2017 Hour of Code with Tickle
BB-8 Swing

Overview

Join BB-8 for a good swing! Use the force of Tickle app and program your way through with BB-8! Be it a difficult move of a figure 8, or tilt your device to move BB-8 in different directions, code away some swag moves for BB-8 to perform. Let's swing!

With Tickle, a user-friendly coding app, you can easily program BB-8 to move in a number of ways by simply dragging and dropping coding blocks to create a command for it to follow.

Lessons

Lesson 1: Intro to BB-8

Overview

- Program BB-8 to move in a square pattern.

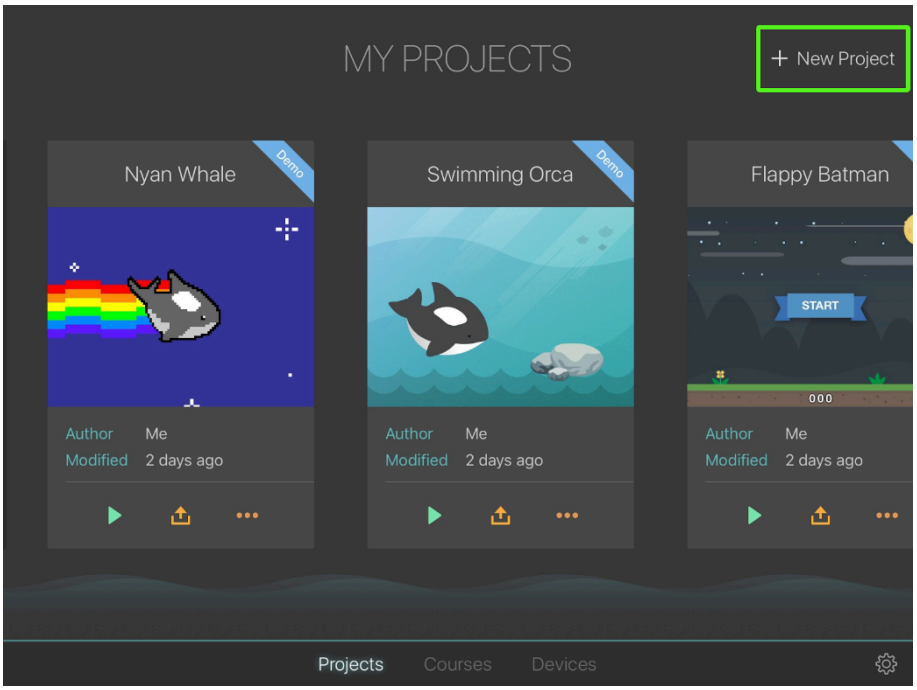
Objectives

- Become familiar with visual programming.
- Program BB-8 to perform actions using basic motion commands.
- Learn the usage of repeating blocks, or loops, which allows code to run multiple times consecutively.

Steps

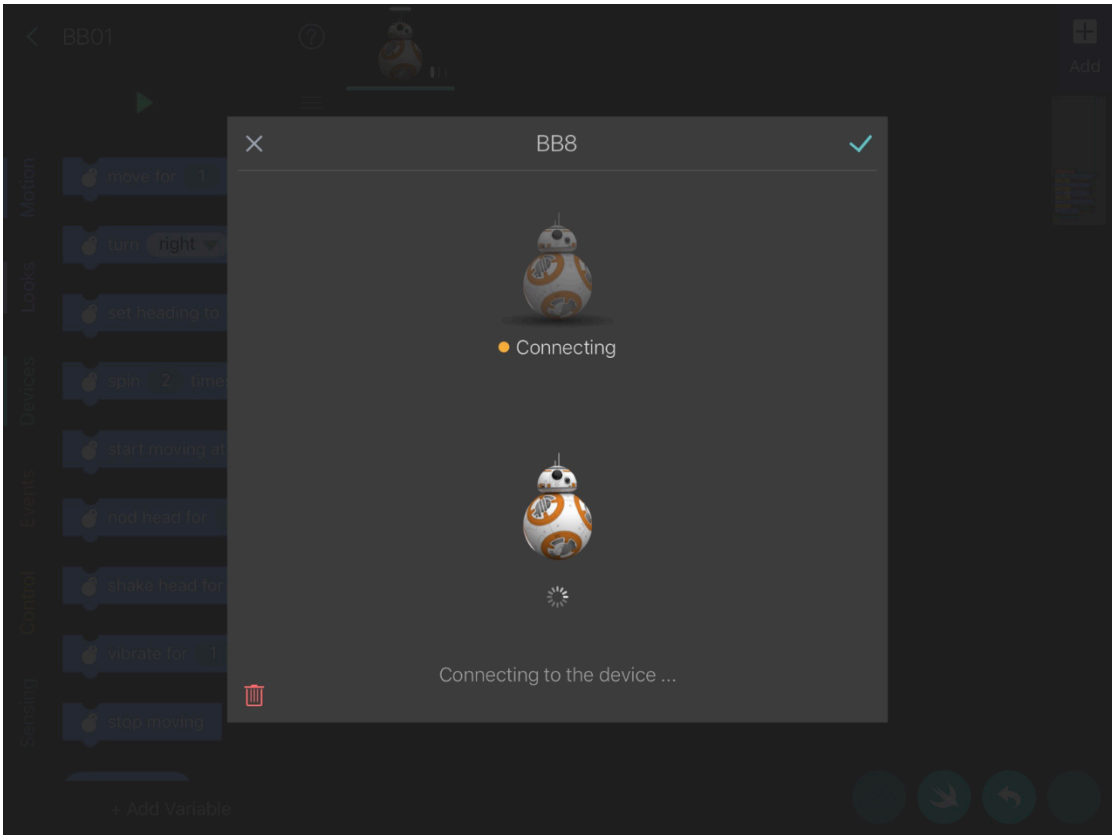
1. Create a BB-8 Project

- Create a new BB-8 project by tapping `+ new Project` via "MY PROJECTS". Choose the template for "Star Wars BB-8".

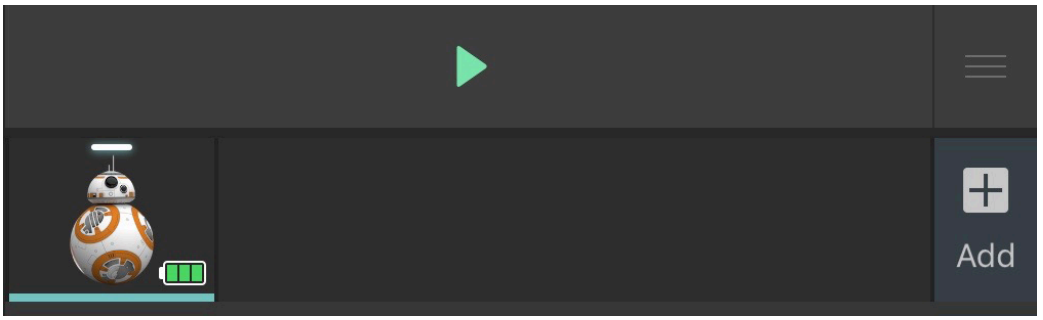


2. Connect to BB-8

- Activate Bluetooth on your iPhone or iPad.
- Tap the BB-8 icon at the top of the screen to open the connection menu. Select your BB-8.
    - Note: Swipe left/right if you have multiple devices.

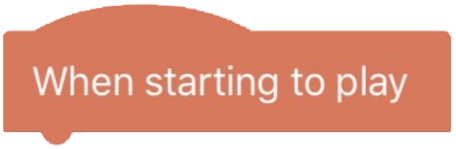


- The BB-8 will show a battery status icon if it's successfully connected. Please charge BB-8 whenever the battery status becomes red, because it may stop responding to your commands.

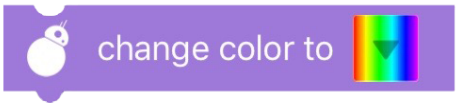


3. Block Review

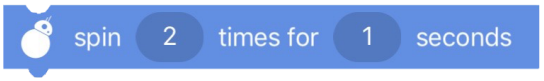
- Let's start by reviewing the provided template that appears when the project is created:



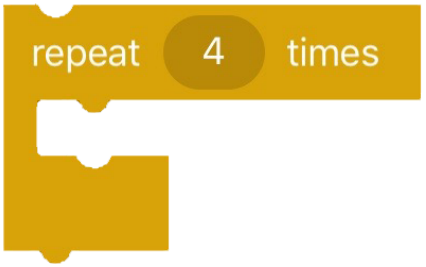
-   : This `Event` block will run the following code blocks when the green play button is pressed.



