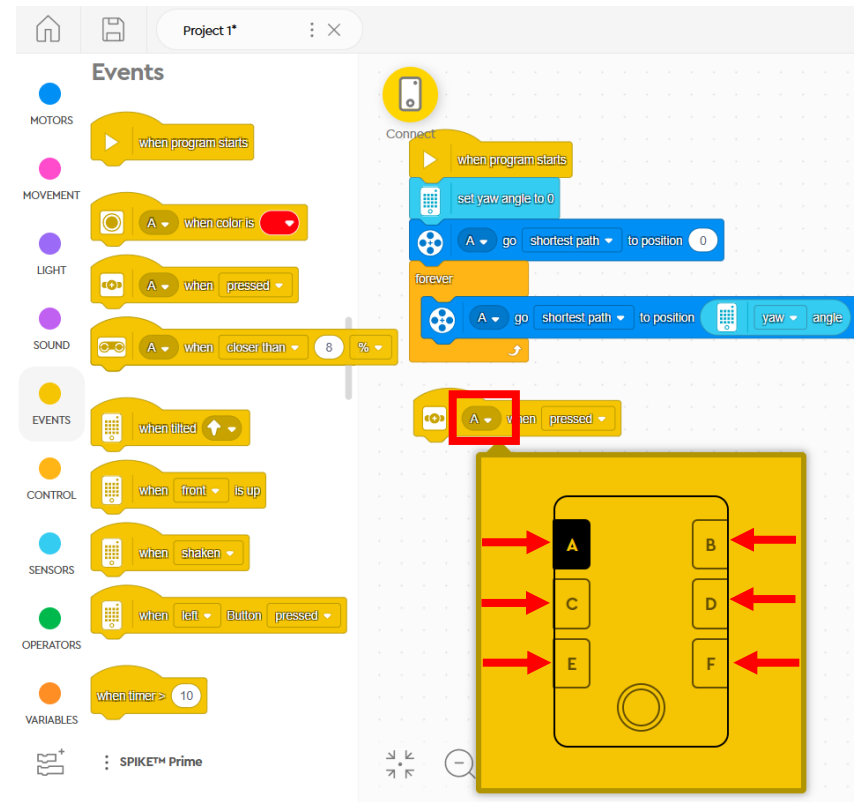
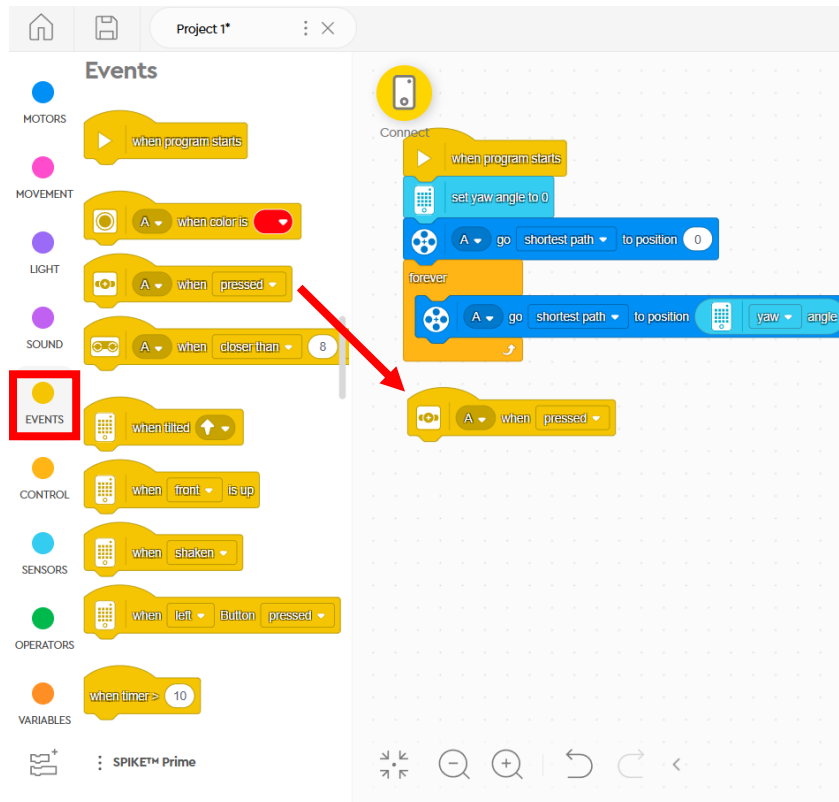
16) Click on “pitch” and change it to “yaw” inside the bubble.



