Scratch 3.0 Tello Extension

v1.1 20211013

Overview

Tello Extension allows users to use Scratch 3.0 to control Tello with visual programming.

Safety Features

After Tello executes the current command, if there is no additional command input after 15 seconds, the drone will automatically land.

Reset the Wi-Fi

The extension only supports Direct Wi-Fi (AP mode). If Tello enters STA mode, you can press and hold the power button for 5s when the drone is on. The status indicator will turn off and the drone will restart. When the status indicator blinks yellow, the Wi-Fi SSID will restore to factory settings, with no set password by default.

Architecture

Build Wi-Fi communication between Tello and computer.

Tello IP: 192.168.10.1 UDP PORT: 8889 << - - >> computer

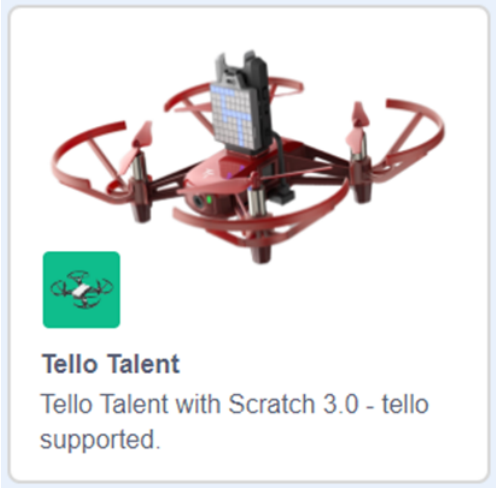
The extension will automatically create two UDP clients that bind to '0.0.0.0:45689' and '0.0.0.0:8890' respectively. Port '45678' is responsible for sending and receiving commands to Tello. Port '8890' is responsible for receiving Tello status information. Before using the extension, make sure both ports are available.

Quick Start

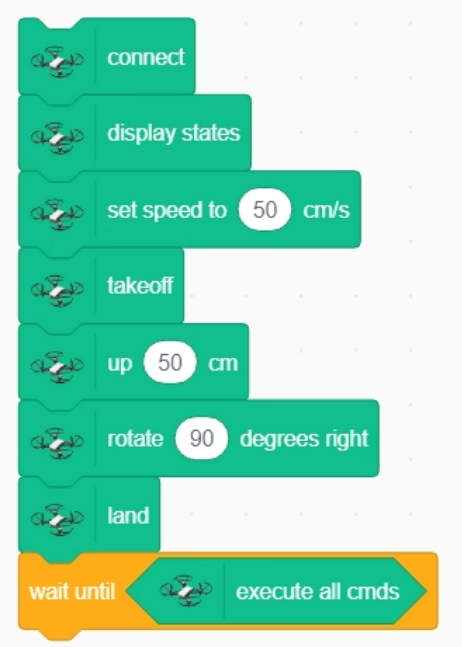
1. Power on Tello, connect computer to Tello's Wi-Fi, and launch Scratch 3.0 for Tello Extension;

2. Click the *Add Extension* button on the bottom left corner to open the extension selection interface;

3. Click the extension *Tello Talent*;



4. Read the command block instructions, and drag the blocks to use them. You can see one example bellow. A *connect* block is always required at the beginning of the program. A *wait execute all cmds* block is required at the end of any non-blocking command (blocking and non-blocking commands will be explained later);

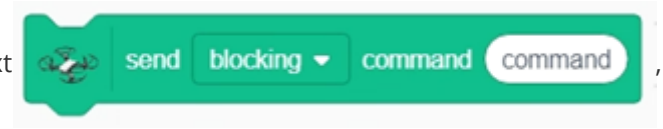


5. Click the code block to initiate the program. A *Connecting* window will pop up to connect with Tello. Once the drone is connected, the *Connecting* window will close automatically and the programs will run successively. The *connect* block will execute the connection command before running every code to make sure Tello is stably connected to the computer;

6. As a state display block is used, the Tello status window will appear and can be closed at any time;

7. While a program is running, the entire code module will be highlighted in yellow. You can stop the program mid-execution by clicking the *Stop* button.

Blocking and Non-blocking

Besides blocking modes in plain-text 

, all other blocks are non-blocking.

