DRONEBLOCKS

Module 1

DRONEBLOCKS INTRO

DRONEBLOCKS APP

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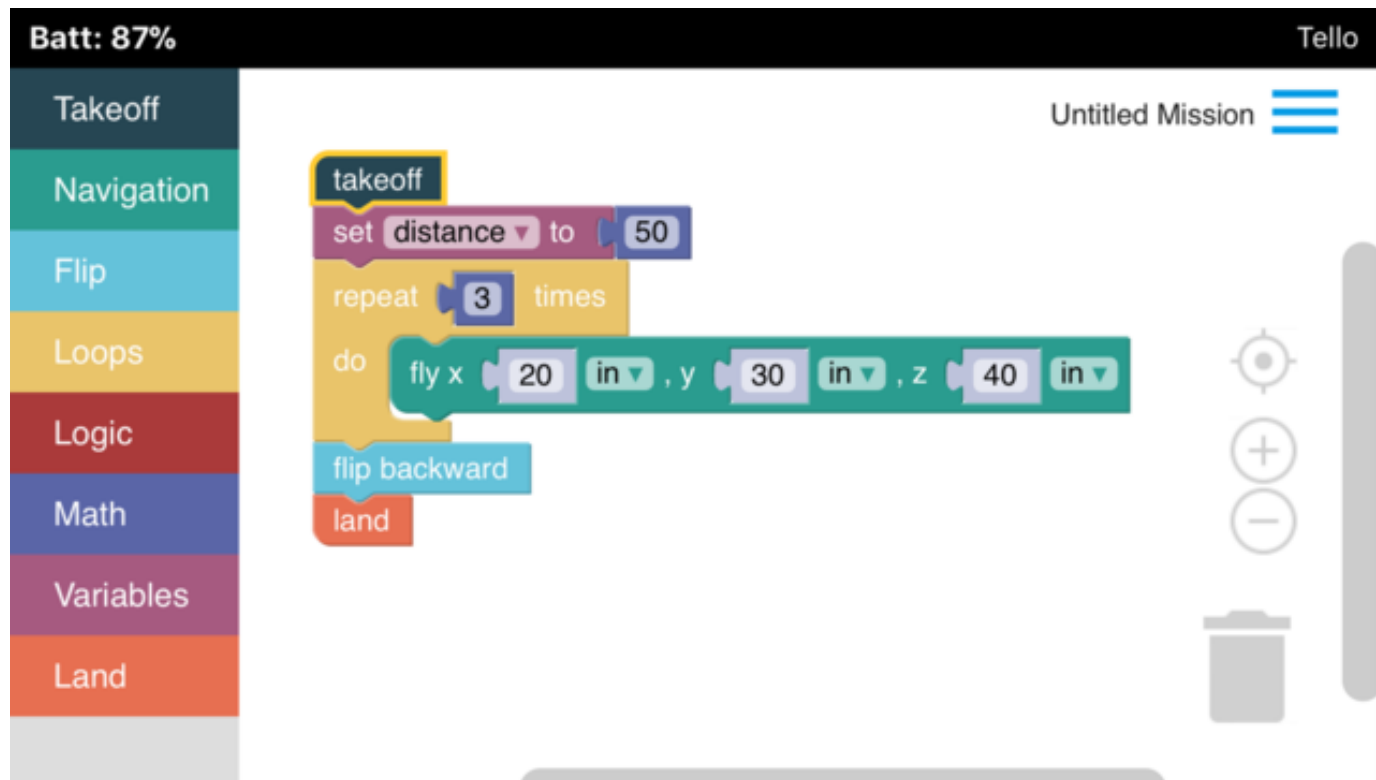

Figure 1. DroneBlocks Interface
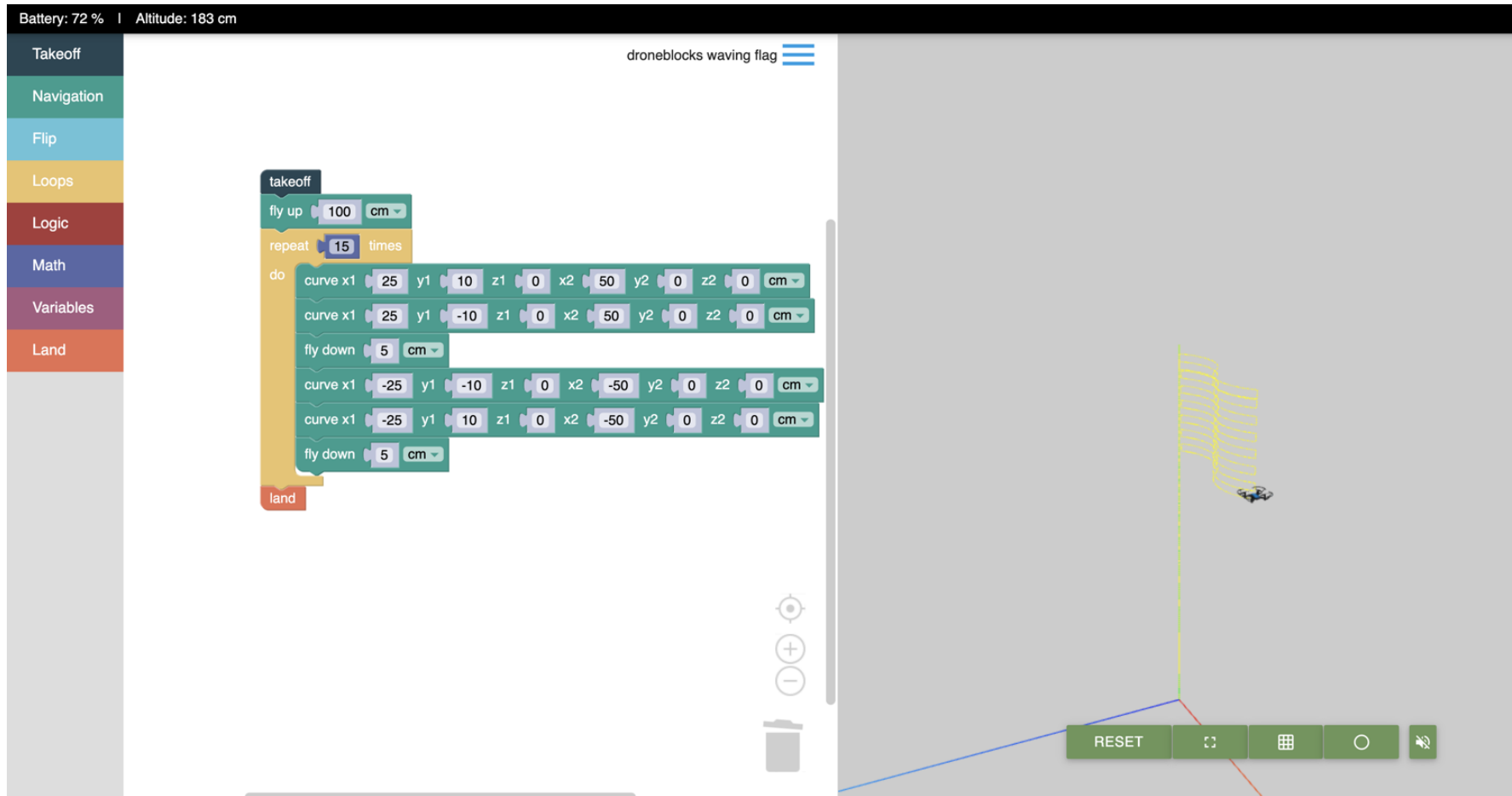
DRONE CODING SIMULATOR