## Part 2: Shooting the Catapult

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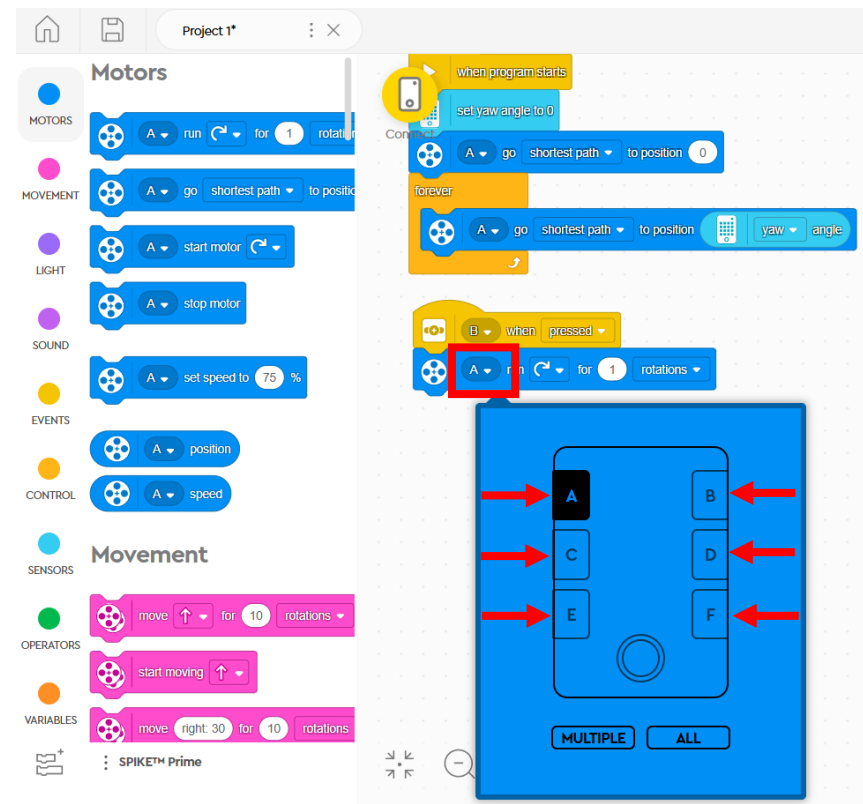
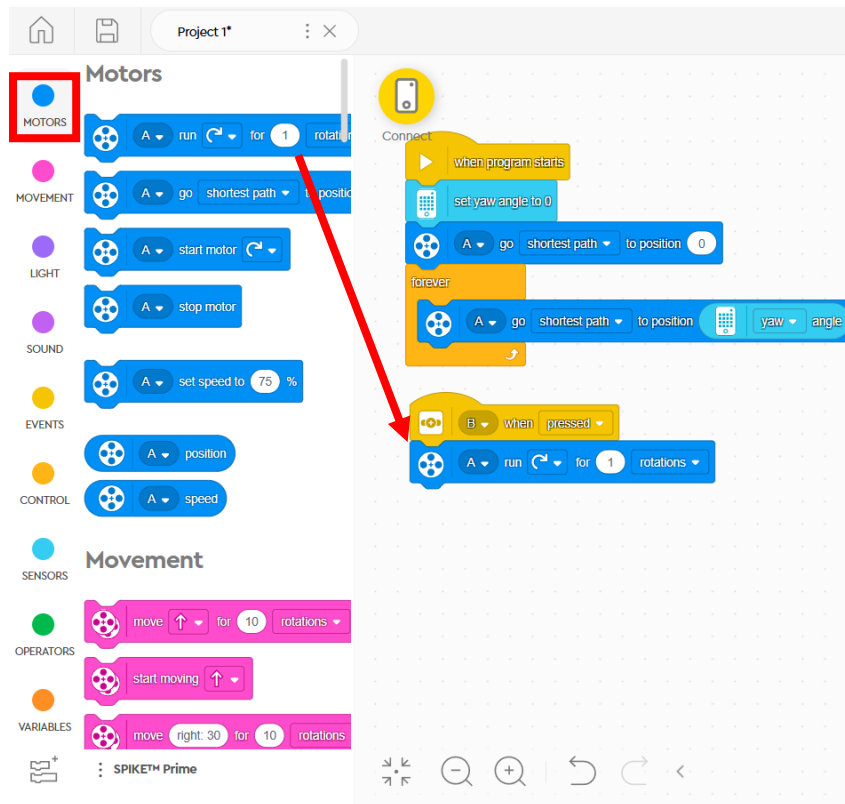
- 17) To continue to the second part of the code, go to the “events” category and drag a “when pressed” event block into the workspace.
- 18) Click on the port letter and change it. Make sure to use the one where the pressure sensor is connected.



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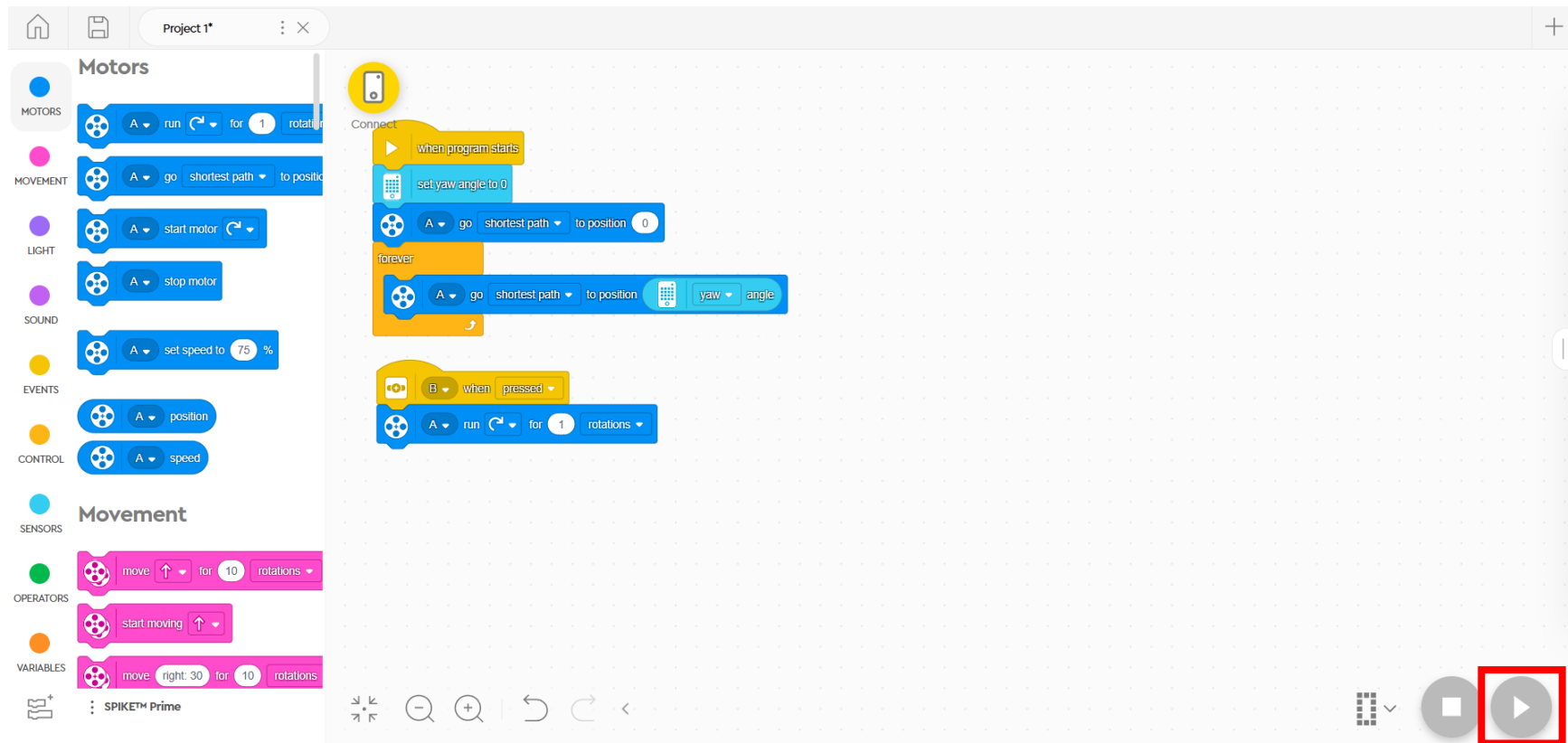
19) Go to the “motors” category. Drag a “run clockwise for 1 rotations” block into the “when pressed” event block.