Non-blocking Blocks

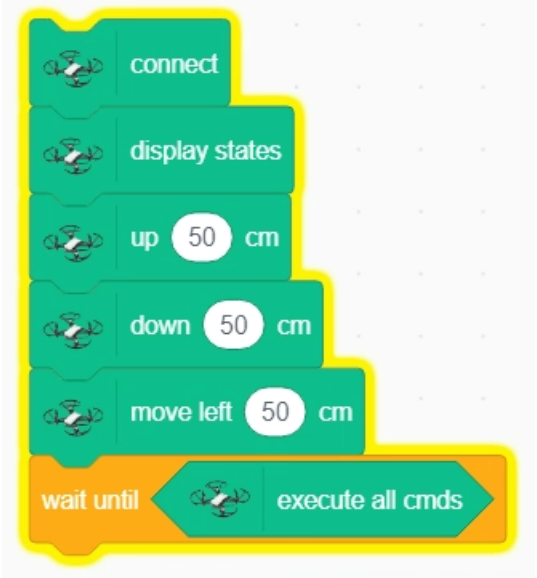
When using non-blocking blocks, all command blocks will automatically be set to completed and then send a *land* command to end the program. After that, the entire code module will no longer be highlighted in yellow and the *Stop* button will not be functional.

As shown in the illustration, the program will directly complete and exit.

To turn an unblocking block into a blocking state, put *wait execute all cmds*

at the end of the non-blocking block.

As shown below, the program can now run normally.

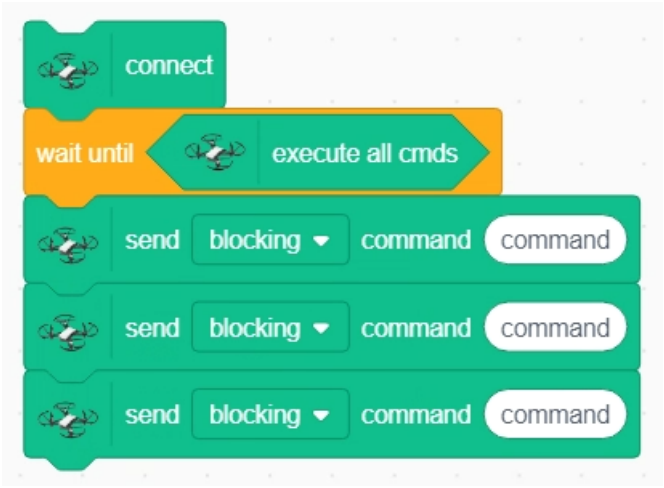


Blocking Blocks

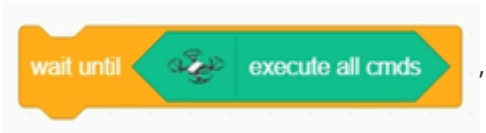
Blocking blocks can be used independently without the *wait executive all cmds* block

. All blocking blocks will executive successively, which means a command will only execute when the previous one is completed.

As shown below, blocking blocks can enter a blocking state.



Combination of Blocking and Non-blocking Blocks

As shown below, all non-blocking blocks should end with 

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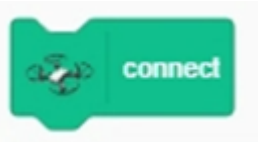
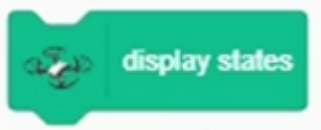
and then be followed by blocking blocks. There are no limits for connections between blocking blocks. A blocking block can be followed directly by a non-blocking one.

Command Blocks

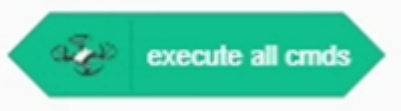


: To connect with Tello, check the connection between a single block and Tello before adding more blocks

Note: This block must be put at the beginning of the Tello program.



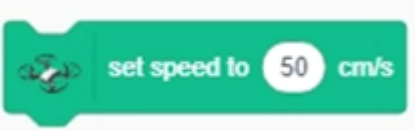
: To open the Tello status window



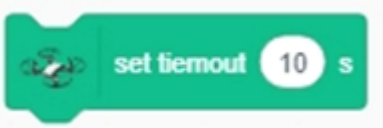
: To return to a Boolean value based on mission status. If the mission is completed, return to true; if not, return to false

Attention: This block should be used with 

, that comes with scratch 3.0 and must be put at the end of the Tello code.