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

Figure 2. DroneBlocks Simulator Interface

DRONEBLOCKS CODE

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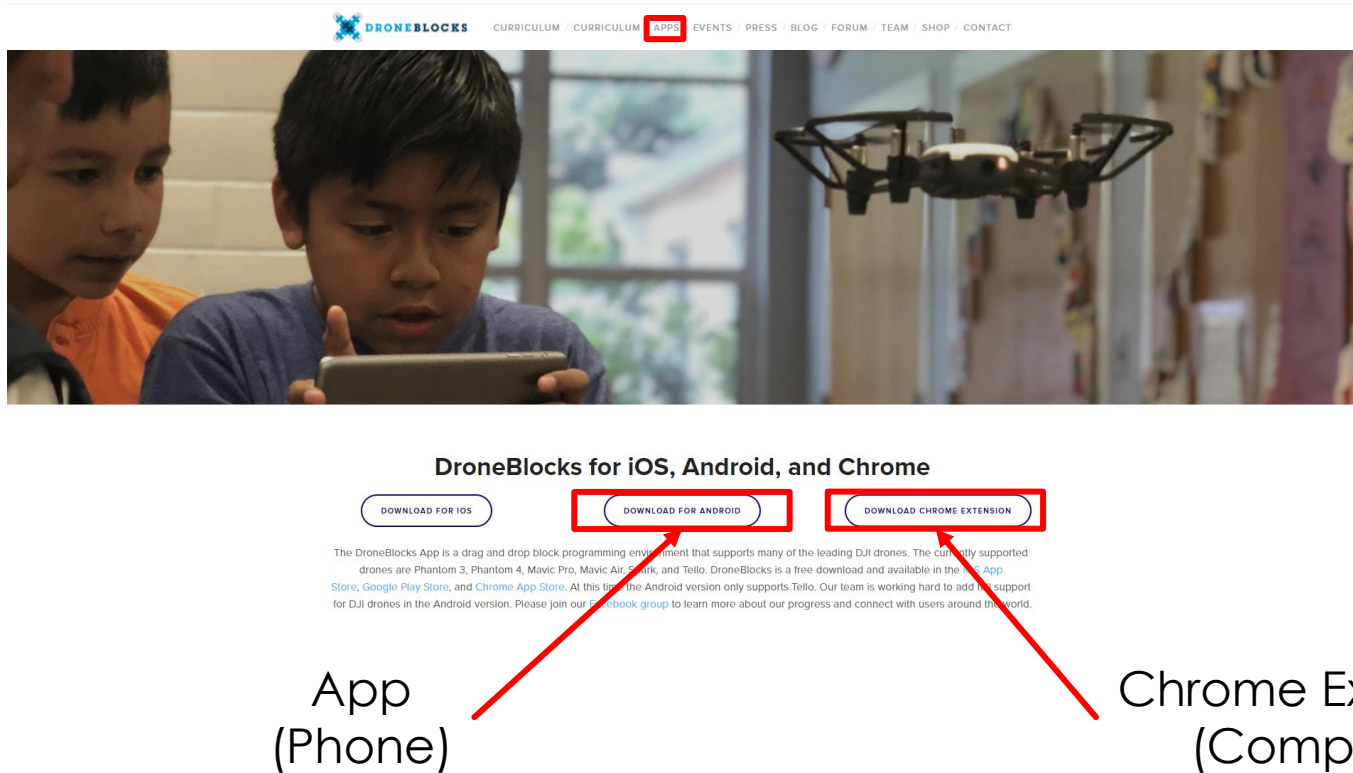 - Program your Tello using JavaScript

```
3:16 📶 ❄ 🖼 ...                                          📶✈ 100% 🔋