20) Change the port letter. Make sure to use the letter corresponding to where the motor at the top of the catapult is connected.



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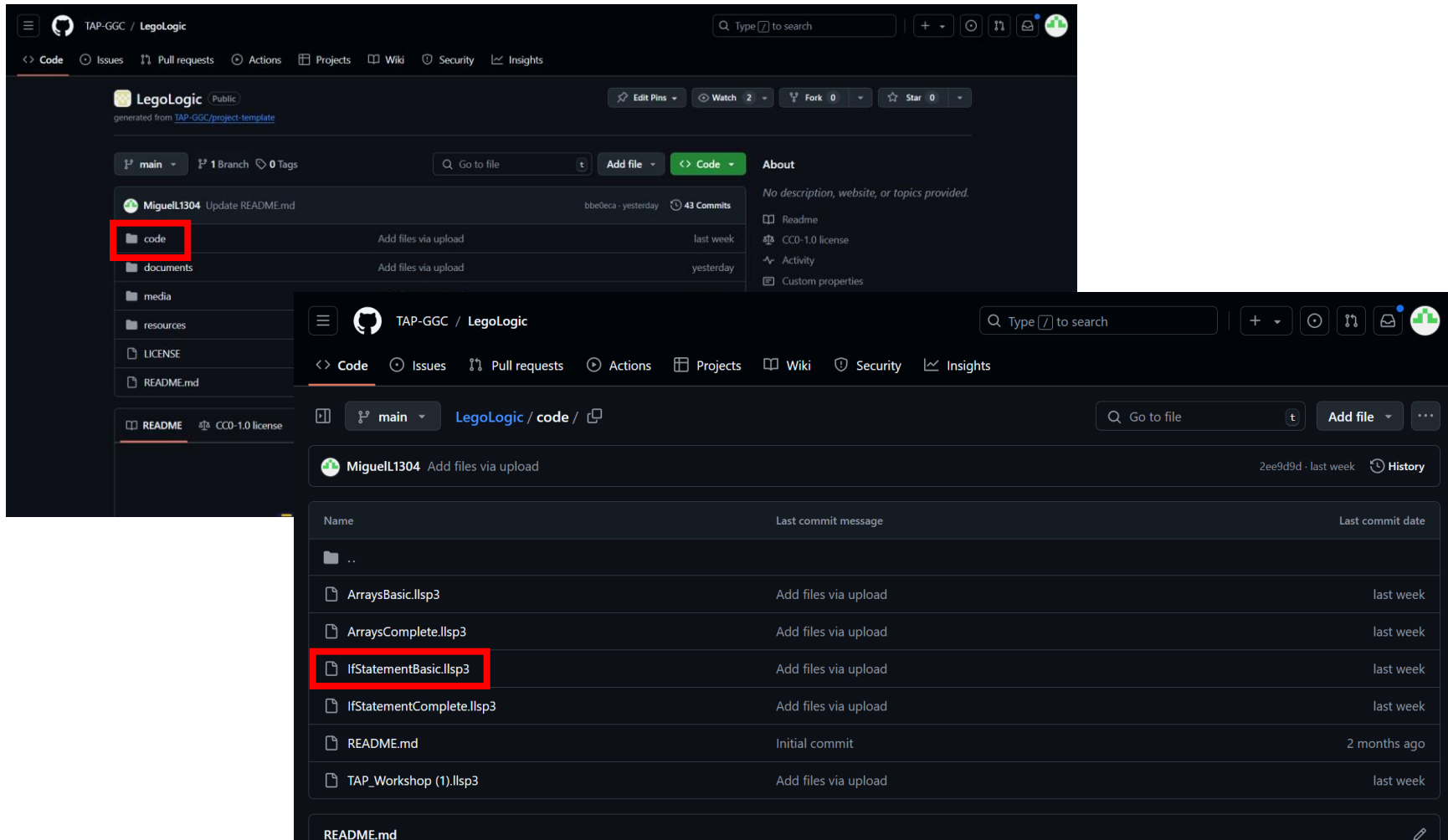
21) At this point students can start testing the catapults and shoot at targets. To start the code click on the start button on the bottom right of the workspace.



# Part 3: Detecting Colors Using If-Statements

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- 22) For the third section of the workshop, students will use an existing project and modify it. Go to the project's GitHub and to the code folder of the repository.
- 23) Download the “IfStatementBasic.llsp3” file.



The screenshot shows the GitHub interface for the repository 'LegoLogic' by user 'MiguelL1304'. The repository is public and has 43 commits. The file structure is shown on the left, with the 'code' folder highlighted. The main content area shows a list of files in the 'code' folder, with 'IfStatementBasic.llsp3' highlighted.

