

DRONEBLOCKS

MODULE 1

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DRONEBLOCKS INTRO

DRONEBLOCKS APP



- **Drag and Drop Programming:**
 - Great way to learn flight logic and algorithms without having to learn to type code

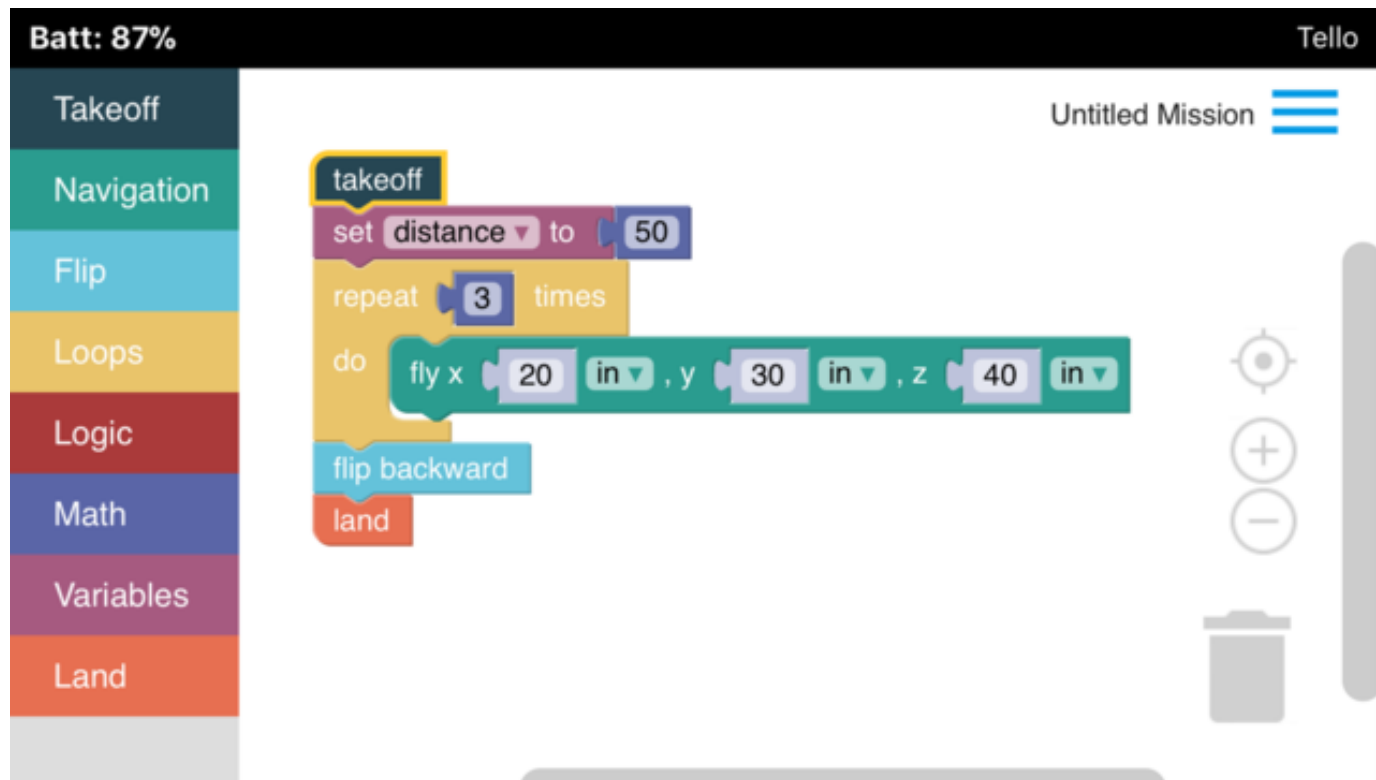


Figure 1. DroneBlocks Interface

DRONE CODING SIMULATOR



- **Simulator:** <https://dev.droneblocks.io/simulator.html#>

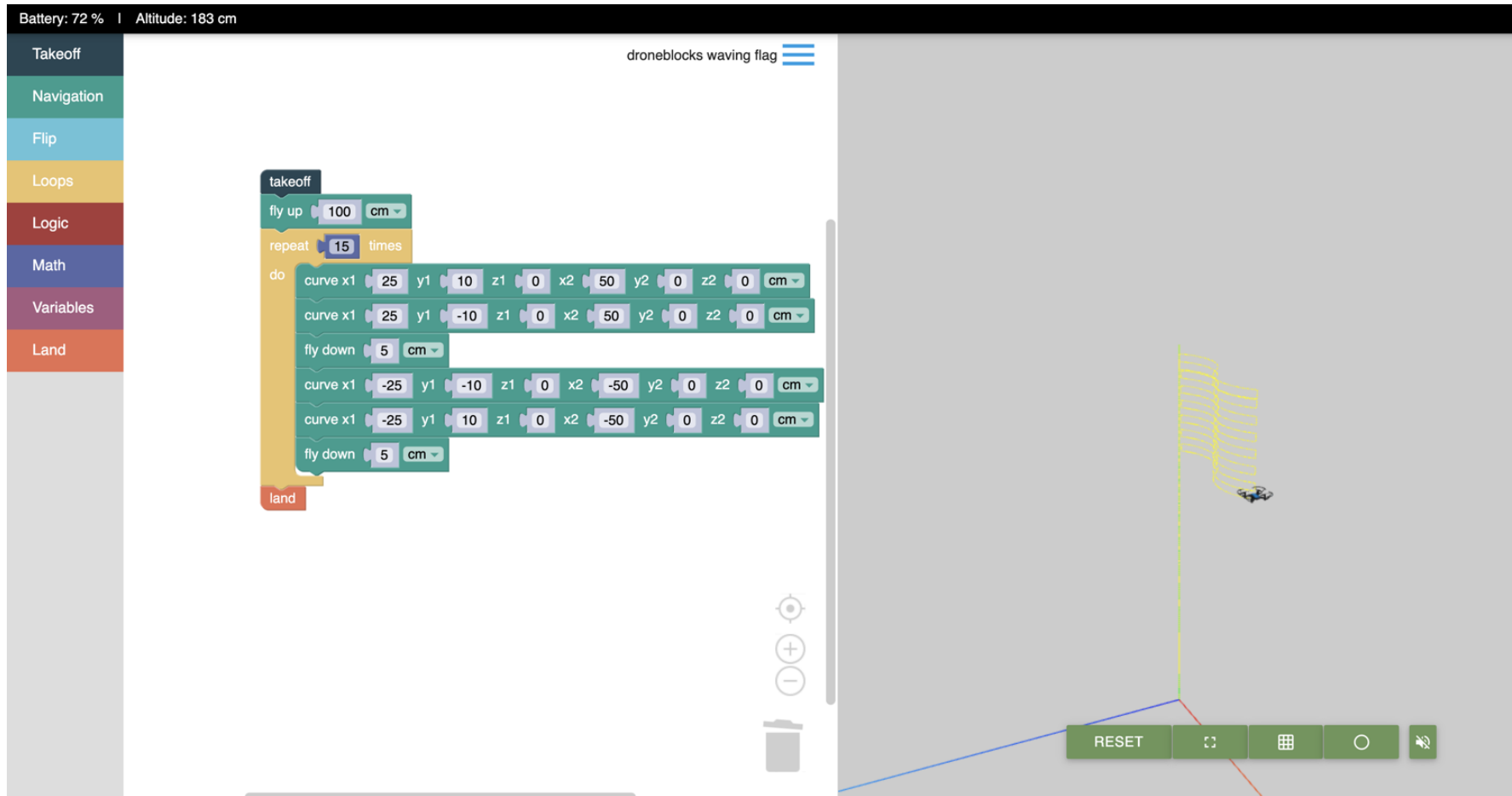


Figure 2. DroneBlocks Simulator Interface



- **DroneBlocks Code:**
 - For advanced users that have moved beyond block coding
 - Great introduction to real-world coding
 - Program your Tello using JavaScript

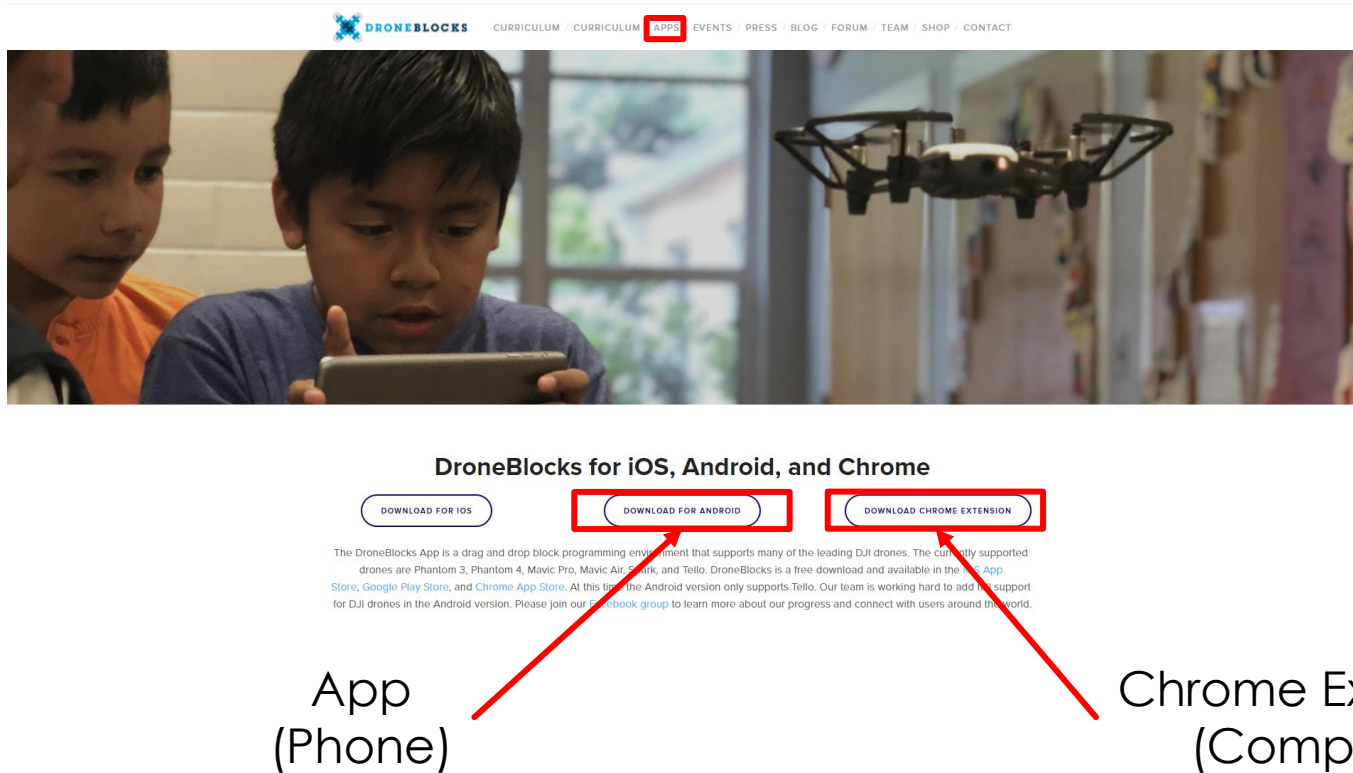
The screenshot shows the DroneBlocks Code editor interface. At the top, there's a status bar with the time 3:16, signal strength, battery level (45%), altitude (0 cm), ToF (10 cm), pitch (0°), roll (0°), yaw (0°), and Tello status. Below this, the code editor displays a sample mission script in JavaScript. The code includes comments and function calls for taking off, displaying a message, and flying in various directions. A green menu icon is visible on the right side of the code editor.

```
1 /* This is the DroneBlocks Code editor with a sample mission below.
2 After creating your script tap on the menu icon and then tap Launch Mission.
3 Please refer to the Function Reference for all supported JavaScript commands.
4
5 // Take off
6 takeOff();
7
8 // Display a brief message that we're taking off
9 showMessage('Taking off!');
10
11 // Fly forward 50 inches
12 flyForward(50, 'in');
13
14 // Fly right 50 centimeters
15 flyRight(50, 'cm');
16
17 // Fly backward 50 inches
18 flyBackward(50, 'in');
19
20 // Fly left 50 centimeters
```