- : This block, located in the `Looks` category, will change BB-8's color to the selected color.



- : Located in the `Motion` category; makes BB-8 spin a set number of times within a certain duration.
  - Note: The spin speed has a limit, so if the duration is not long enough, BB-8 will not complete all of the spins you write.

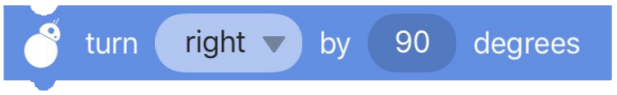


- : Any code inside this `Control` block loop will repeatedly run a set

number of times, before moving on and performing other actions.
    - Note: For example, if you set the number to 4, the code inside will consecutively run 4 times, and then move on.

-   : This motion block will move BB-8 for a set duration at a certain speed.
    - Note: For example, BB-8 will move for 1 second at 80% of his maximum speed.

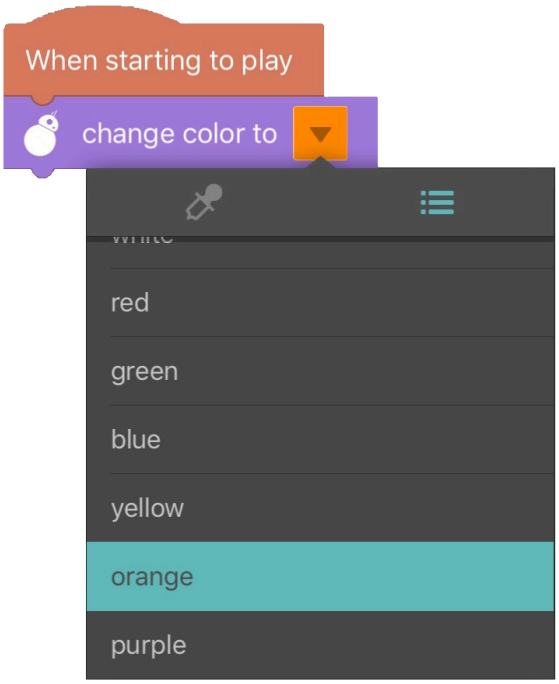
-   : This control block will pause the current section of code for a set duration.
    - Note: For example, BB-8 will not follow any more commands until 2 seconds has passed.



- : This motion block will make BB-8 turn left or right by a set angle.

4. Program BB-8 to change color and spin

- Before starting on this lesson, remove the template program. Hold and drag the blocks beneath the `when starting to play` block, and drag it to the delete area that appears.
- Let's begin by changing BB-8's color. We'll use a `change color to ...` block for this. For this lesson, let's set the color to orange.



- To make BB-8 spin in place, add a `spin 2 times for 1 seconds` block. This block makes BB-8 spin a certain number of times in a set duration. Let's change the number of spins to 5, and set the duration to 2 seconds.
- At this point the code should look like the following:

5. Program BB-8 to move in a square pattern

- To make BB-8 move forwards, add a `move for 1 secs at 50% speed` block.
  - Note: try increasing the time or speed to make a bigger square!
- Add a `turn right by 90 degrees` to make BB-8 turn. To create a square pattern, BB-8 has to turn 4 times to complete a full 360° turn. The number of degrees to turn each time is then **360°** divided by **4** = **90°**.

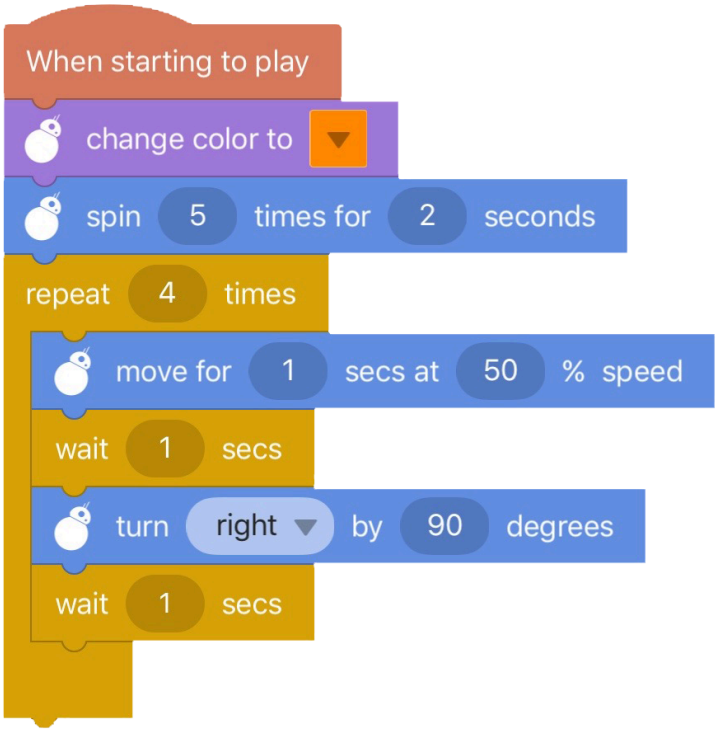
- To program BB-8 to complete the square, copy the `move for 1 secs at 50% speed` and `turn right by 90 degrees` blocks 3 more times. Press play to watch BB-8 move in a square!
  - **Tip*:*** If the actions are too fast, add a `wait 1 secs` block between each command to slow it down.

6. Add a loop to simplify the code

- Instead of copying the same code 4 times, add a `repeat 4 times` control block with one cycle of a `move for 1 secs at 50% speed` and `turn right by 90 degrees` blocks inside.
  - **Tip*:*** If the actions are too fast, add a `wait 1 secs` block between each command to slow it down.

7. Add a loop to simplify the code

- Instead of copying the same code 4 times, add a `repeat 4 times` control block with one cycle of a `move for 1 secs at 50% speed` and `turn right by 90 degrees` blocks inside.
  - Note: In programming, a loop is a control statement that allows code to be executed repeatedly. In Tickle, a block whose label begins with “forever” or “repeat” is a looping construct.



 <iframe width="560" height="315"
src="https://www.youtube.com/embed/m8miV2JfeZk" frameborder="0"
allowfullscreen></iframe>

Lesson 2: Move in a Figure-Eight

Overview

- Program BB-8 to move in a figure-eight pattern.

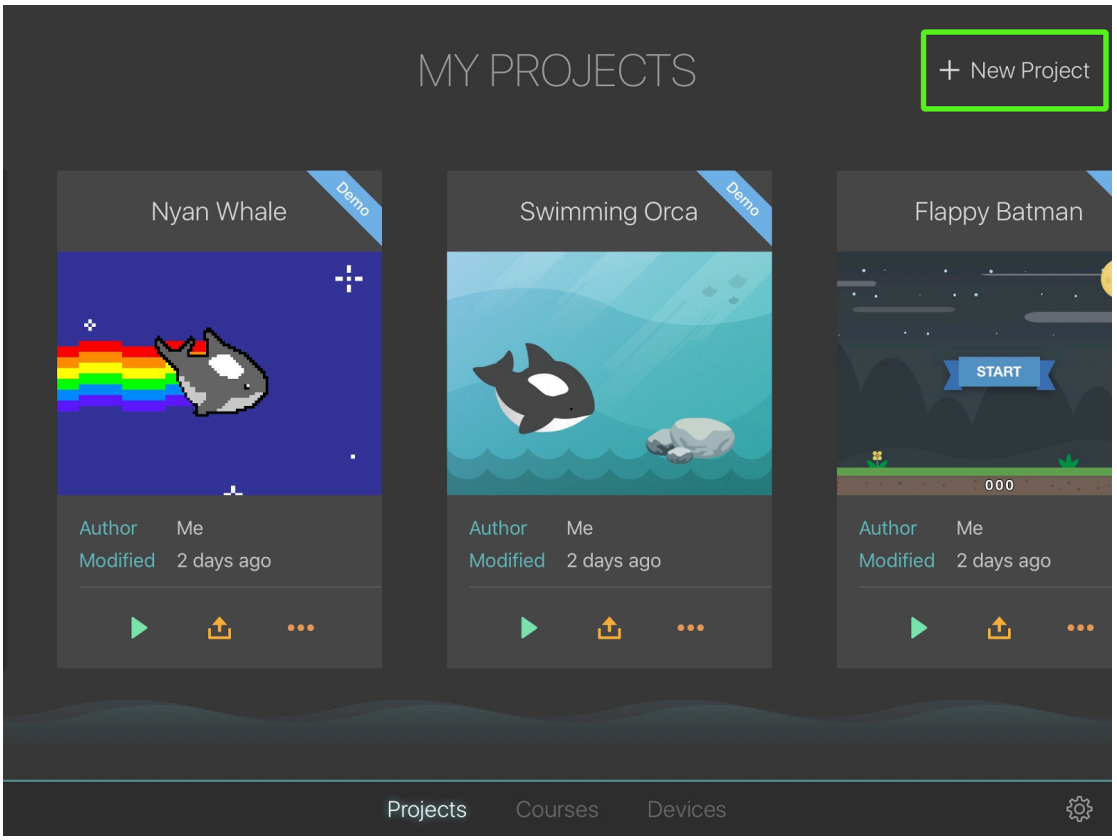
Objectives

- Become familiar with visual programming.
- Program BB-8 to move using basic motion commands.
- Become more familiar with loops, a programming control statement that allows code to run multiple times consecutively.