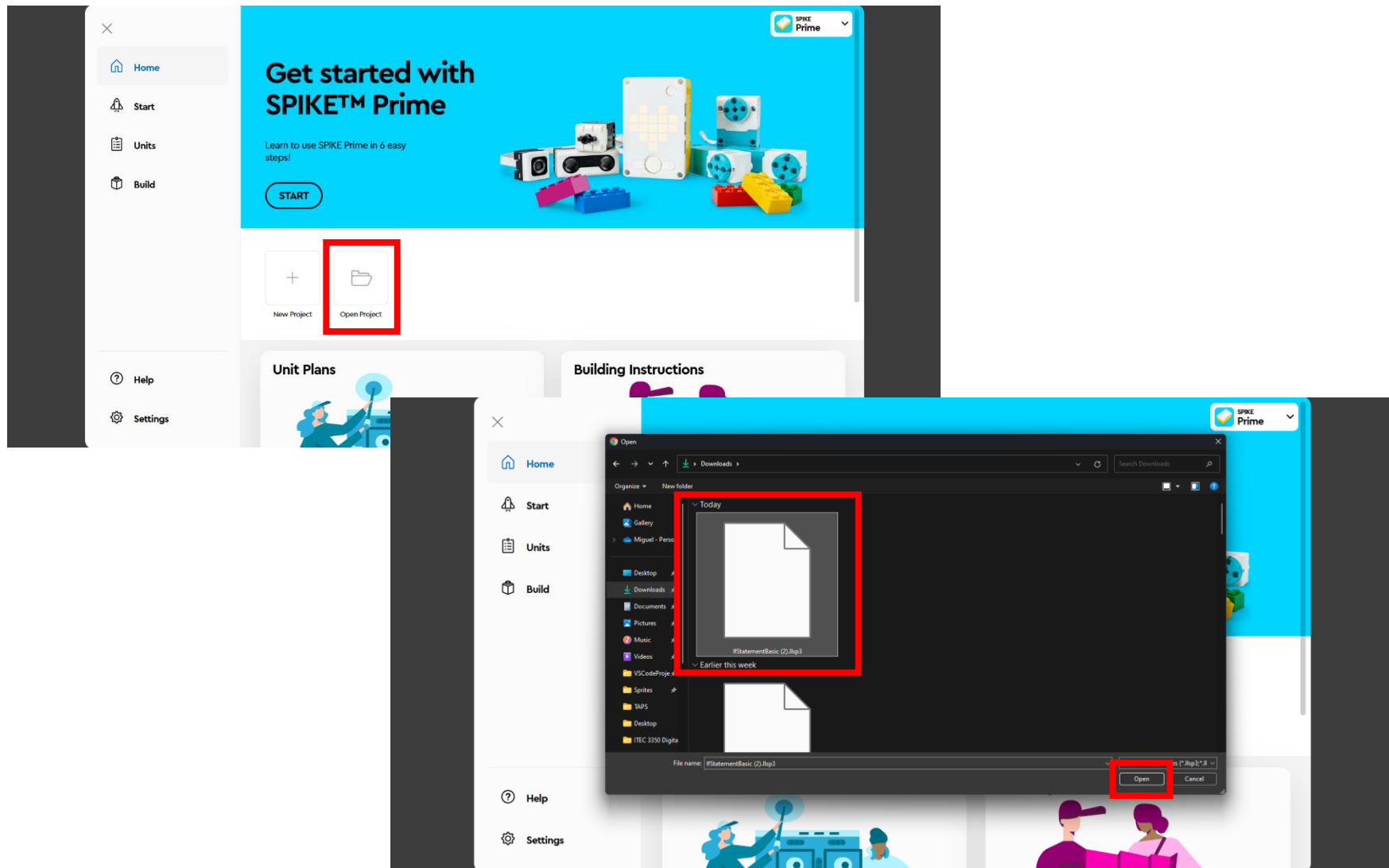
Name	Last commit message	Last commit date
..		
ArraysBasic.llsp3	Add files via upload	last week
ArraysComplete.llsp3	Add files via upload	last week
IfStatementBasic.llsp3	Add files via upload	last week
IfStatementComplete.llsp3	Add files via upload	last week
README.md	Initial commit	2 months ago
TAP_Workshop (1).llsp3	Add files via upload	last week



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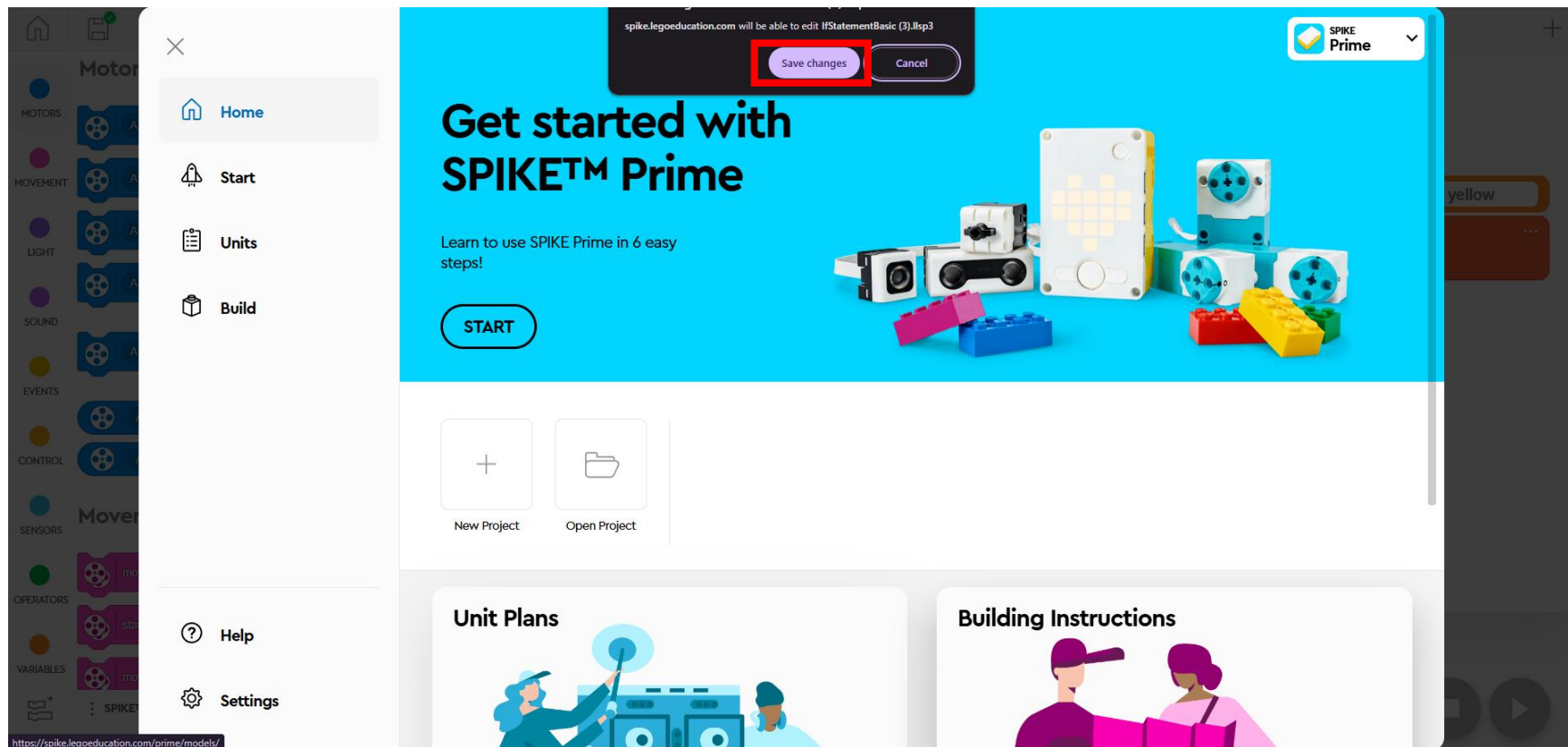
24) Go back to the Spike Prime website. Click on “Open Project” this time.