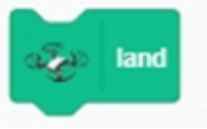


: To set speed



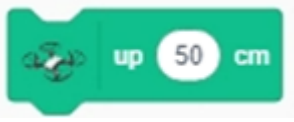
: To set timeout. If there is no response after timeout, the program will send a land command and then stop

: To take off

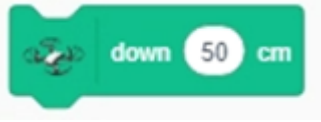


: To land

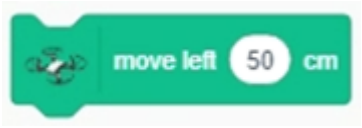
: To turn off Tello during an emergency



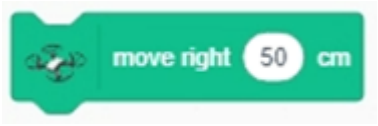
: To move Tello up by [X]cm; X: 20-500



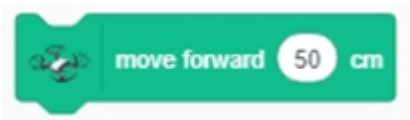
: To move Tello down by [X]cm; X: 20-500



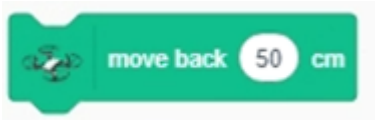
: To move Tello left by [X]cm; X: 20-500



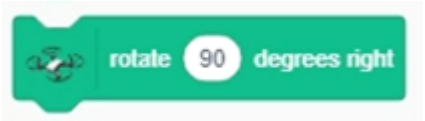
: To move Tello right by [X]cm; X: 20-500



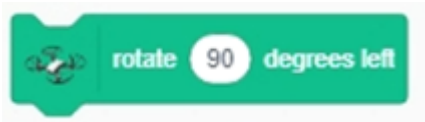
: To move Tello forward by [X]cm; X: 20-500



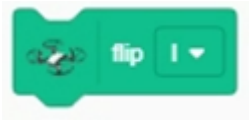
: To move Tello back by [X]cm; X: 20-500



: To right rotate Tello by [X] degrees; X: 1 - 360



: To left rotate Tello by [X] degrees; X: 1 - 360



: To flip Tello [forward, back, left, right]

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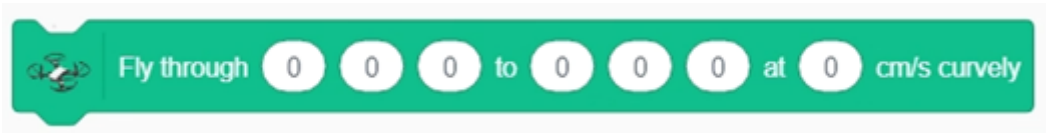
To set the speed at (cm/s) and fly to (x,y,z) ;

x: -500 - 500 y: -500 - 500 z: -500 - 500

speed: 10-100 (cm/s);

x, y and z should not be in the -20 to 20 range all at the same time.



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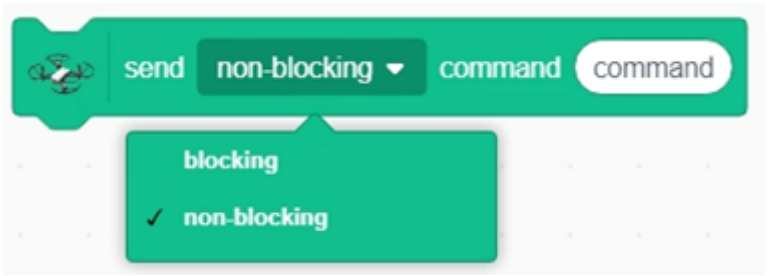
To set the speed at (cm/s) and fly through (x1,y1,z1) in a curve to (x2,y2,z2). If the curve radius is not in the 0.5-10 meters range, return relevant notifications;

x1, x2: -500 - 500 y1, y2: -500 - 500

z1, z2: -500 - 500 speed: 10-60 (cm/s)

x, y and z should not be in the -20 to 20 range all at the same time.