Steps

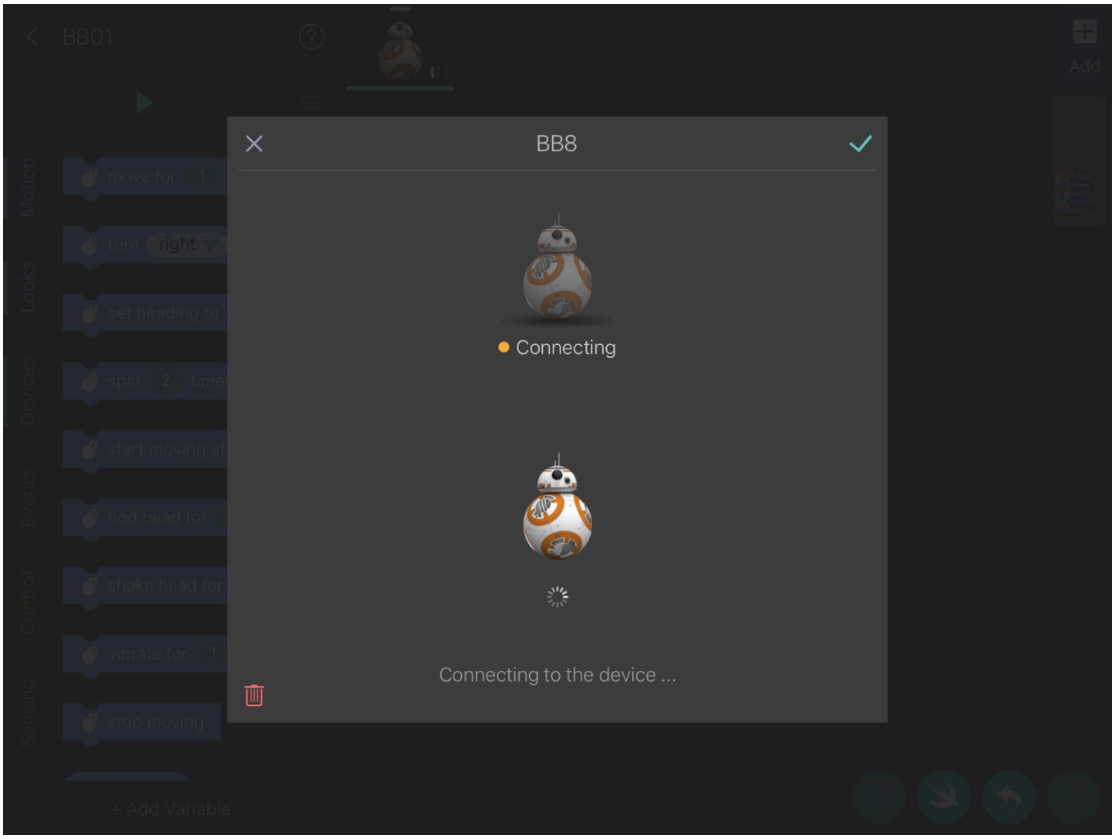
1. Create a BB-8 Project

- Create a new BB-8 project by tapping `+ new Project` via “MY PROJECTS”. Choose the template for “Star Wars BB-8”.

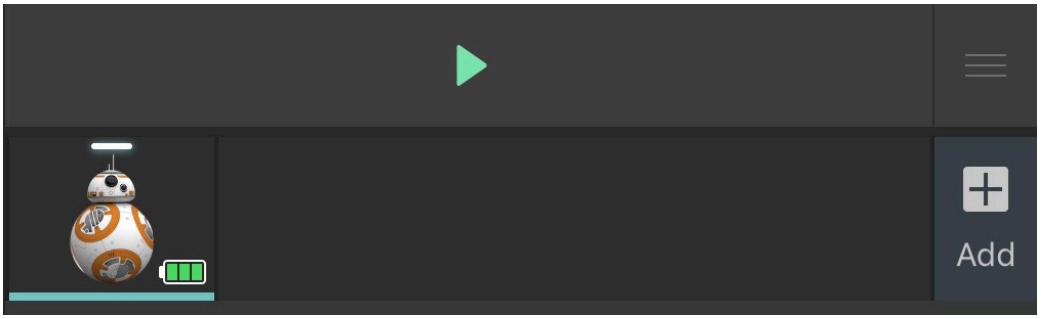


2. Connect to BB-8

- Activate Bluetooth on your iPhone or iPad.
- Tap the BB-8 icon at the top of the screen to open the connection menu. Select your BB-8.
  - Note: Swipe left/right if you have multiple devices.



- The BB-8 will show a battery status icon if it's successfully connected. Please charge BB-8 whenever the battery status becomes red, because it may stop responding to your commands.

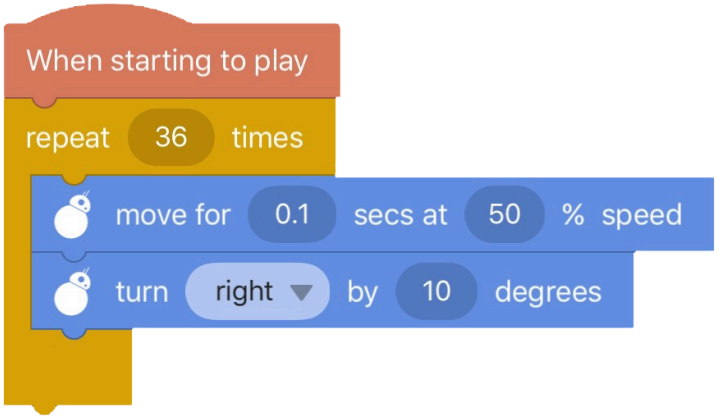


3. Program BB-8 to move in a Figure-Eight

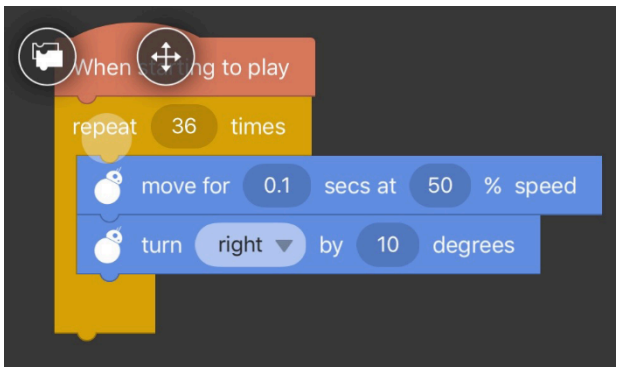
- Let's begin by creating a loop. Add a `repeat 10 times` block from the `control` category, and set it to 36 times by tapping the number and changing the numeric value.
- Our next step will be to make BB-8 start moving. Add a `move for 1 sec at 50% speed` block from the `motion` category. Let's set the duration to just 0.1 seconds, and keep the speed at 50%.
- After each movement, BB-8 shall turn a little bit. Add a `turn right by 10 degrees` block from the `motion` category to have BB-8 turn 10 degrees.
    - **Tip**: During the 36 times of code looping, BB-8 shall turn 36 times to

complete a full 360° circle. The number of degrees each turn is then **360°** divided by **36** = **10°**.