25) Go to the downloads folder and open the file.



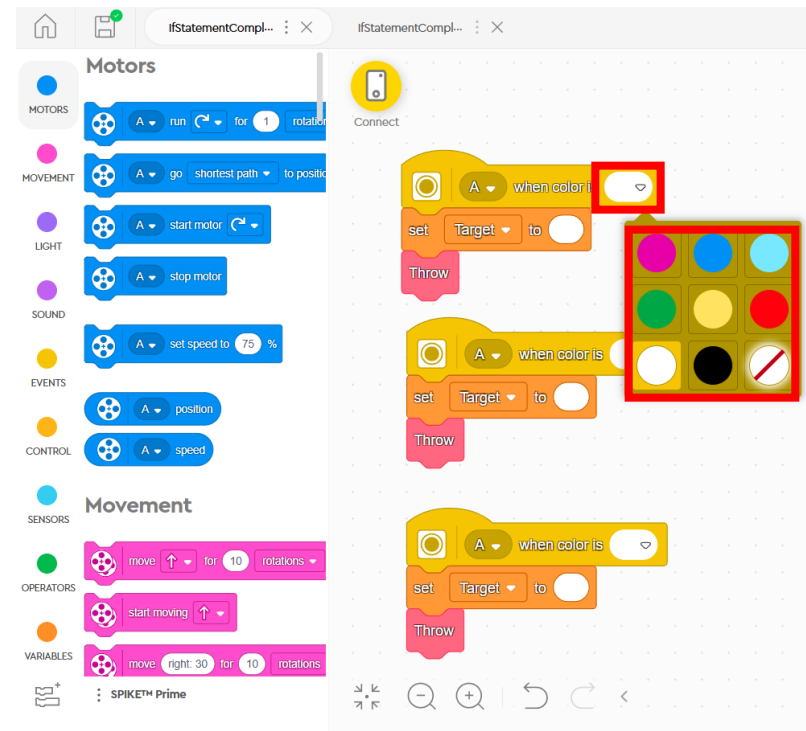
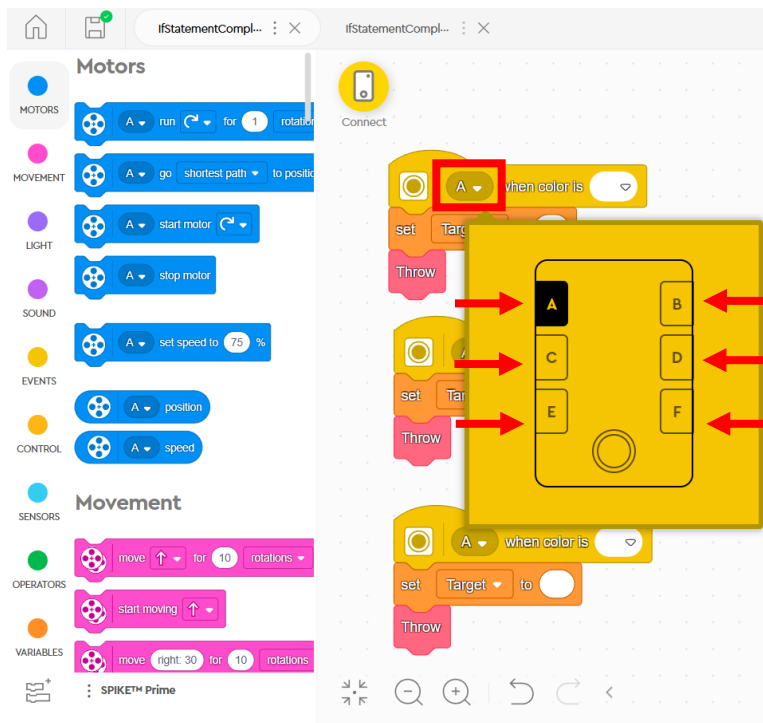
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26) Click on “Save changes” if you want to save the modifications to the code.



