

Drone Obstacle Course



Rheannon is very excited. She is old enough to enter a project in the school science fair. Her project is writing code to direct a drone to navigate an obstacle course. She entered the code on the iPad near her hand to direct BB-8 to move around the rocks. Here is a link to a movie showing BB-8's movement.

https://www.dropbox.com/s/98hy3zcxxhfv3o/BB8_1.mov?dl=0

Rheannon attends a small school with children from toddler thru 8th grade. She is in 1st grade in a multi age primary class, which is for 1st – 3rd grade students. Her project will be demonstrated in her classroom. However, she is excited for the day when she will be in upper elementary (7th - 8th grade) and her science project will be displayed in the auditorium for parents and the whole school to see.

I researched drones and control software appropriate for young children. My first criterion was 2D. Rhea's (her nickname like the heroin in Star Wars) coding experience to date includes forward, back, right and left. I didn't want to confuse things with 3D attributes of up, down, yaw, roll, and pitch. So, flying drones were not considered. Also, flying drones can hit you in the head. Let's stick with something that can only run over your foot if the code has a bug in it. My second criterion was control software that would be understandable to Rhea and build upon her current coding knowledge.

	
<p>R2D2 by LittleBits https://shop.littlebits.cc/pages/starwars</p>	<p>BB-8 by Sphero https://www.sphero.com/starwars/bb8</p>

R2D2 is by LittleBits (<https://littlebits.cc/how-it-works>). LittleBits is like Snap Circuits (<https://elenco.com/brand/snap-circuits/>) on steroids. The LittleBits R2D2 kit comes with the necessary electronic blocks to build a programmable drone. The best part of this was assembling R2D2 following the excellent step-by-step iPad based instructions. The electronic blocks are snapped together and their functionality verified before moving to the next step. The downside, at least for a young child (<12), is the programming language. R2D2 operates using SWIFT code. SWIFT is a programming language developed by Apple for writing apps for devices (e.g., iPhone, iPad, Mac). Apple created the user interface “Swift Playgrounds” to aid in learning SWIFT and writing code to control robots and drones. SWIFT syntax is way beyond Rhea’s current code writing capabilities. So, R2D2 is on the shelf collecting dust for a few years.

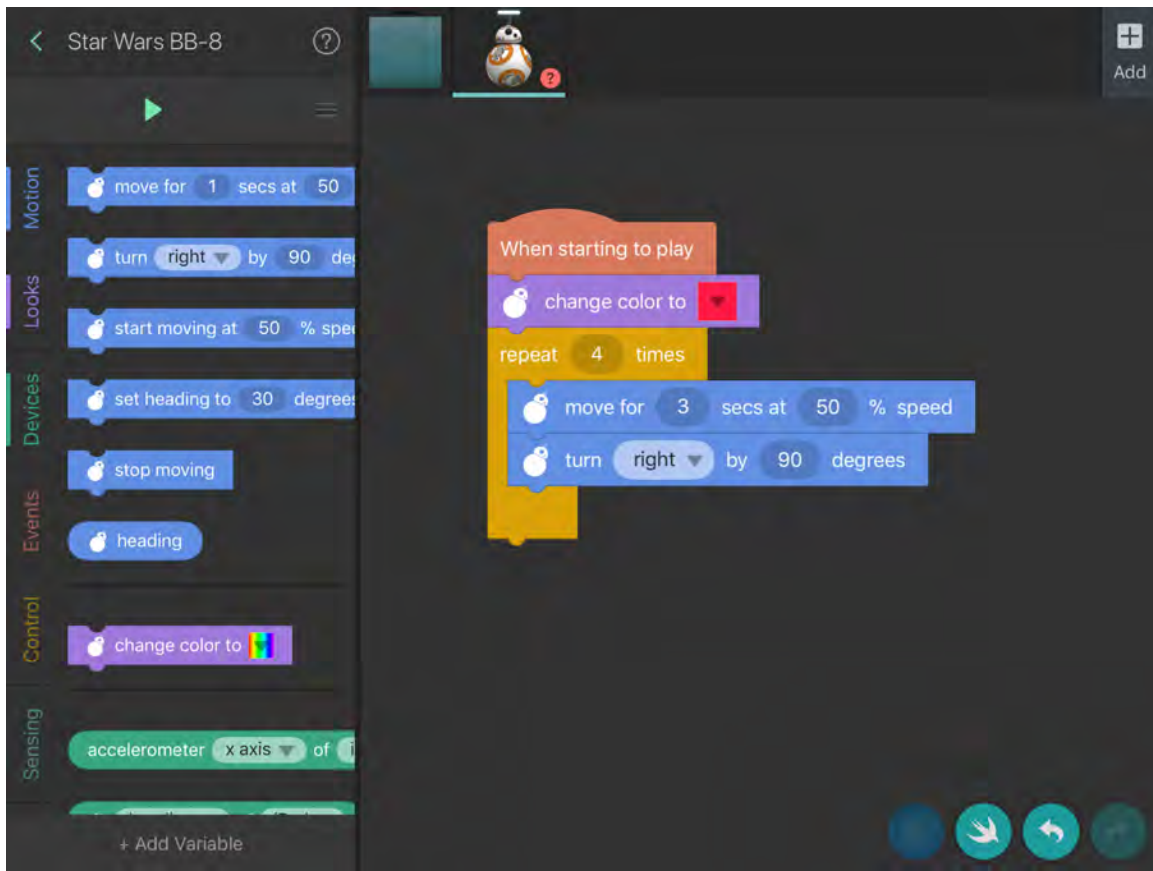
Google (Blockly code), MIT (Scratch code), and Berkeley (Snap code) have been developing open source libraries and visual programming languages to teach young children the logical process behind solving problems. Instead of writing the code from zero, these visual programming languages allow the student to drag and drop boxes that represent a certain action or logical decision. By chaining several of them together they are able to achieve their objective.

The BB-8 droid by Sphero (<https://www.sphero.com/starwars/bb8>) was perfect. Not only does BB-8 come fully assembled and use code based on the (Google, MIT, Berkeley) design philosophy, it is also cute. You can program BB-8 motion using several iPad applications:

Sphero	https://itunes.apple.com/us/app/sphero-edu/id1017847674?mt=8
Tynker	https://itunes.apple.com/us/app/tynker-coding-for-kids/id805869467?mt=8
Tickle	https://itunes.apple.com/us/app/tickle-app-learn-to-code/id1063639403?mt=8

I found Tickle syntax the best. The Tickle UI can connect to many of the current available drones (e.g., Lego WeDo, Parrot, Sphero, MicroBit). Tickle code to direct BB-8 to travel in a square pattern is shown below. Notice the small bird icon in the lower right of the picture. This converts the block Tickle code into SWIFT code syntax, which is shown in the next picture.

Warning – Communication between the drone and tablet (e.g., iPad) is by Bluetooth Low Energy (BLE) interface. All recent iOS and Android devices use BLE. However, older devices may not. So, before giving your child an old hand-me-down tablet or laptop computer, make sure it’s BLE. There are BLE dongles available for old Windows laptops. Also, Parrot drones, which I will discuss in a future article, communicate via WiFi.



```
BB8.swift
1  func onStart() {
2      guard let bB8 = getCurrentBB8Device() else {
3          return
4      }
5      bB8.color = 0xff1b47ff
6      for index in 0 ..< 4 {
7          bB8.move(seconds:3, speed:50)
8          bB8.turn(direction:right, degree:90)
9      }
10 }
11
```