Figure 3. DroneBlocks JavaScript Code



GETTING STARTED



DroneBlocks for iOS, Android, and Chrome

[DOWNLOAD FOR IOS](#) [DOWNLOAD FOR ANDROID](#) [DOWNLOAD CHROME EXTENSION](#)

The DroneBlocks App is a drag and drop block programming environment that supports many of the leading DJI drones. The currently supported drones are Phantom 3, Phantom 4, Mavic Pro, Mavic Air, Spark, and Tello. DroneBlocks is a free download and available in the [App Store](#), [Google Play Store](#), and [Chrome App Store](#). At this time, the Android version only supports Tello. Our team is working hard to add full support for DJI drones in the Android version. Please join our [Facebook group](#) to learn more about our progress and connect with users around the world.

App
(Phone)

Chrome Extension
(Computer)

Figure 4. DroneBlocks Installation

INTRODUCTORY COURSES



- **Courses:**
 - <https://droneblocks.io/>
 - Introduction to Tello Programming (19 mins)

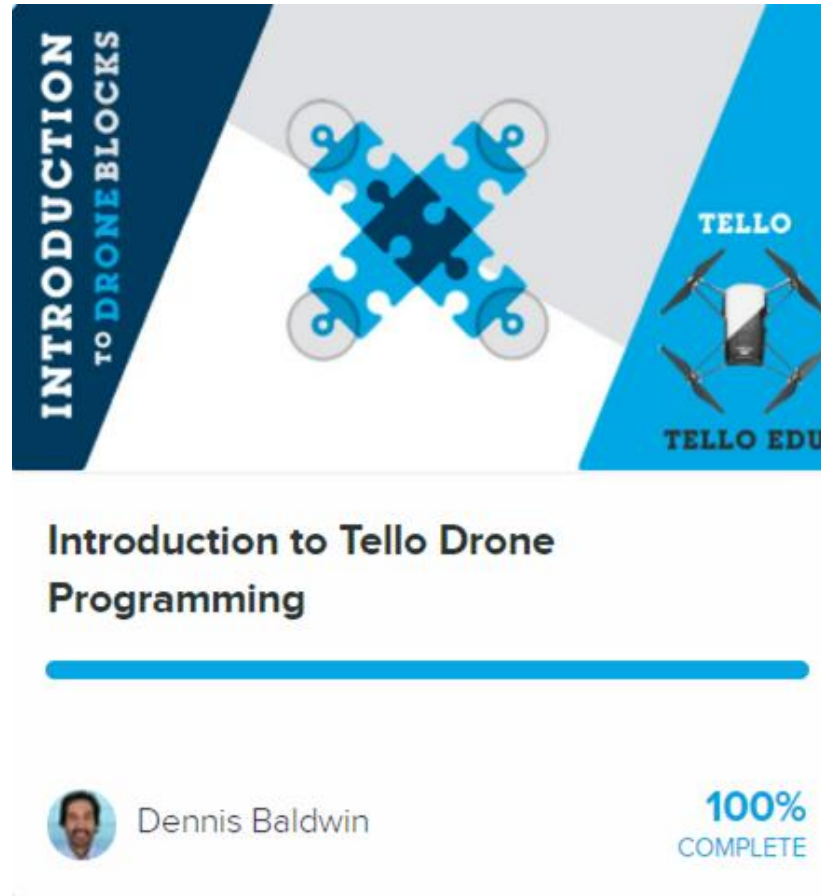


Figure 5. DroneBlocks Lessons



PRACTICE EXAMPLE

PRACTICE EXAMPLE – CODE



- **Practice: Spin 180**
 - Make your drone spin to the right using the following code
 - Use DroneBlocks and/or JavaScript