Batt: 45%      Alt: 0 cm      ToF: 10 cm    Pitch: 0°    Roll: 0°    Yaw: 0°           Tello
 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

GET DRONEBLOCKS

**App
(Phone)**

**Chrome Extension
(Computer)**

Figure 4. DroneBlocks Installation

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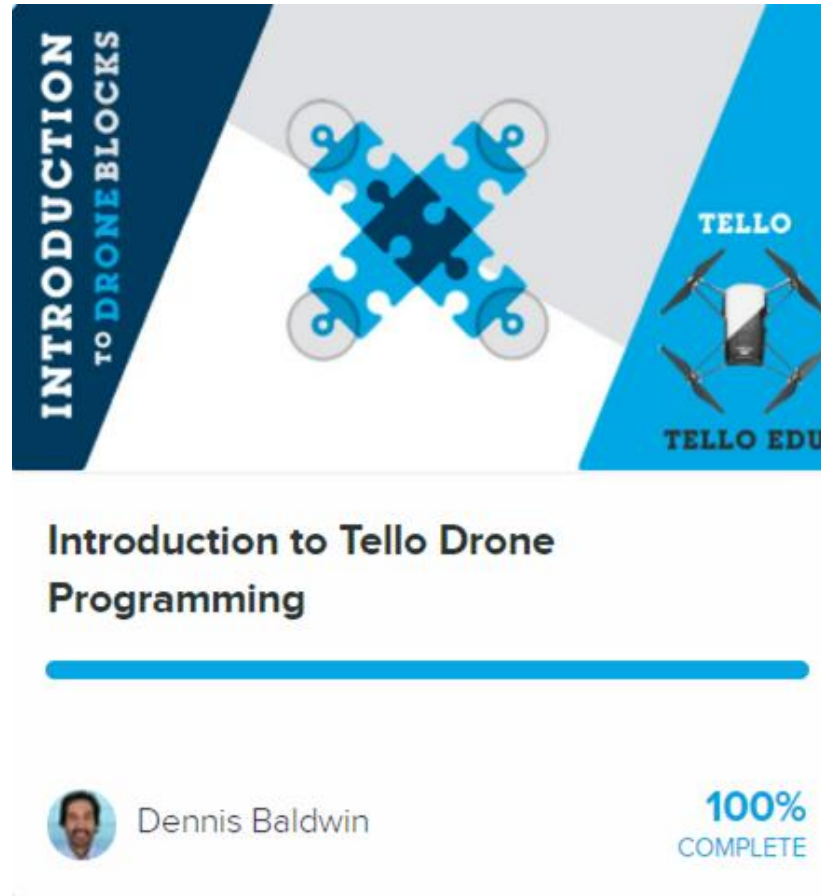 - https://droneblocks.io/
  - Introduction to Tello Programming (19 mins)

Figure 5. DroneBlocks Lessons

PRACTICE EXAMPLE

- **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