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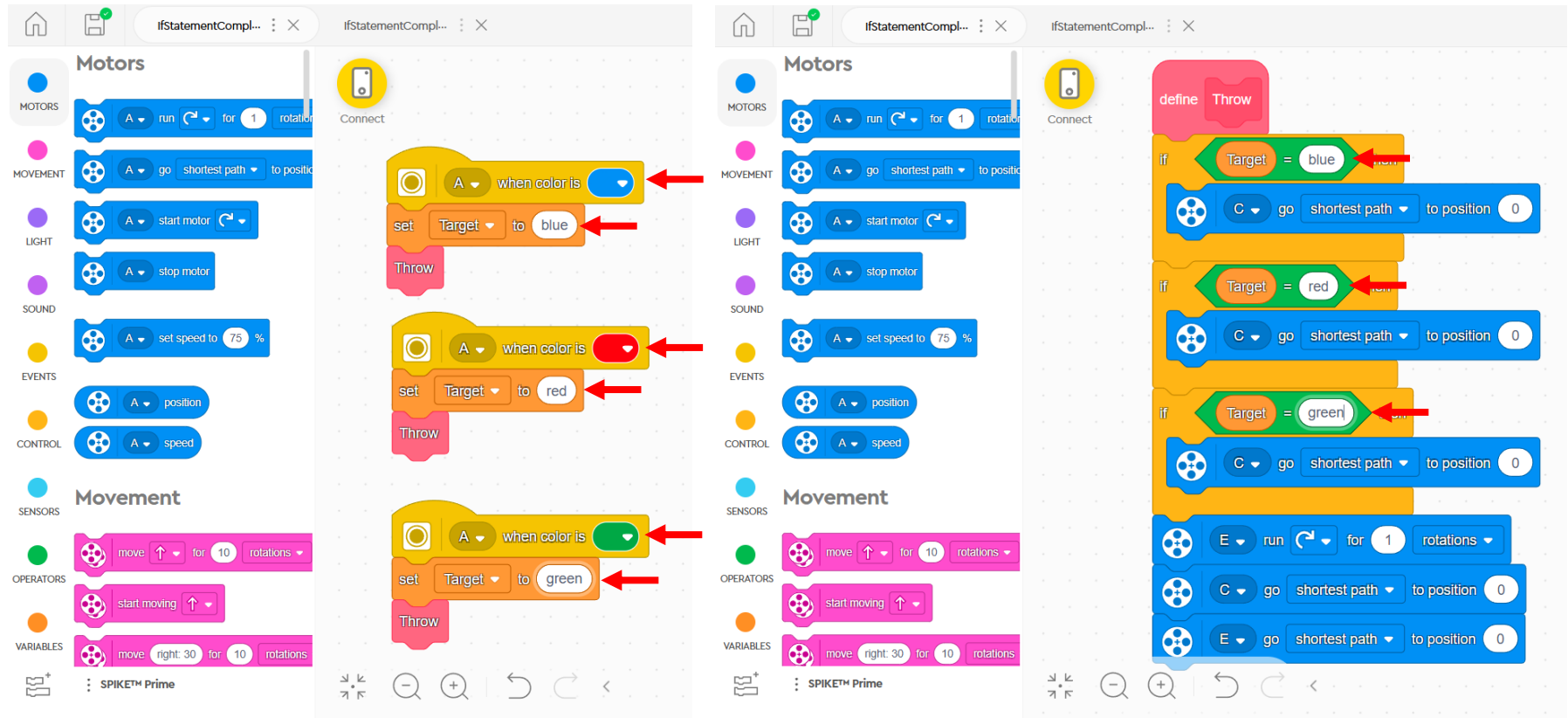
- 27) Go to the color sensor event blocks. Make sure to change the pressure sensor with the color sensor. Change the port letter to the where the new sensor is connected. Repeat for each one of the event blocks.
- 28) Give each team 3 Lego blocks of different colors. Change the detected colors of the events blocks to match those 3 Lego blocks.



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29) Type the name of each color inside of the “set Target to” block. Make sure to match that with the color the event block is detecting.

30) Go to the “Throw” function block. Type those same colors inside each one of the If-statement blocks.



The image displays three sequential screenshots of the Lego Spike Prime coding environment, illustrating the step-by-step setup of a 'Throw' function block.

**Left Screenshot:** Shows the initial setup. The 'Throw' block is added to the workspace. The 'when color is' block is set to 'blue'. The 'set Target to' block is set to 'blue'. The 'Throw' block is set to 'Throw'.

**Middle Screenshot:** Shows the next step. The 'when color is' block is set to 'red'. The 'set Target to' block is set to 'red'. The 'Throw' block is set to 'Throw'.

**Right Screenshot:** Shows the final step. The 'when color is' block is set to 'green'. The 'set Target to' block is set to 'green'. The 'Throw' block is set to 'Throw'.

The workspace includes the following blocks:

- Motors:** A run for 1 rotation, A go shortest path to position, A start motor, A stop motor, A set speed to 75%.
- Movement:** A move up for 10 rotations, A start moving up, A move right 30 for 10 rotations.
- Sensors:** A when color is, A position, A speed.
- Operators:** A set Target to.
- Variables:** A move right 30 for 10 rotations.

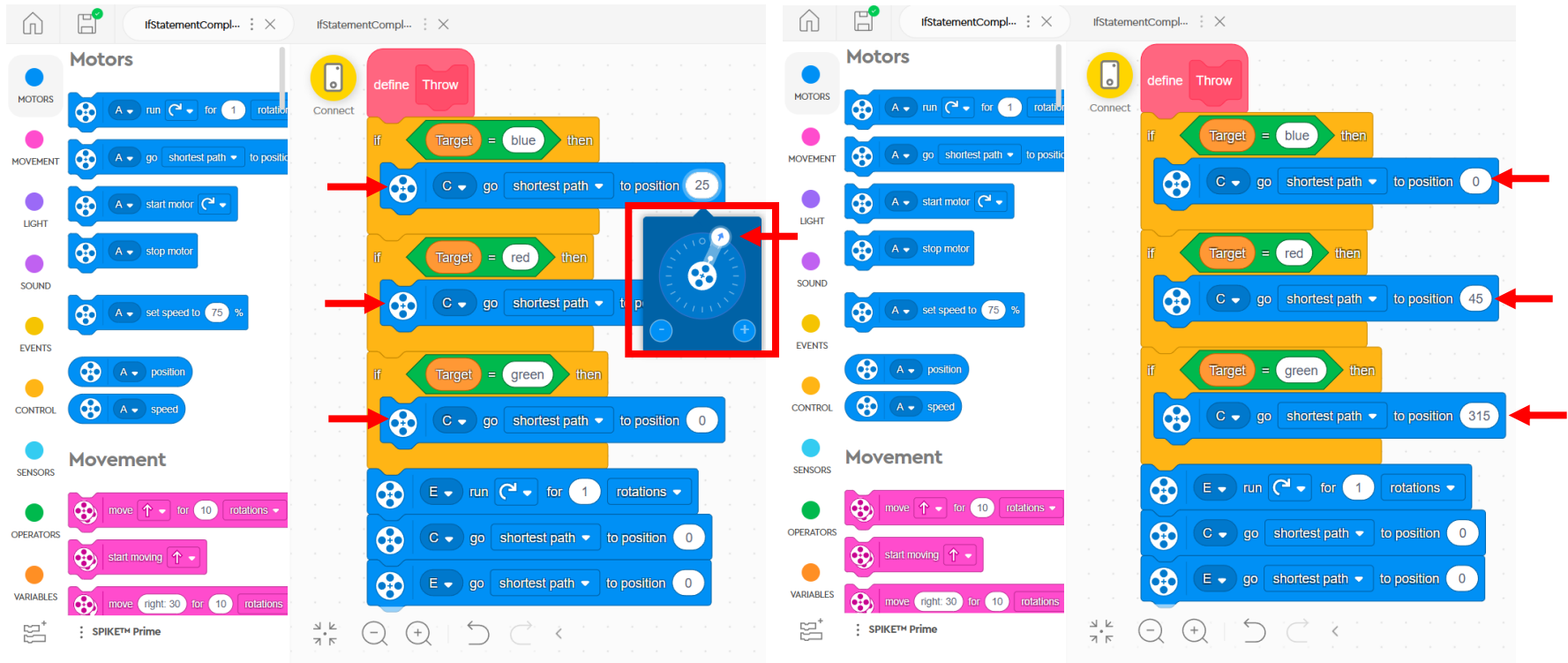
The 'Throw' block is defined with the following logic:

```

define Throw
  if Target = blue
    C go shortest path to position 0
  if Target = red
    C go shortest path to position 0
  if Target = green
    C go shortest path to position 0
    E run for 1 rotations
    C go shortest path to position 0
    E go shortest path to position 0
  