DroneBlocks

```
takeoff();  
yaw("right", 360);  
land();
```

JavaScript

PRACTICE EXAMPLE – NOTES



- Each block can be executed individually, or as a program
- EXAMPLE:
 - Takeoff
 - Yaw right or yaw left
 - Land
- When issuing a Takeoff command, Tello will climb to an altitude of 4-5 feet
- Tello does not have GPS (accuracy is not precise)
- Tello uses sensors and flight control logic to determine its altitude and distance
- After taking off, DroneBlocks will send the next command to Tello's flight controller
- This is considered Sequential Logic, where each block is executed in a specific order
- The Land block command Tello to land at its current location
 - *Make sure the area is clear for landing





LAUNCHING YOUR MISSION



Tello & DroneBlocks iOS Launch Instructions

Follow these instructions precisely, to avoid connectivity problems with your device.

To Launch Tello Blocks:

1. Open the  DroneBlocks app and allow blocks to fully load.
2. Make sure you see "Connect To Tello" in the upper right corner. If not, tap the  menu (or "hamburger") icon and select: **Tello Blocks** (Tip: The "Flip" block will show on the left).
 - Drag & drop the blocks to create your mission.

When Ready To Connect to Tello:




1. Tap "Connect to Tello" at the top right of the app.
 - A window will pop up with instructions to enter the SSID for the Tello you are connecting.
(This can be located in your WiFi Network settings when Tello is powered on--take note!)
2. Power on Tello and type the hotspot/SSID name, which will look similar to: **Tello-XXXXXX**.
3. Click the blue "Connect" button. 
4. You should now see  and the Battery % listed at the top of your app screen.
5. When you are ready to execute a full mission, or individual commands, tap the  menu icon, then select: "**Launch Mission**".

Figure 6. DroneBlocks iOS Launch Instructions



Tello & DroneBlocks ANDROID Launch Instructions

Follow these instructions precisely, to avoid connectivity problems with your device.

To Launch Tello Blocks:

1. Open the  DroneBlocks app and allow it to fully load.
2. Make sure you see "Connect To Tello" in the upper right corner. If not, tap the  menu (or "hamburger") icon and select: **Tello Blocks** (Tip: The "Flip" block will show on the left).
3. Drag & drop the blocks to create your mission.

When Ready To Connect to Tello Drone:


1. Tap "Connect to Tello" at the top right of the app.
 - A window will pop up with a "Connect to Tello" link but do not tap this yet!
2. Power on Tello, which will broadcast a WiFi hotspot.
3. Navigate from DroneBlocks to: **Settings > Wifi > Tello**
 - The hotspot name will look similar to: **Tello-XXXXXX**.
4. Close Settings and return to the DroneBlocks app.
5. Click the "Connect to Tello" link.
6. You should now see "Tello" and the "Battery %" listed at the top of your app screen.
7. When you are ready to execute a full mission, or individual commands, tap the  menu icon, then select: **"Launch Mission"**.

Figure 7. DroneBlocks Android Launch Instructions



Tello & DroneBlocks CHROME Launch Instructions

Follow these instructions precisely, to avoid connectivity problems with your device.

To Launch Tello Blocks:

1. Open the  DroneBlocks app and allow blocks to fully load.
2. Make sure you see "Connect To Tello" in the upper right corner. If not, tap the  menu (or "hamburger") icon and select: **Tello Blocks** (Tip: The "Flip" block will show on the left).
 - Drag & drop the blocks to create your mission.

When Ready To Connect to Tello:


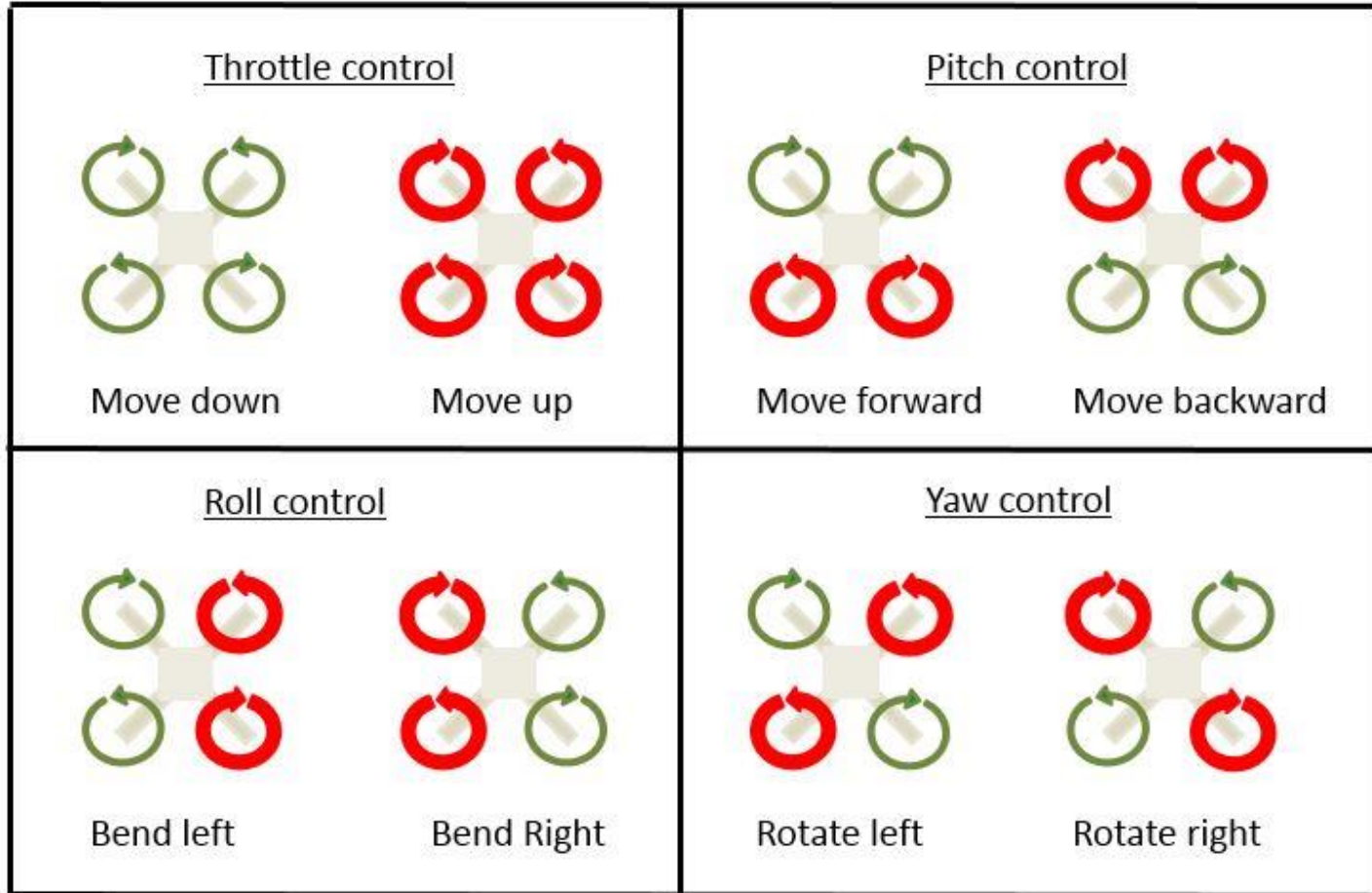

1. Click "Connect to Tello" at the top right of the app screen.
 - A window will pop up with a "Connect" button but do not tap this button yet!
2. Power on Tello, which will broadcast a WiFi hotspot.
3. Navigate from DroneBlocks to your Wifi **Settings > Wifi > Tello**
 - The hotspot name will look similar to: **Tello-XXXXXX**.
4. Close Settings and return to the DroneBlocks app.
5. Click the "Connect" button.
6. You should now see "Tello" and the "Battery %" listed at the top of your app screen.
7. When you are ready to execute a full mission, or individual commands, tap the  menu icon, then select: **"Launch Mission"**.