- 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. Connect

4. You should now see Tello 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

ARC

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
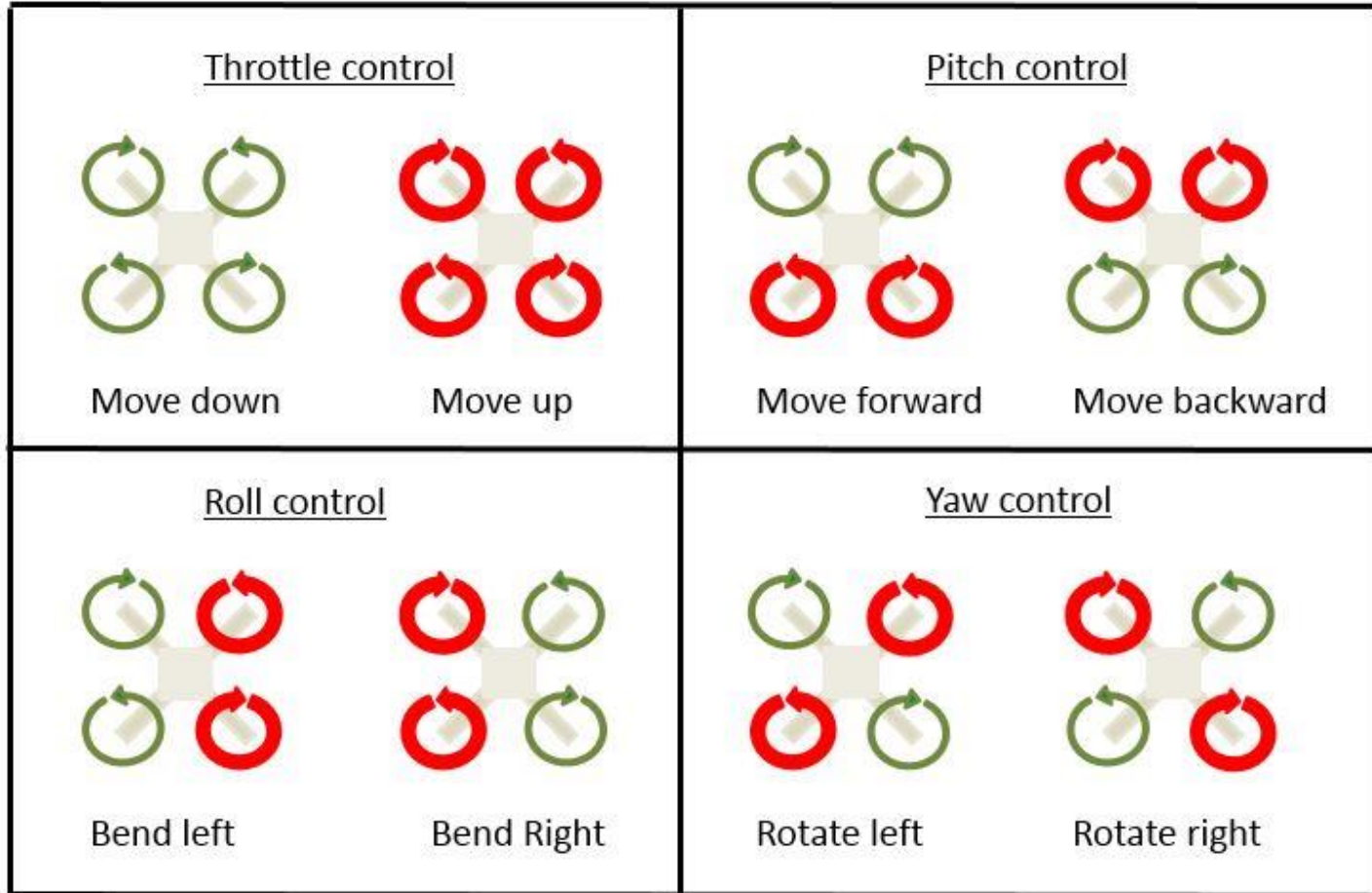