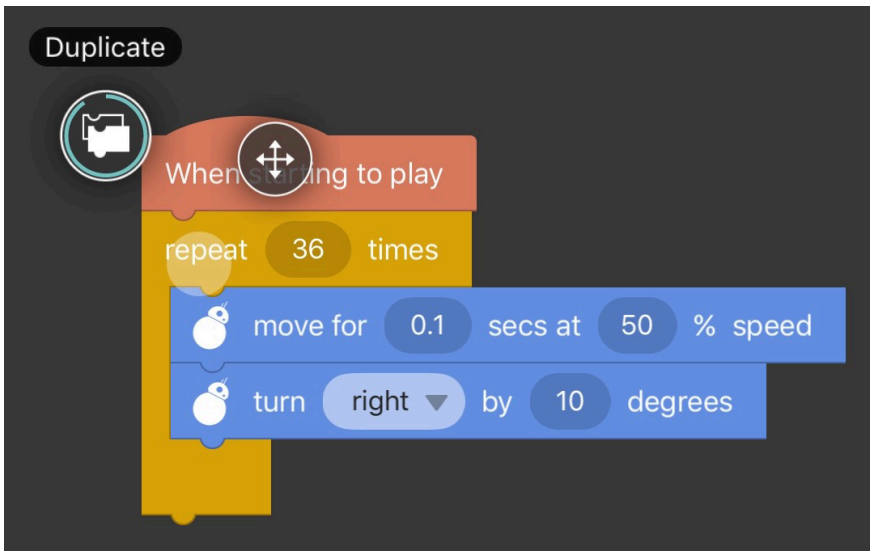
- Note: We are making the movement as close to a circle as possible by reducing the angle per turn, and increasing the number of repeats. You may change the smoothness of the circle as you like, but remember that after the loop is completed, BB-8 has to complete a 360° circle. [# of repeats] x [angle per turn] = **360°**.



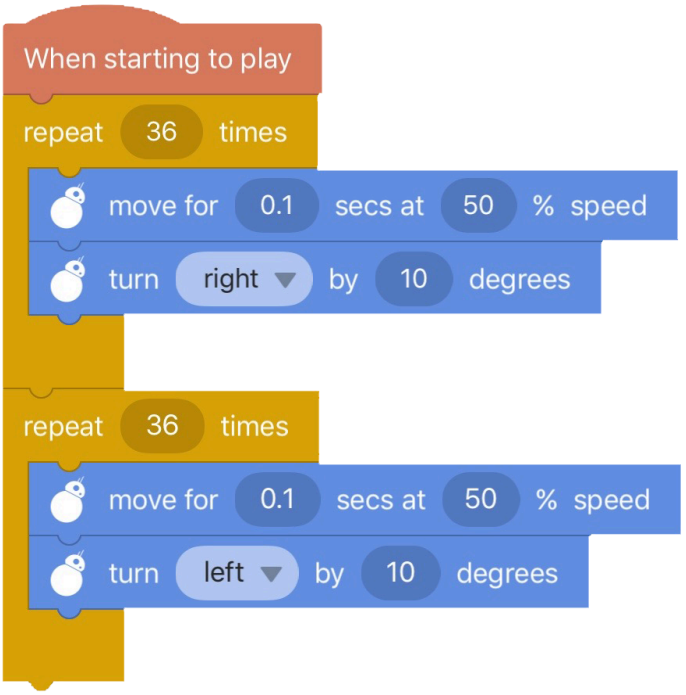
- Give it a test run! You'll see that we've now completed one circle. To complete a Figure-Eight, we'll need another loop just like this.
- Use the built-in duplicate feature to easily copy a block of code. To duplicate, press your finger on the first block that you wish to copy (in this lesson, it will be the `repeat 36 times` block). Hold it until this display appears:



- While holding down, drag towards the Duplicate option on the left side. If successful, both the block you pressed and all blocks beneath it get duplicated. Drag it down and place it below the first copy.



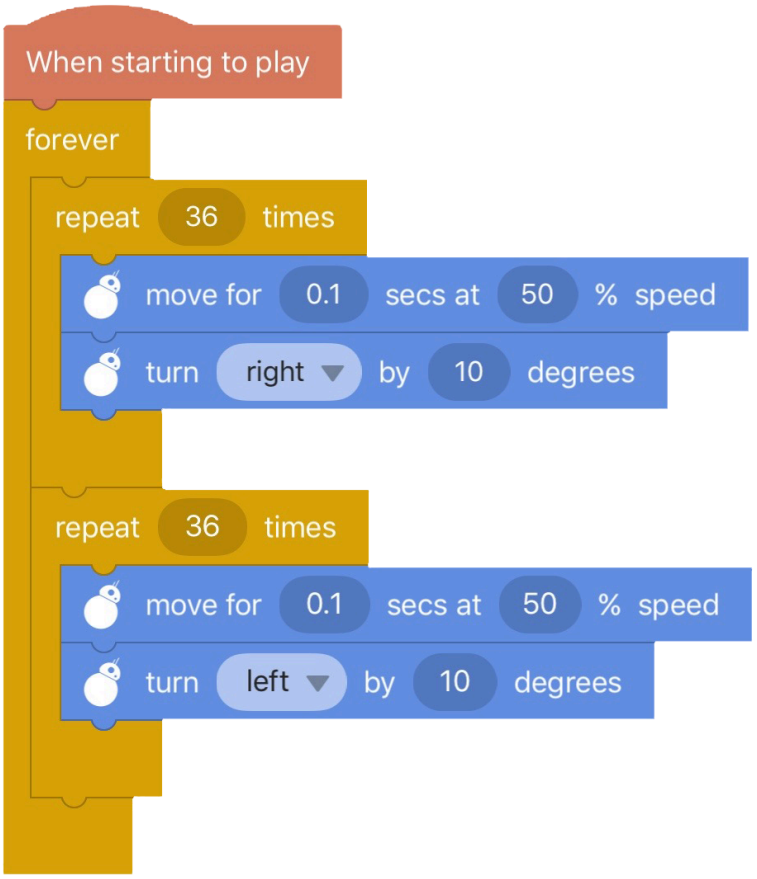
- We're almost done! Right now we are making BB-8 move in a circle twice. To change it to a figure-eight, change the `turn right by 10 degrees` to `turn left by 10 degrees`.



- The code is now complete! Press The code is complete! Press the green Play button to watch BB-8 go!

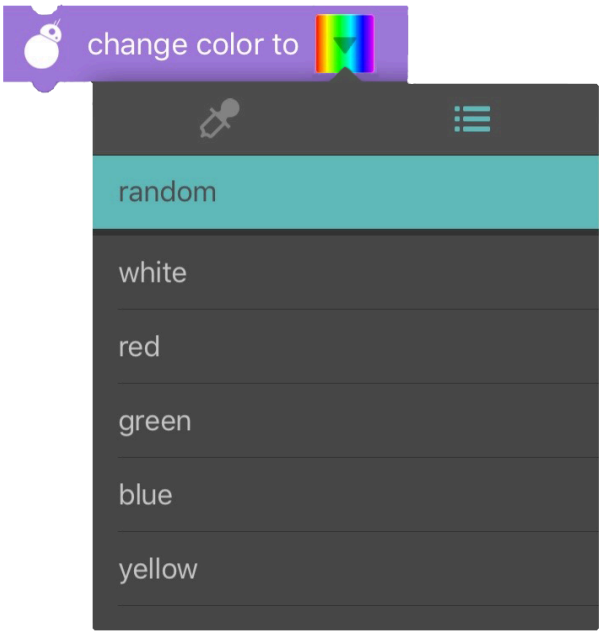
4. Make BB-8 do this forever!