Figure 8. DroneBlocks Chrome Launch Instructions



INTRO TO CONTROLS



 Normal Speed

 High Speed

Figure 9. Quadcopter Rotor Control

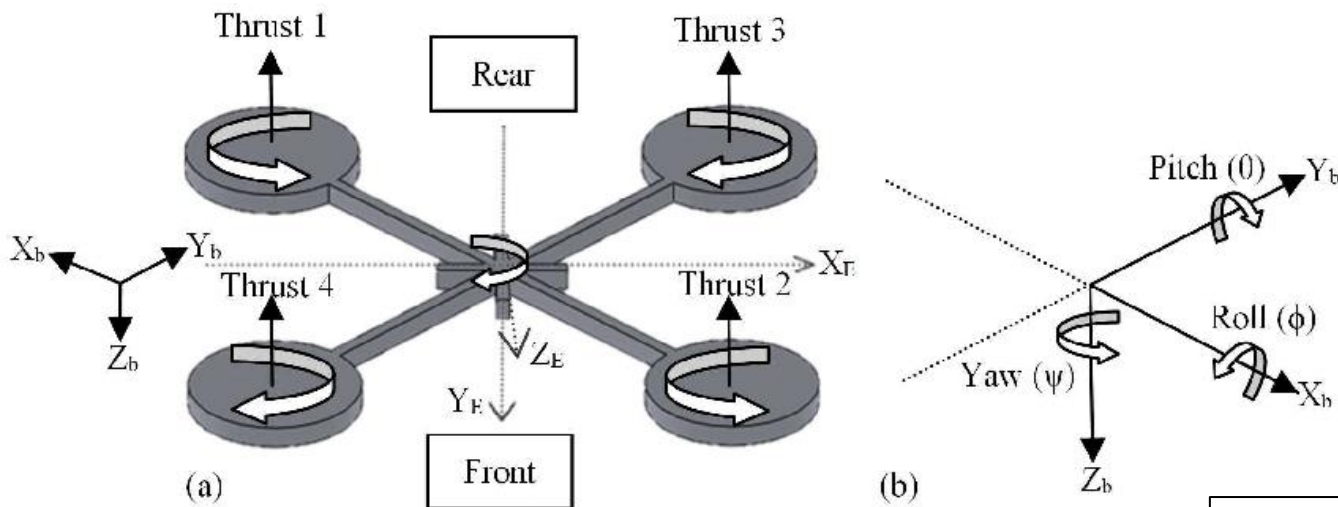



Figure 10. Quadcopter Roll/Pitch/Yaw

 **torque**
/tɔrk/

See definitions in:

All Physics Jewellery Archaeology

noun

- MECHANICS**
a twisting force that tends to cause rotation.
"the three-liter engine has lots of torque"
- variant spelling of [torc](#).

verb

apply torque or a twisting force to (an object).
"he gently torqued the hip joint"

Figure 11. Definition of Torque



Aircraft Rotations Body Axes

Glenn
Research
Center

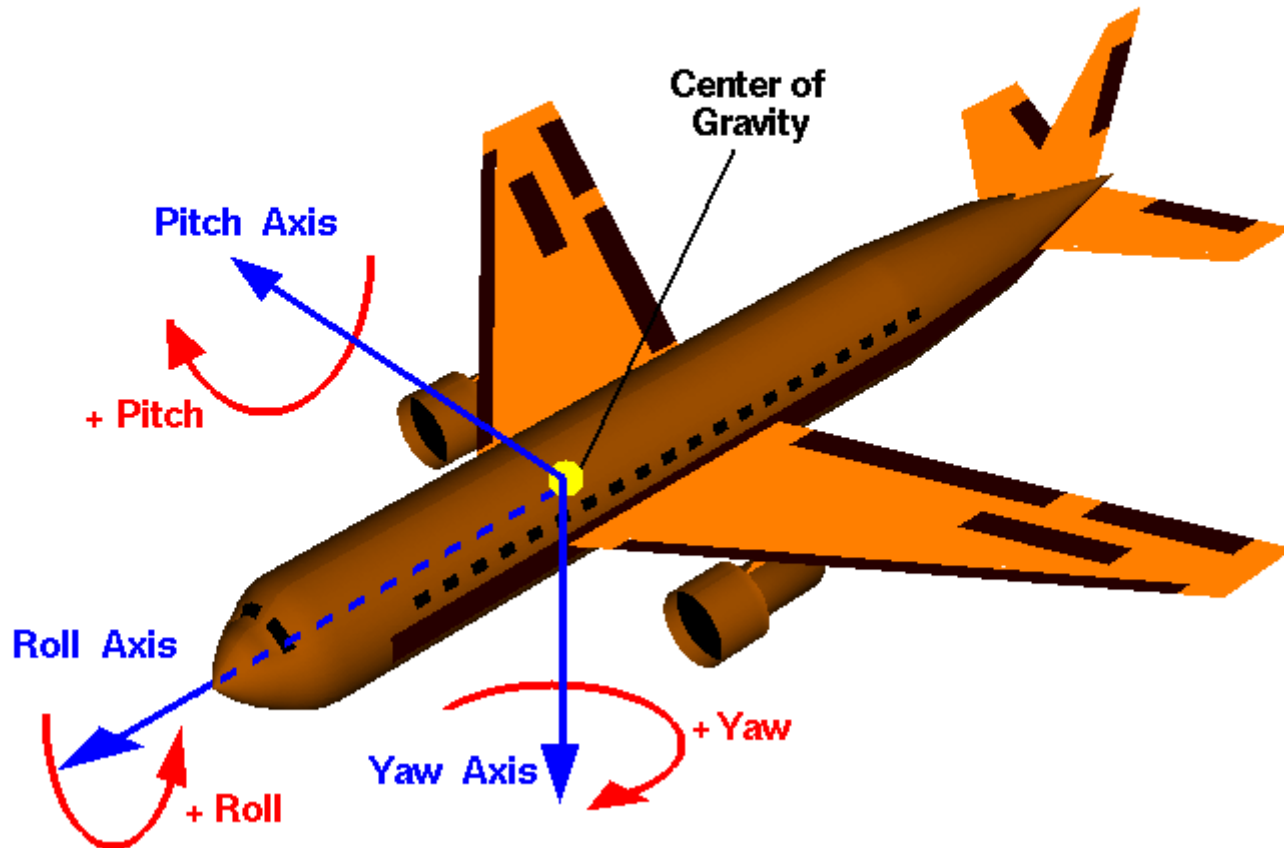


Figure 12. Airplane Roll/Pitch/Yaw

ROLL



- **How to Roll:**
 - Increase RPM of 1 & 2 to roll right
 - Increase RPM of 3 & 4 to roll left
 - Net zero torque
 - $1+2 \text{ Thrust} = 3+4 \text{ Thrust}$