Figure 9. Quadcopter Rotor Control

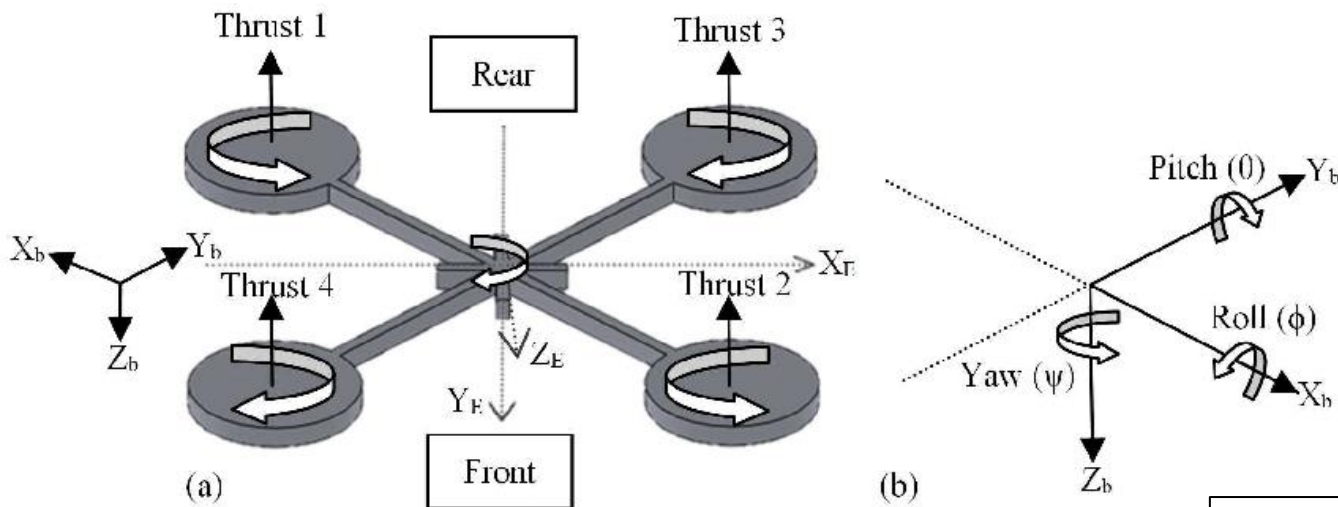**Figure 10. Quadcopter Roll/Pitch/Yaw**

Figure 11. Definition of Torque

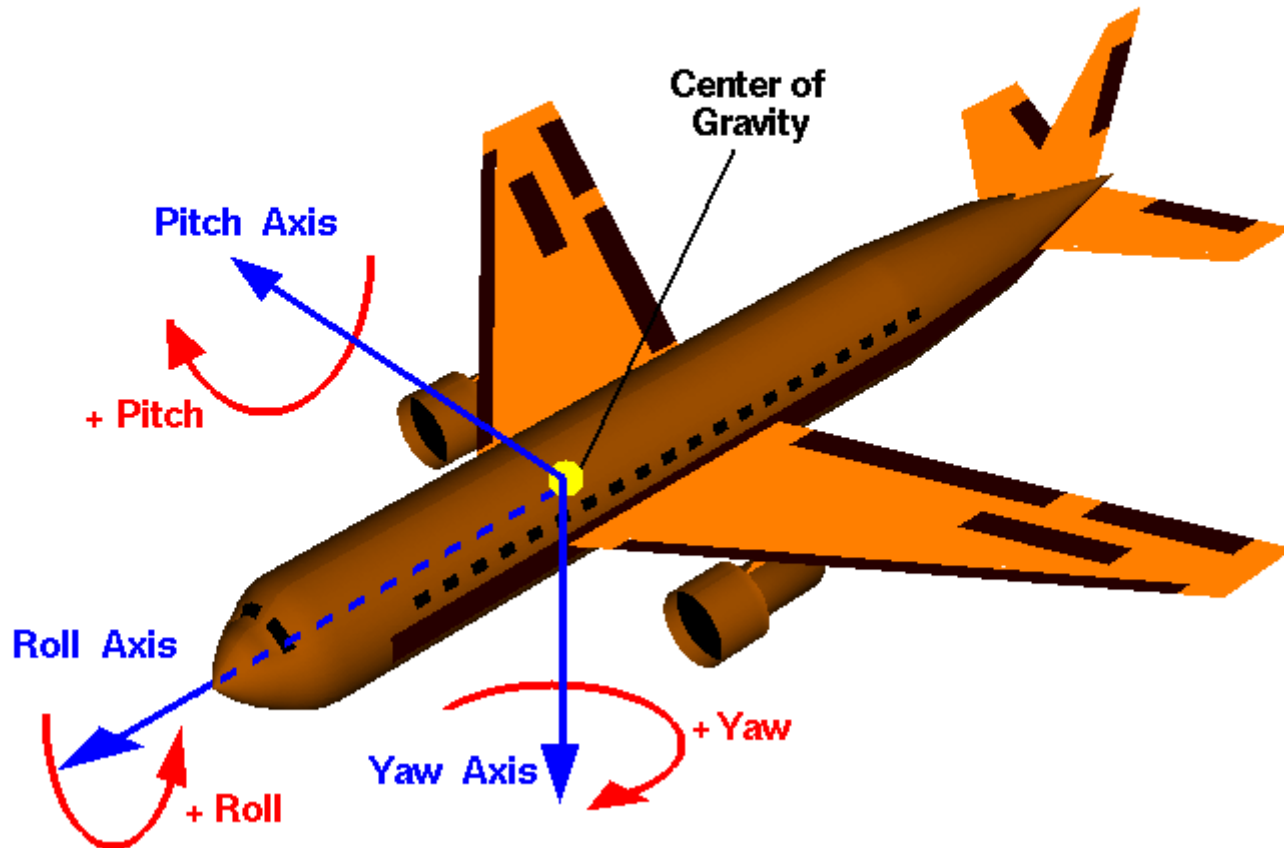**Figure 12. Airplane Roll/Pitch/Yaw**

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