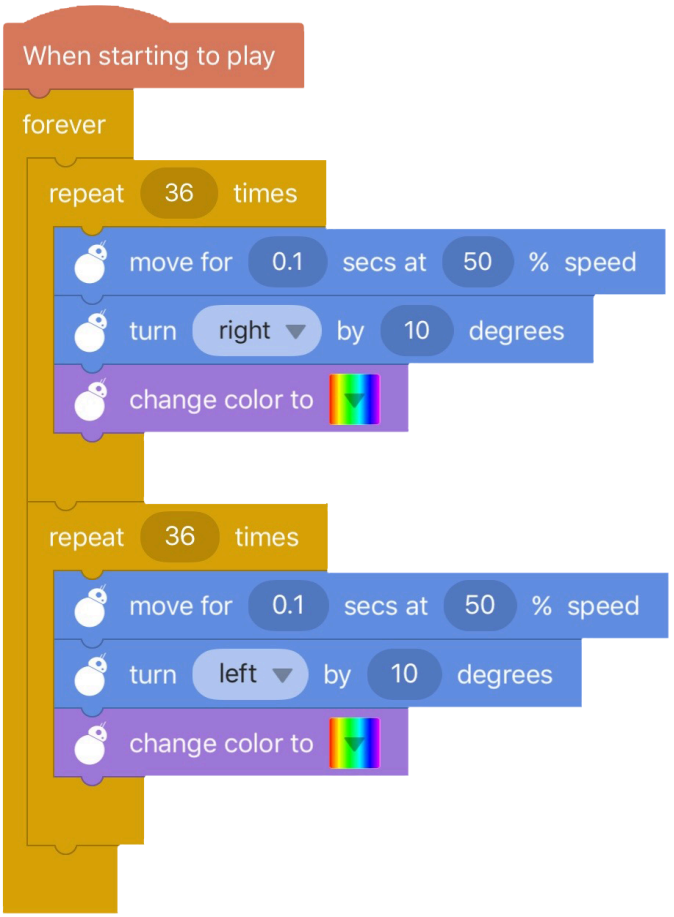
- We can make BB-8 do infinite figure-eights by adding a `forever` loop from the control category. Place everything we've written so far inside this forever loop.



5. Make it more fun!

- Add a `change color to ...` block after each turn to make BB-8 change colors! Select the `random` option inside the menu to make BB-8 change colors randomly each time!


change color to
random
white
red
green
blue
yellow


When starting to play
forever
repeat 36 times
move for 0.1 secs at 50 % speed
turn right by 10 degrees
change color to
repeat 36 times
move for 0.1 secs at 50 % speed
turn left by 10 degrees
change color to

Lesson 3: Play "Guess the Number" with BB-8

Overview

- Program BB-8 to randomly select a number between 1 and 10, and then guess the number!

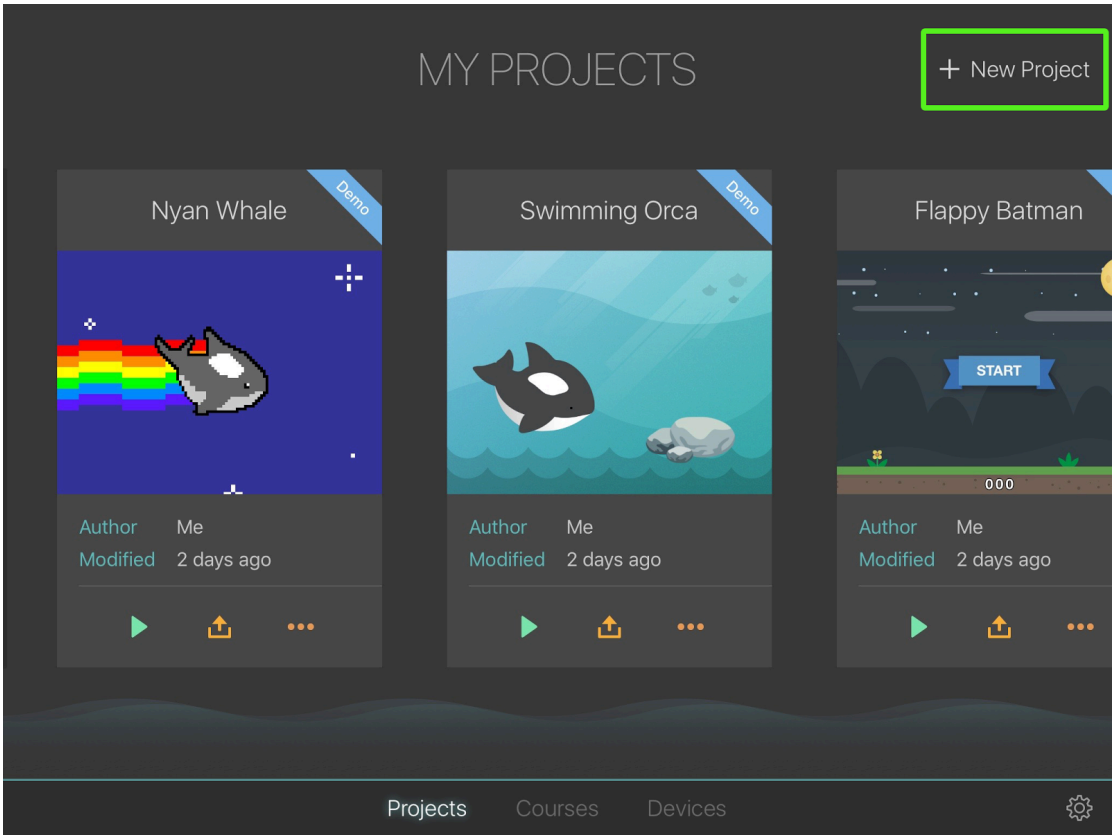
Objectives

- Become familiar with mathematics in programming.
- Become familiar with visual programming.
- Learn how to create variables in programming.
- Program BB-8 to ask questions, receive answers, and respond to your current answer.

Steps

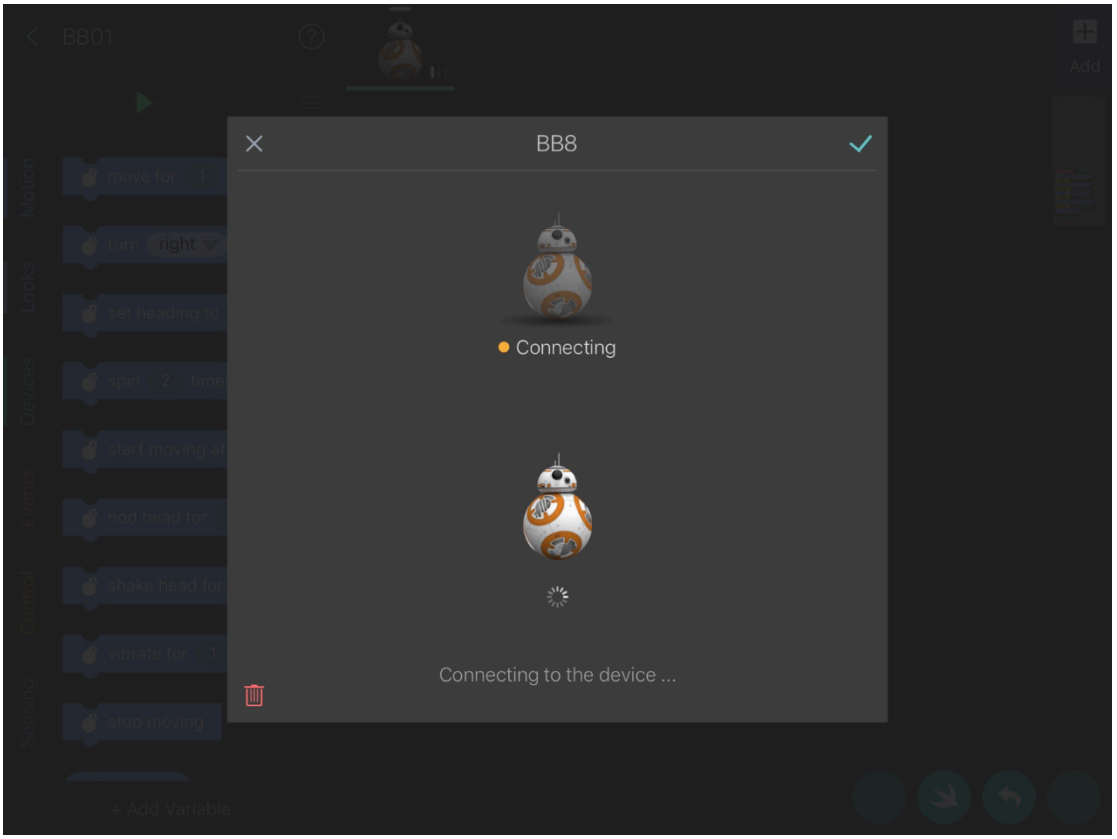
1. Create a BB-8 Project

- Create a new BB-8 project by tapping `+ new Project` via “MY PROJECTS”. Choose the template for “Star Wars BB-8”.