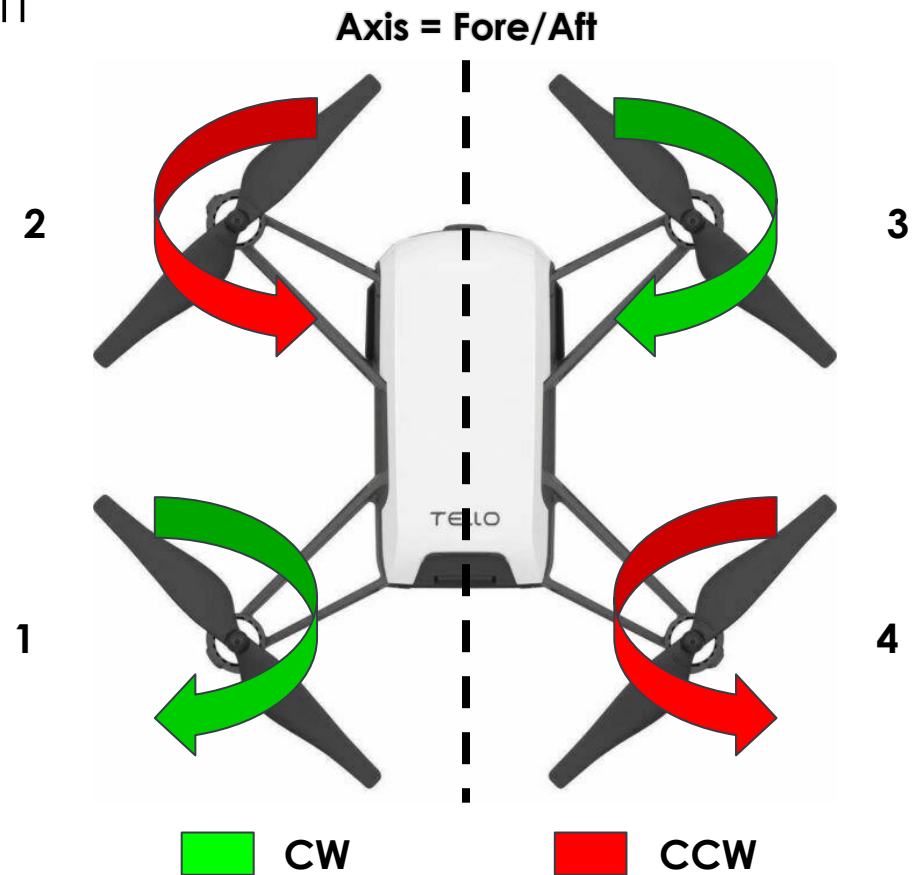


Figure 13. Drone Roll

PITCH



- **How to Pitch:**
 - Increase RPM of 1 & 4 to pitch down
 - Increase RPM of 2 & 3 to pitch up
 - Net zero torque
 - $1+4 \text{ Thrust} = 2+3 \text{ Thrust}$