Axis = Fore/Aft

CW CCW

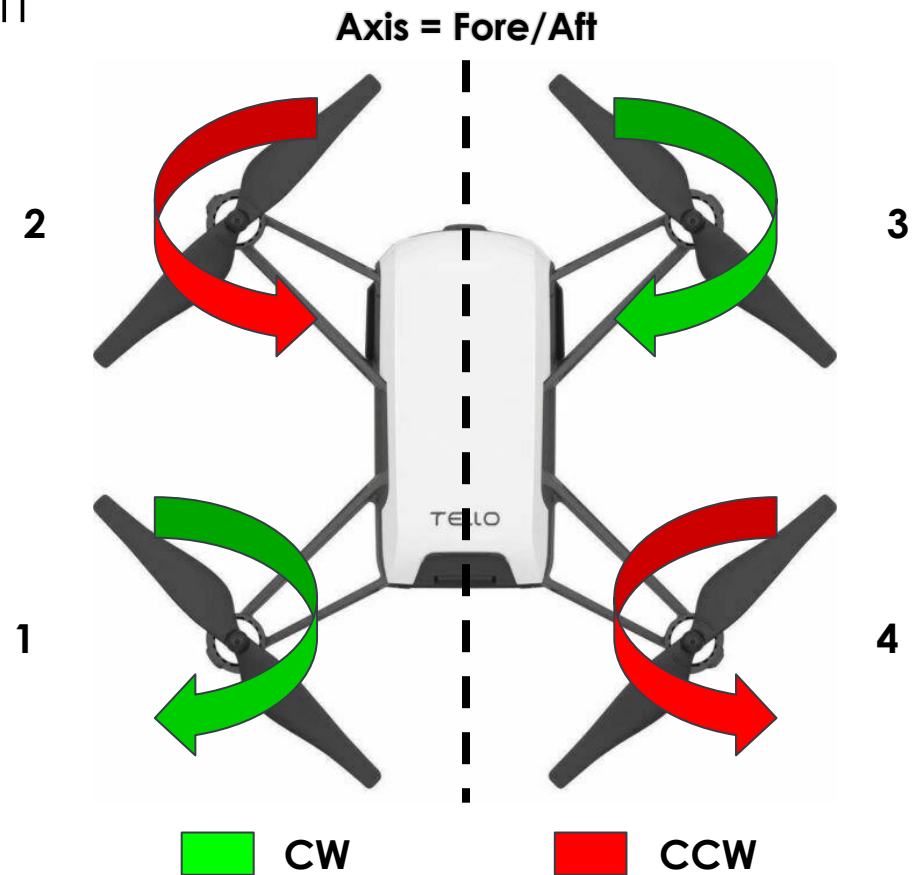**Figure 13. Drone Roll**

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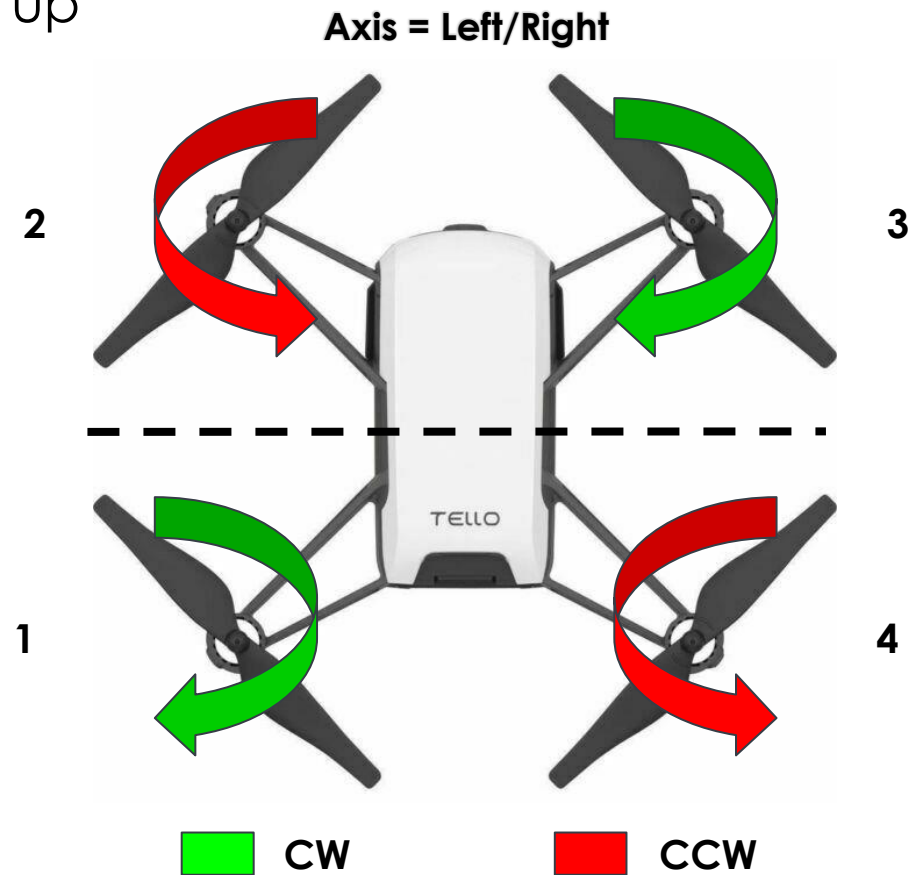   - 1+4 Thrust = 2+3 Thrust

Axis = Left/Right

2

3

1

4

CW CCW

Figure 14. Drone Pitch