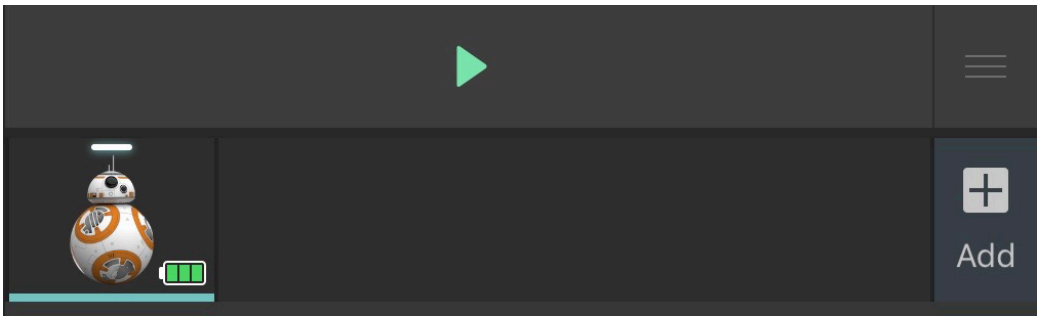


2. Connect to BB-8

- Activate Bluetooth on your iPhone or iPad.
- Tap the BB-8 icon at the top of the screen to open the connection menu. Select your BB-8.
    - Note: Swipe left/right if you have multiple devices.



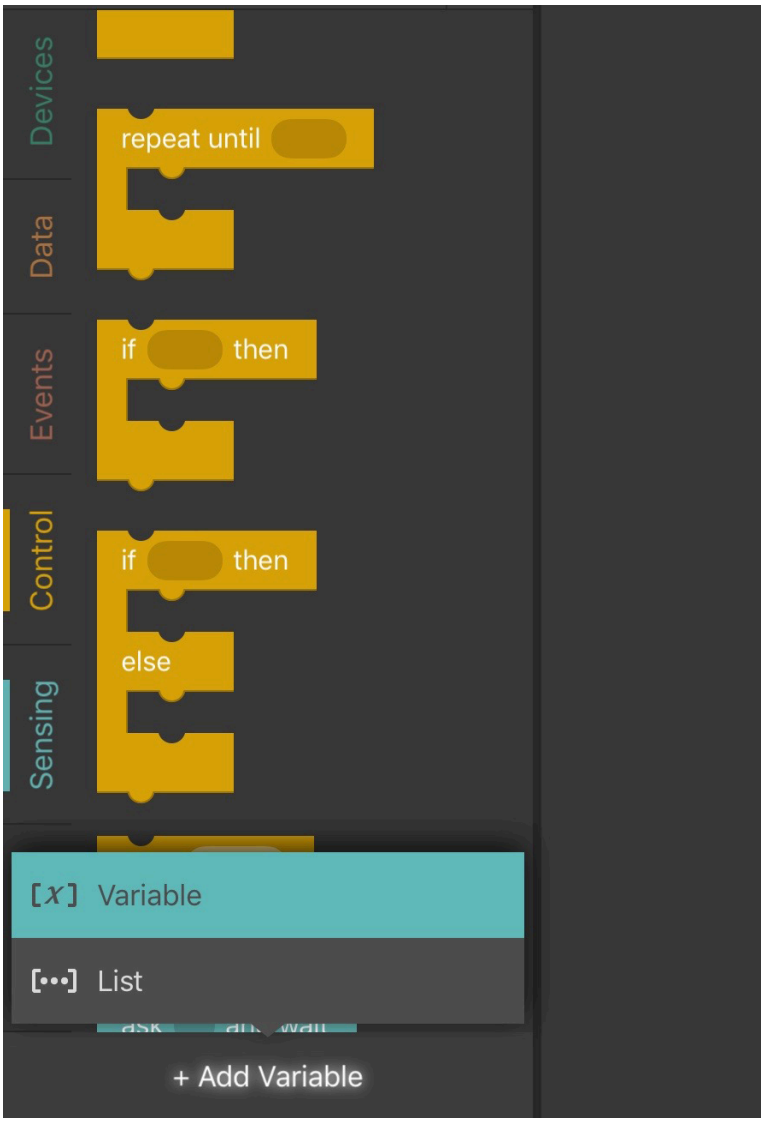
- The BB-8 will show a battery status icon if it's successfully connected. Please charge BB-8 whenever the battery status becomes red, because it may stop responding to your commands.

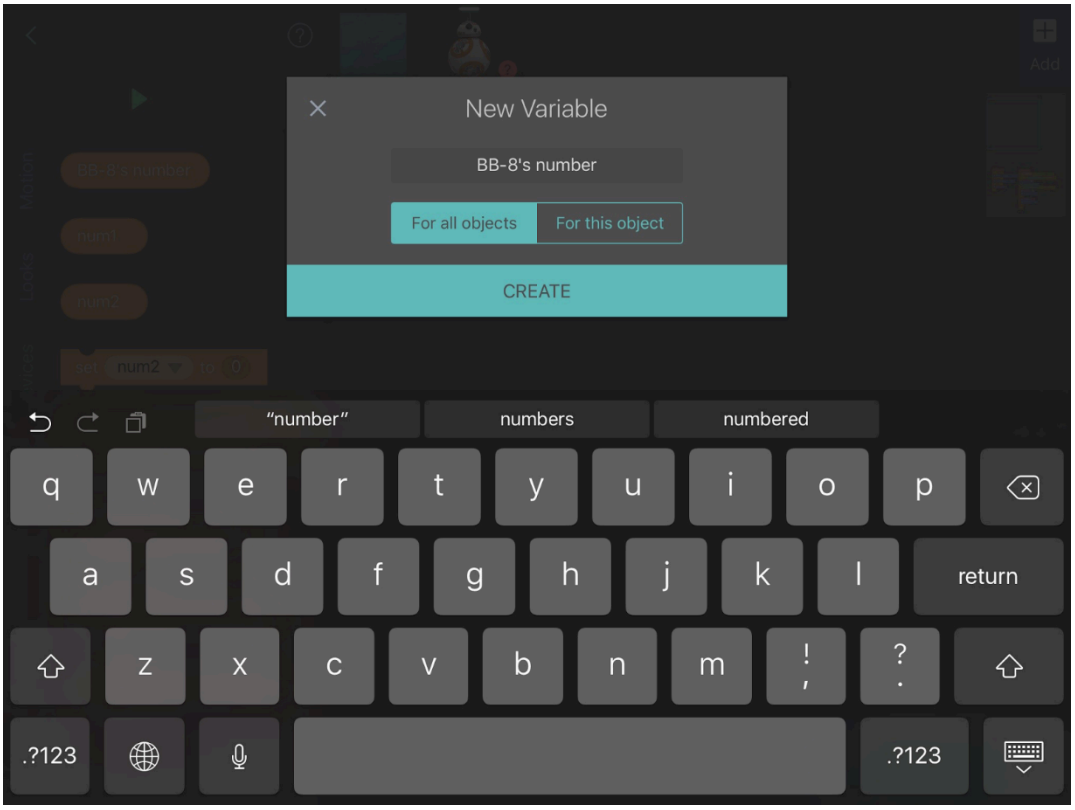


3. Let's make a variable

- Before we create the number for BB-8, we need to create a variable to save it. A variable is used to save and use a single value given to it. It will save that value until another one is given, and if you call the variable, you will retrieve the value that is currently saved.

- To create a variable, click on the `+ Add Variable` at the bottom of the menu. Select the `Variable` option. Let's call this variable "BB-8's number." Tap `CREATE` to create this variable.
    - Note: The new variable will appear under the "Data" category.