```

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- 31) Change the angle of each one of the motor blocks inside each if-statement. Dragging the arrow on the wheel helps you visualize the direction the motor will aim at.
- 32) We suggest starting with 0, 45, and 315 degrees to shoot forward, right, and left respectively. You can adjust these numbers to aim at your specific targets.



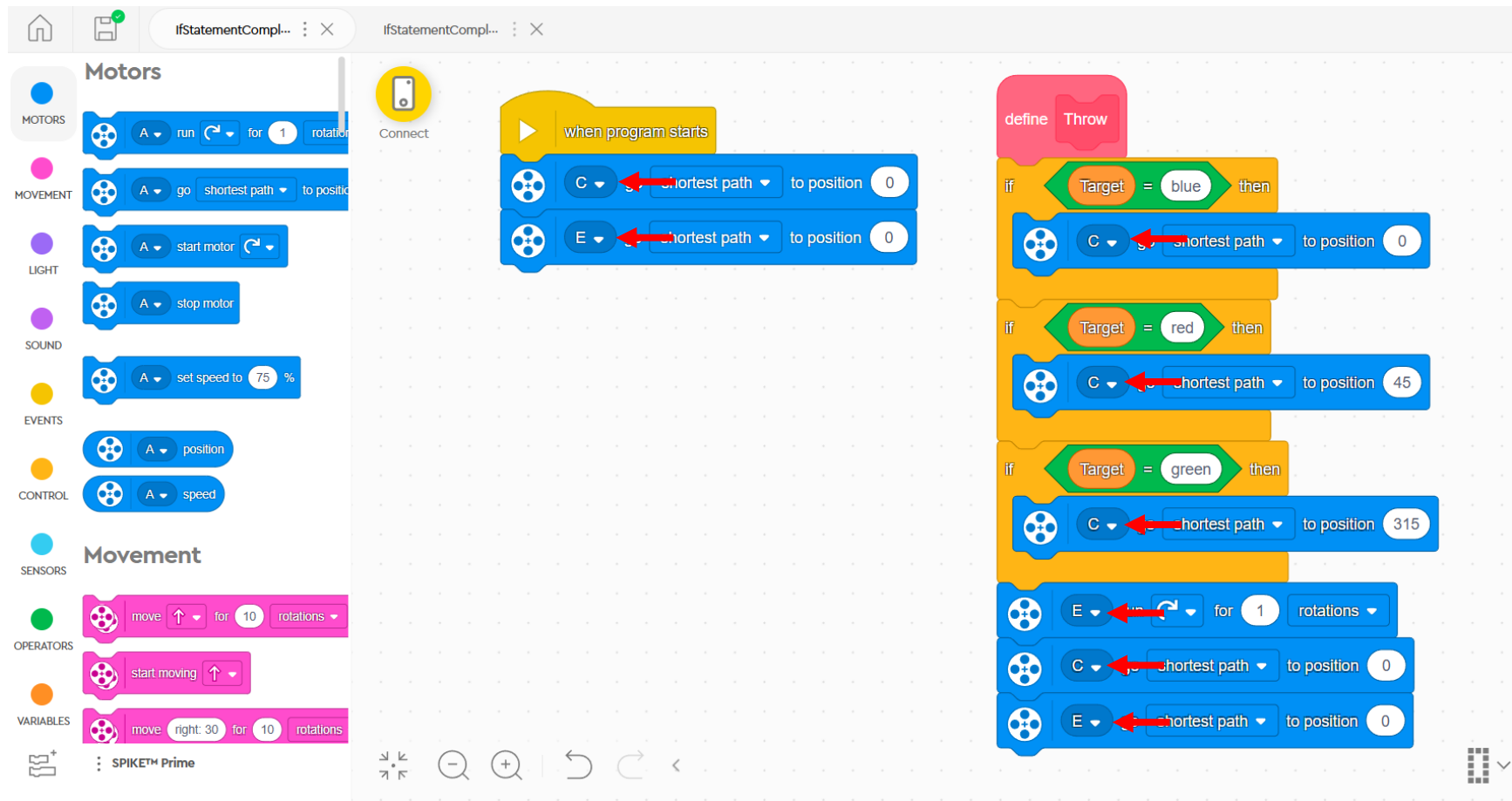
The image displays three sequential screenshots of the LEGO Spike Prime coding environment, illustrating the process of adjusting motor angles for different targets. The interface shows a 'define Throw' function with three conditional blocks based on the 'Target' sensor (blue, red, and green).

- Left Screenshot:** The 'Throw' function is defined. The 'if Target = blue' block has a motor block set to 'go shortest path to position 25'. The 'if Target = red' block has a motor block set to 'go shortest path to position 0'. The 'if Target = green' block has a motor block set to 'go shortest path to position 0'. A red box highlights the 'go shortest path to position 0' block for the red target, and a red arrow points to the '0' value.
- Middle Screenshot:** The 'Throw' function is modified. The 'if Target = blue' block has a motor block set to 'go shortest path to position 0'. The 'if Target = red' block has a motor block set to 'go shortest path to position 45'. The 'if Target = green' block has a motor block set to 'go shortest path to position 315'. Red arrows point to the '0', '45', and '315' values respectively.
- Right Screenshot:** The 'Throw' function is further modified. The 'if Target = blue' block has a motor block set to 'go shortest path to position 0'. The 'if Target = red' block has a motor block set to 'go shortest path to position 45'. The 'if Target = green' block has a motor block set to 'go shortest path to position 315'. Red arrows point to the '0', '45', and '315' values respectively.