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

Axis = Up/Down

2   3

1   4

CW   CCW
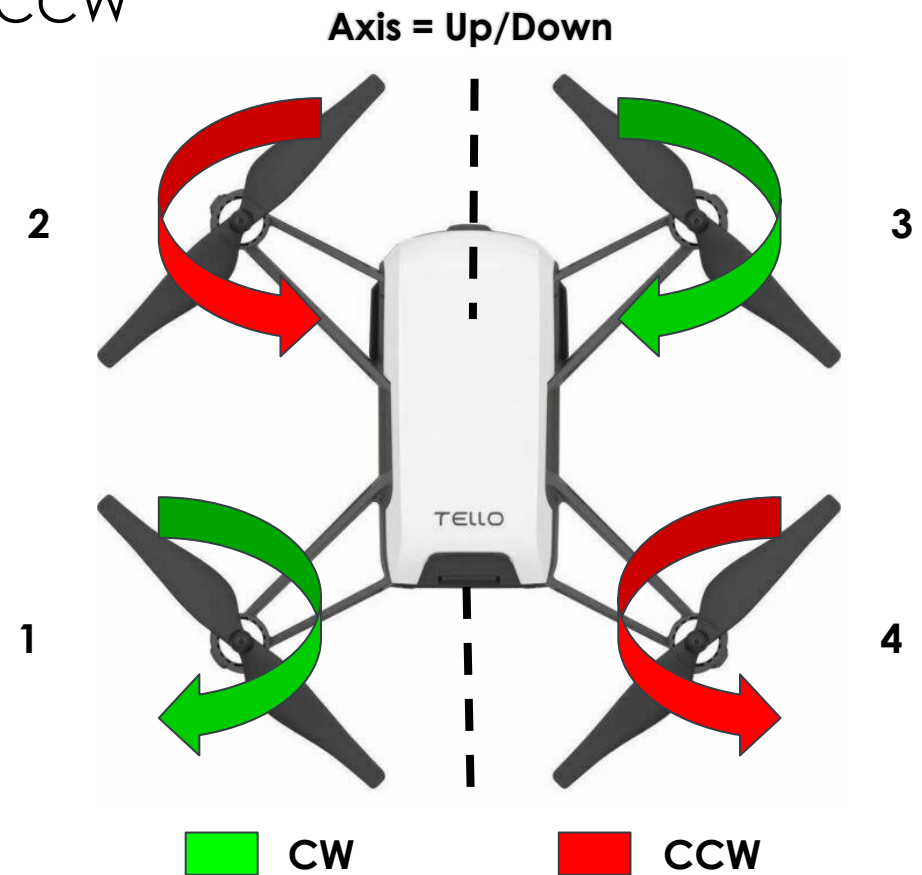
Figure 15. Drone Yaw

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

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/