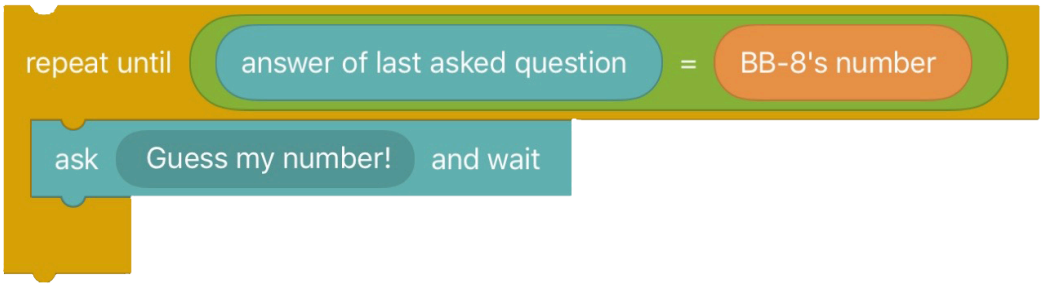
4. Program BB-8 to generate a random number

- Let's have BB-8 select a random number from 1 to 10. Add a `pick random from 1 to 10` block in the "Operators" section.
- To save it in `BB-8's number`, add a `set BB-8's number to ...` block. Drag the `pick random from 1 to 10` block into the oval currently showing "0."
  - Note: This will save our random number into `BB-8's number`, and it won't change during this game.

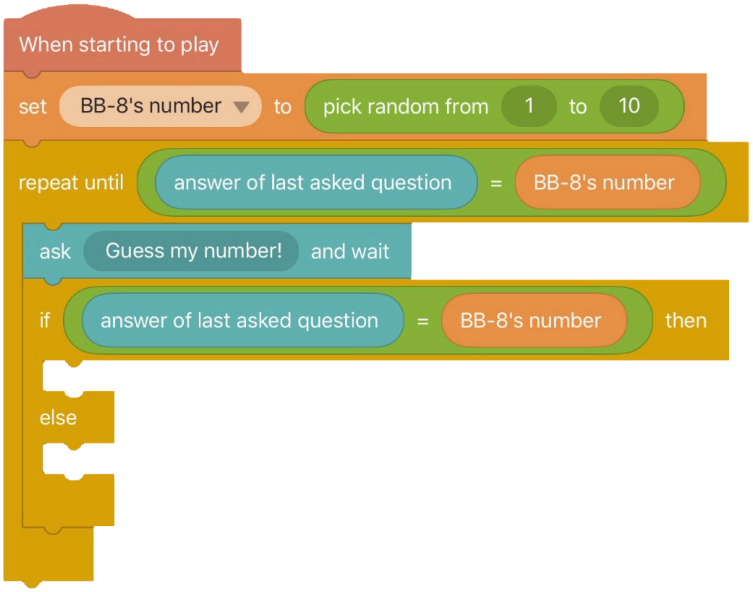
5. Let's Play "Guess the Number"!

- Now that BB-8 has chosen a number, let's try to guess it!
- To begin, add a `ask ... and wait` block. Let's write "Guess my number!" into the oval.
- Next, add a `repeat until ...` block. Replace the empty oval with a `... = ...` block from the `Operators` category. Add a `answer of last asked question` block from the `Sensing` category to the left oval and `BB-8's number` to the right. Place our question inside this loop!
  - **Tip**: This `repeat` loop will keep running until our answer is the same as BB-8's number! If we get the answer wrong, we can keep

trying until we get it right!



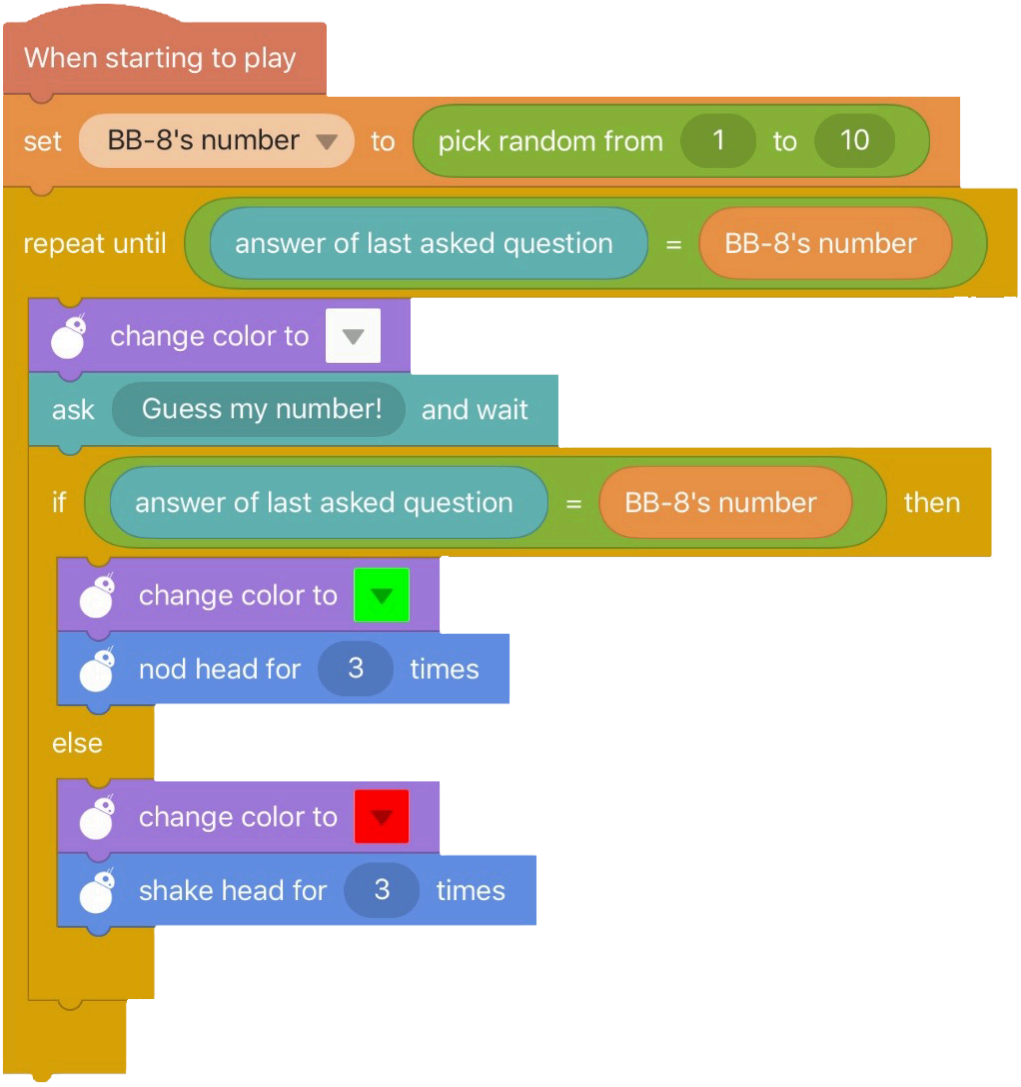
- We have two possible results for this question, right or wrong. Add a `if ... then ... , else ...` block to check for the right answer.
- Add another `answer of last asked question = BB-8's number` inside this oval.
  - **Tip**: The purpose of this block is: if the answer is correct, then we will do something. Otherwise (the answer is wrong), we will do something else. This helps us create interactions for both results in one block.



6. Let's add some interactions

- Let's add interactions for correct and incorrect answers. For the correct answer, let's have BB-8 nod his head three times. Add a `nod head for 3 times` to make this happen.
- For incorrect answers, let's have BB-8 shake his head three times. Add a `shake head for 3 times` block in the `else` area.
- To make things more fun, add a `change color to green` block if the answer is correct, and a `change color to red` block if the answer is incorrect. Also, add a `change color to white` block before asking the

question to reset the color each time.



- Great job! Now you can play games with BB-8! Press the green Play button to play “Guess the number” with BB-8!

7. Challenge 1:

- Have BB-8 tell you whether his number is higher or lower than your current answer!
  - Note: With this, you may set the limit to be larger than 10.

8. Challenge 2:

- Let the user only have a certain number of tries to get the correct answer!
  - **Tip**: Create a new variable to store the number of tries.
  - **Tip**: The question will be asked until the answer is correct OR all tries have been used.

Lesson 4: Steer BB-8 using Motion Sensors

Overview

- Utilize the tilting sensors of your phones and tablets to pilot BB-8. For example, tilting the iPad forwards will make BB-8 move forwards, and shaking the iPad will make BB-8 vibrate.

Objectives

- Use motion sensors in smartphones and tablets to sense motion events (tilt and shake) to pilot BB-8.
- Learn and understand the programming concept of “event-driven programming.”