The interface also shows a 'Movement' section with blocks for 'move' and 'start moving'.

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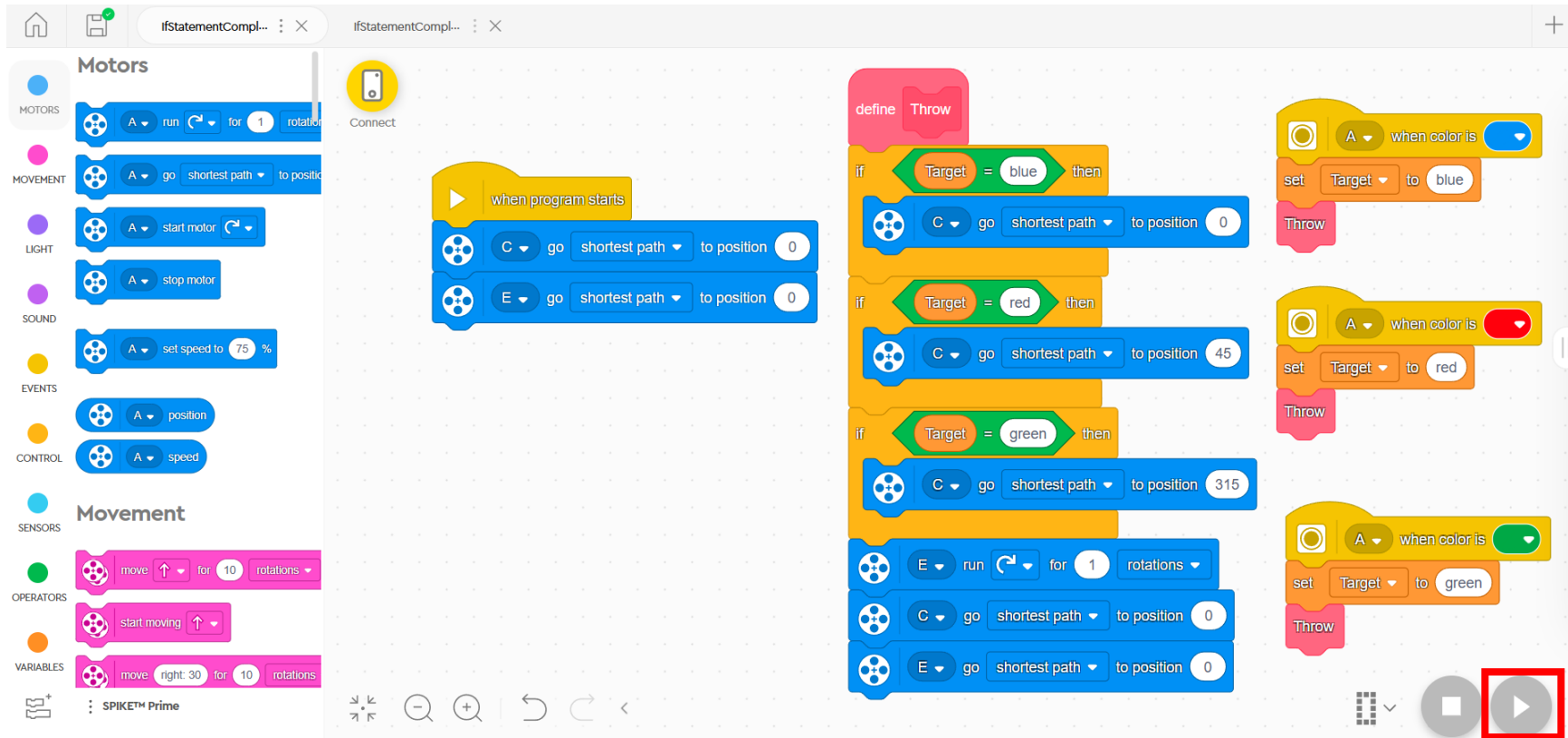
- 33) Before testing the code, make sure to change each one of the motor blocks to use the correct letter port. Blocks with the port “C” correspond to the motor that aims the catapult, located at the base. Blocks with the port “E” correspond to the motor that shoots, located at the top of the catapult. You may also plug in these two motors to ports “C” and “E” to match the existing code.



The screenshot displays the LEGO Spike Prime coding environment. On the left, the 'Motors' and 'Movement' categories are visible in the block palette. The main workspace shows a program starting with a 'when program starts' block, followed by two 'shortest path' blocks for ports C and E, both set to position 0. A 'define Throw' block contains three conditional blocks: 'if Target = blue then C to position 0', 'if Target = red then C to position 45', and 'if Target = green then C to position 315'. After the conditionals, there is a 'for 1 rotations' block for port E, followed by 'shortest path' blocks for ports C and E to position 0. Red arrows point to the port dropdowns in the 'shortest path' blocks, indicating the need to change them to the correct motor port (C or E).

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34) Click on the play button to test the code. Show a color to the sensor to the catapult aim and shoot at the corresponding target.



The screenshot shows the LEGO Spike Prime coding environment. The left sidebar contains categories: MOTORS, MOVEMENT, LIGHT, SOUND, EVENTS, CONTROL, SENSORS, OPERATORS, and VARIABLES. The main workspace displays a program with the following blocks:

- when program starts** (yellow block)
- Motor A** go shortest path to position 0 (blue block)
- Motor C** go shortest path to position 0 (blue block)
- Motor E** go shortest path to position 0 (blue block)
- define Throw** (pink block)
- if Target = blue then** (green block)
  - Motor C** go shortest path to position 0 (blue block)
- if Target = red then** (green block)
  - Motor C** go shortest path to position 45 (blue block)
- if Target = green then** (green block)
  - Motor C** go shortest path to position 315 (blue block)
- Motor E** run for 1 rotations (blue block)
- Motor C** go shortest path to position 0 (blue block)
- Motor E** go shortest path to position 0 (blue block)

On the right side, there are three sensor blocks:

- when color is blue** (yellow block)
  - set Target to blue** (orange block)
  - Throw** (pink block)
- when color is red** (yellow block)
  - set Target to red** (orange block)
  - Throw** (pink block)
- when color is green** (yellow block)
  - set Target to green** (orange block)
  - Throw** (pink block)

The play button at the bottom right is highlighted with a red box.