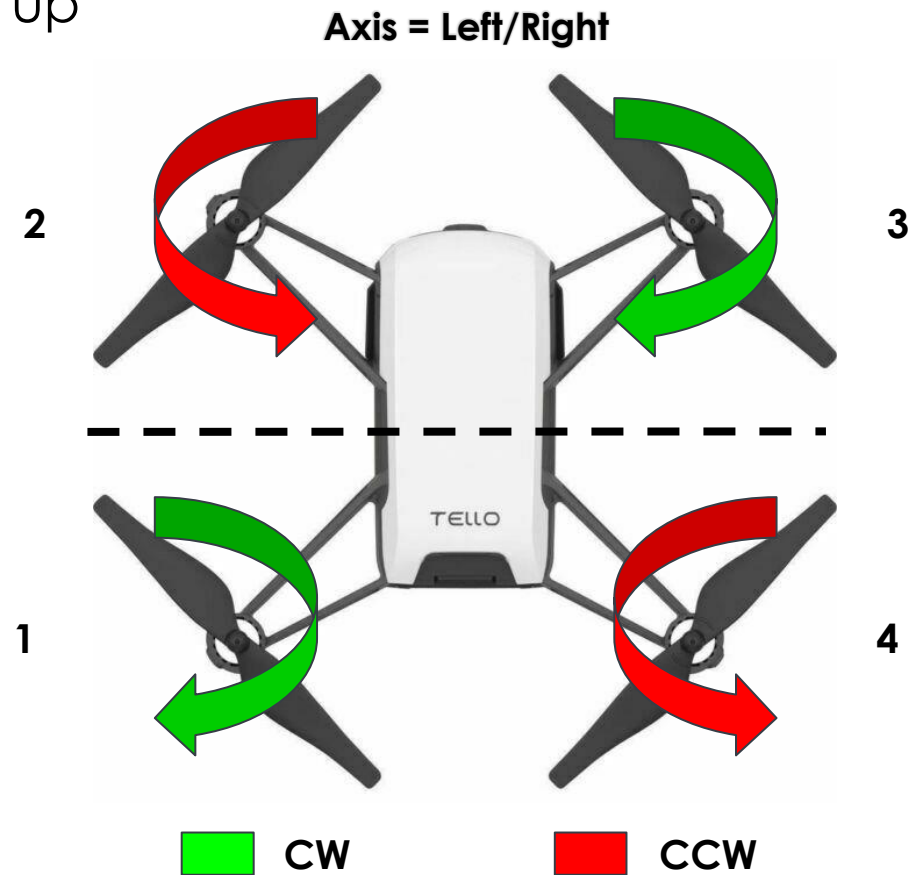


Figure 14. Drone Pitch

YAW



- **How to Yaw:**
 - Increase RPM of 1 & 3 to yaw CW
 - Increase RPM of 2 & 4 to yaw CCW
 - Net zero torque
 - $1+3 \text{ Thrust} = 2+4 \text{ Thrust}$

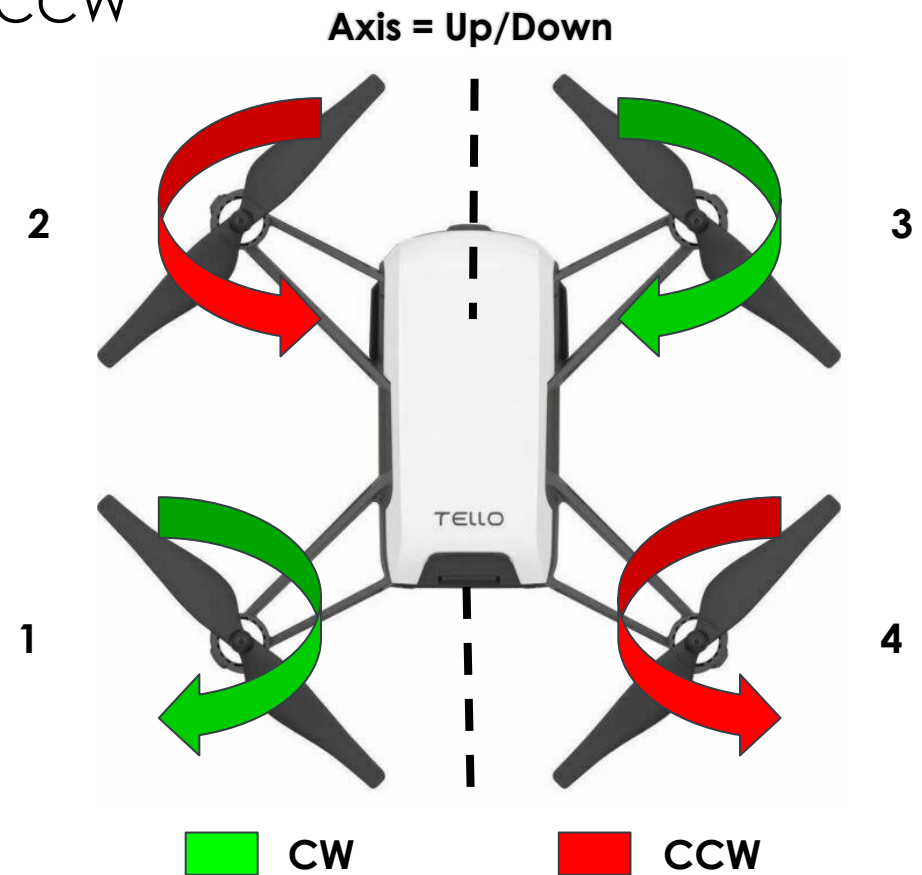


Figure 15. Drone Yaw



RESOURCES

MORE RESOURCES



- **Quadcopter Dynamics:**
<https://www.youtube.com/watch?v=DNc8o9CZLHU>
- **DroneBlocks:** <https://www.droneblocks.io/>
- **Download DroneBlocks:** <https://www.droneblocks.io/app>
- **Download DroneBlocks Code:**
<https://www.droneblocks.io/droneblocks-code>



SOURCES

- **Figure 1:** <https://droneblocks.io/apps>
- **Figure 2:** <https://droneblocks.io/blog/2020/9/15/get-social-with-the-droneblocks-code-board>
- **Figure 3:** <https://droneblocks.io/apps>
- **Figure 4:** <https://droneblocks.io/app>
- **Figure 5:** <https://learn.droneblocks.io/p/membership>
- **Figures 6-8:**
<https://learn.droneblocks.io/courses/1106056/lectures/23681135>
- **Figure 9:** https://www.researchgate.net/figure/Dynamic-movement-of-a-quadcopter_fig3_329303380
- **Figure 10:** https://www.researchgate.net/figure/3-UAV-roll-pitch-and-yaw-control_fig3_338954801
- **Figure 11:** (Oxford Dictionary Definition)
https://www.google.com/search?q=torque+definition&rlz=1C1ONGR_enUS965US966&oq=t&aqs=chrome.0.69i59l2j35i39j69i57j69i60l4.548j0j4&sourceid=chrome&ie=UTF-8
- **Figure 12:** <https://www1.grc.nasa.gov/beginners-guide-to-aeronautics/aircraft-rotations/>