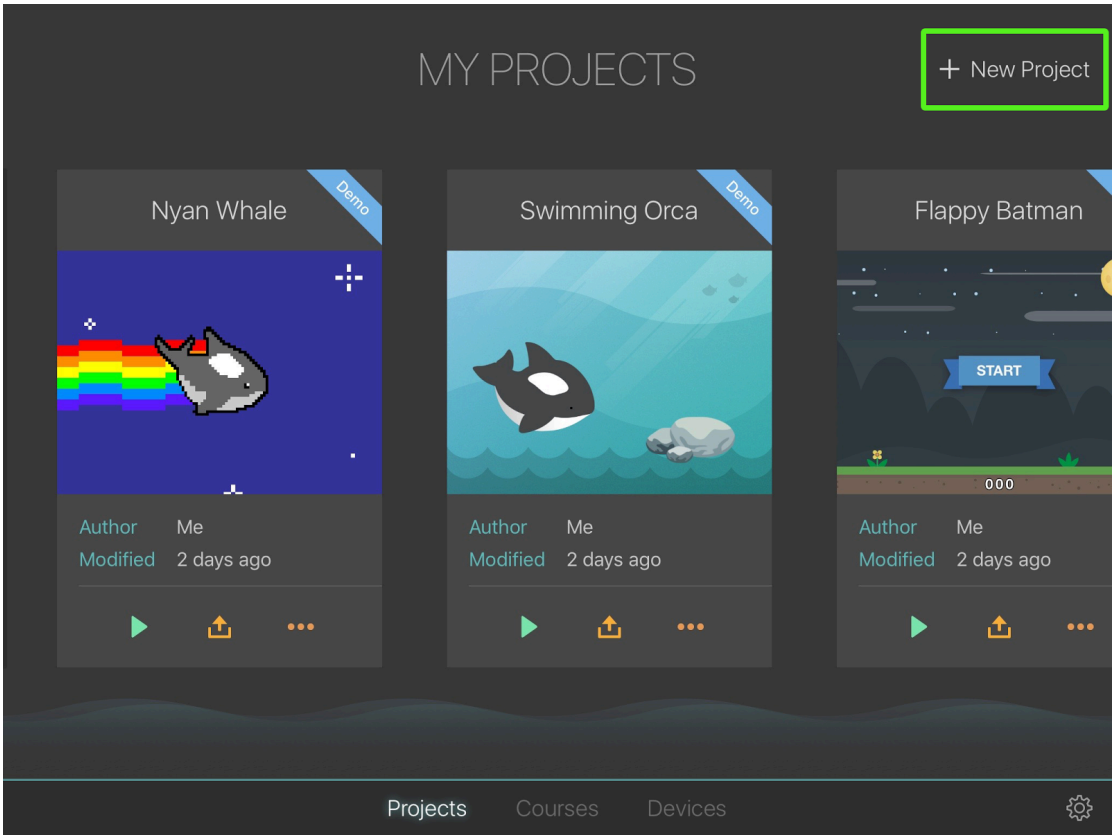
Event-driven Programming and Event Blocks

- Event-driven programming is a computer science concept in which the flow of a program is determined by events such as sensor input, user actions (like touching the screen or tilting the device), and messages from other programs.
- It is the dominant paradigm generally used in modern applications like graphical user interfaces (GUI) and web-pages that perform certain actions in response to user input.
- A simple way to think of it is "**when** something happens, **do** something." For example, “When it rains, open your umbrella.”

Steps

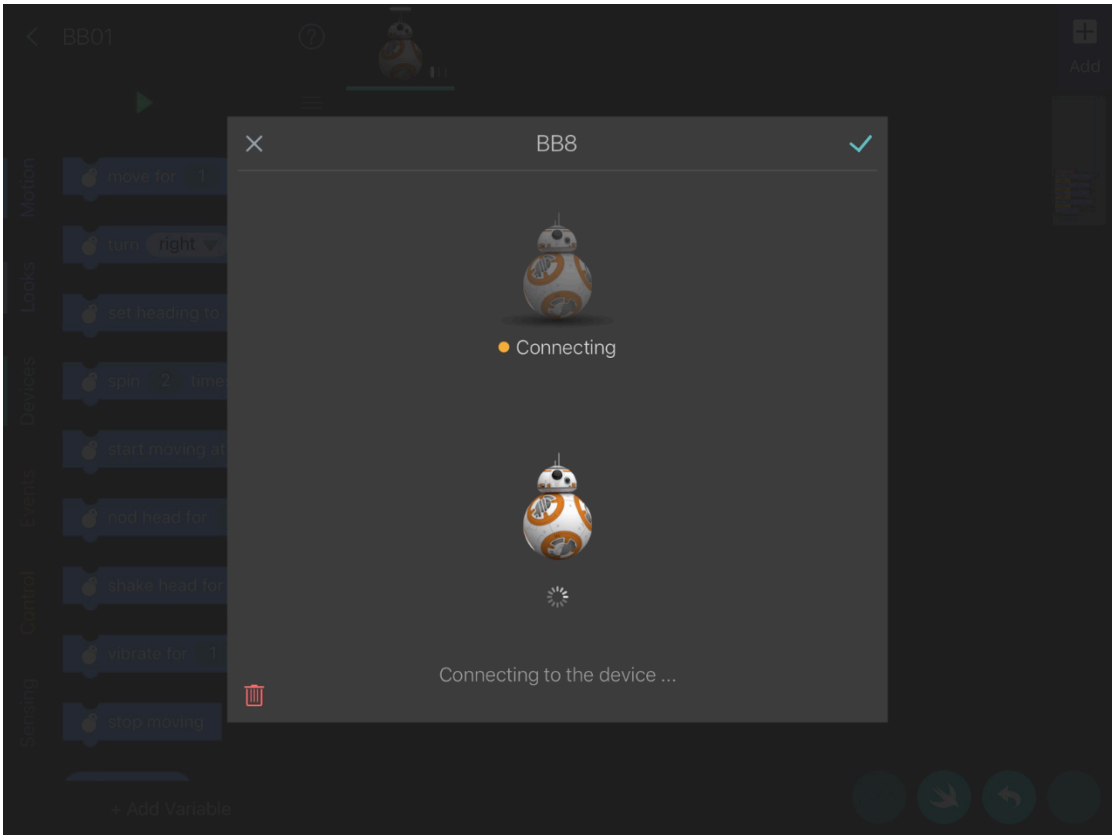
1. Create a BB-8 Project

- Create a new BB-8 project by tapping `` `+ new Project` `` via “MY PROJECTS”. Choose the template for “Star Wars BB-8”.

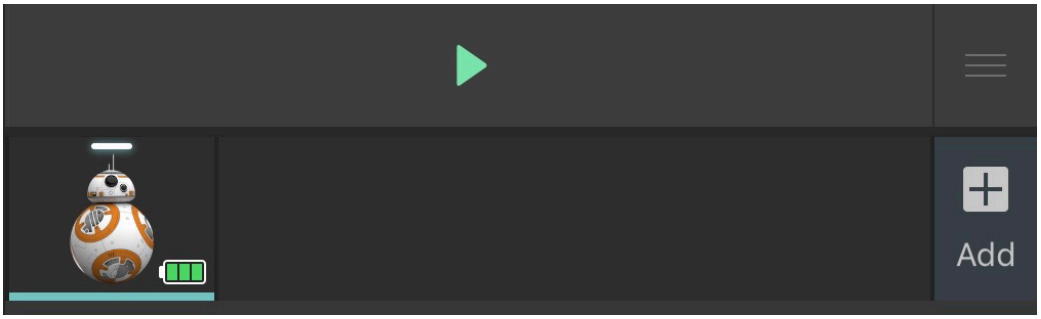


2. Connect to BB-8

- Activate Bluetooth on your iPhone or iPad.
- Tap the BB-8 icon at the top of the screen to open the connection menu. Select your BB-8.
    - Note: Swipe left/right if you have multiple devices.



- The BB-8 will show a battery status icon if it's successfully connected. Please charge BB-8 whenever the battery status becomes red, because it may stop responding to your commands.



3. Move forwards using motion controls

- Under the `Events` category, add the motion sensing block `when iPad is tilted forwards`.
- Since the forward direction is at 0 degree, add a `set heading to 0 degrees` block to set the direction to forwards. Then add a movement block like the following:

4. Use motion controls to move in all directions

- To pilot BB-8 in all 4 directions, add a `when ... is tilted ...` block for each direction. Set each heading to their respective angles.
- Also add a `when ... is shaken` event block to make BB-8 vibrate!