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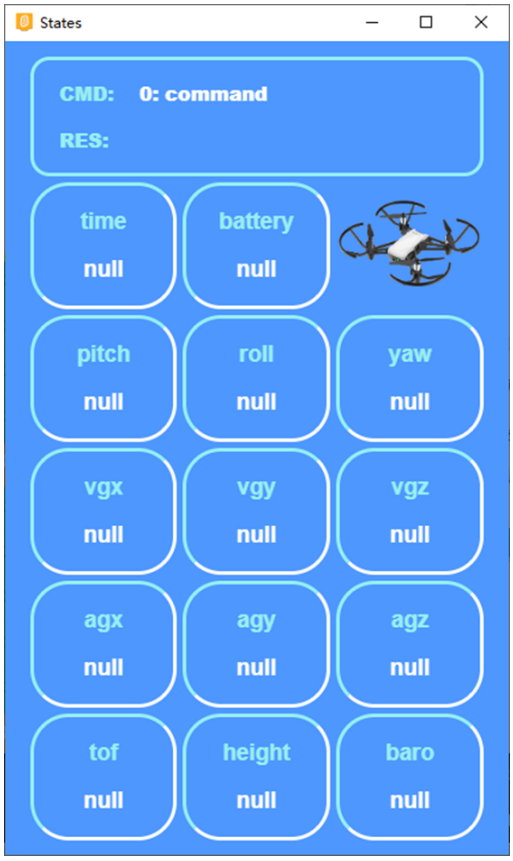
Plain-text command: To send plain-text commands in non-blocking or blocking mode.

To learn more about plain-text command, please refer to Tello_SDK_3.0_User_Guide.

Status Information



CMD: Command number: current command

RES: Command number: return information of the command

time: flight time after Tello takes off

battery: remaining power of Tello

pitch: pitch angle

roll: roll angle

yaw: yaw angle

vgx/vgy/vgz: speed on x,y,z

agx/agy/agz: acceleration on x,y,z

tof: height from the ground

height: height from the takeoff point

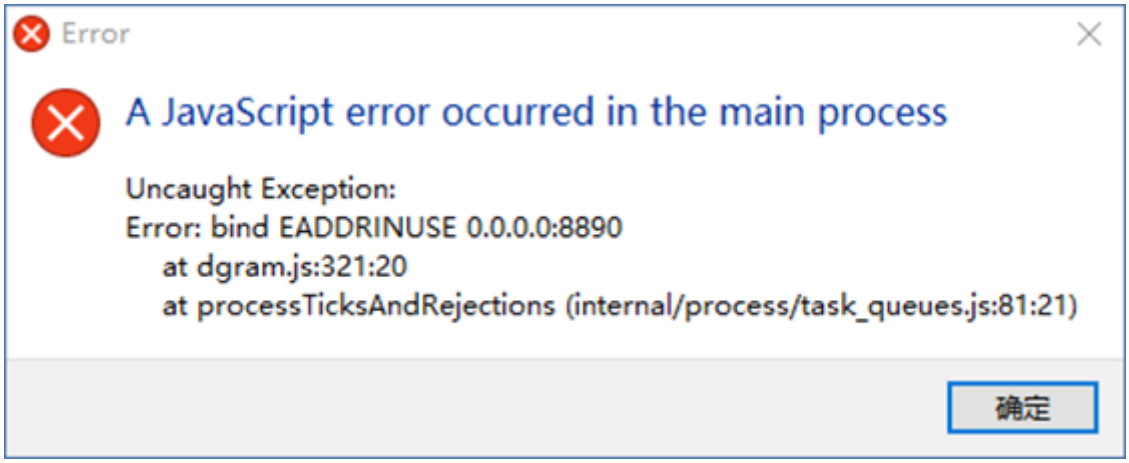
baro: height of the barometer

FAQs

1. Command Block Compatibility with Tello and Tello Talent.

Only established blocks in the extension supports Tello. Other plain-text commands in SDK 3.0 do not support Tello. Using unsupported commands will lead to an ***Unknown Command*** notification in the ***RES*** status window.

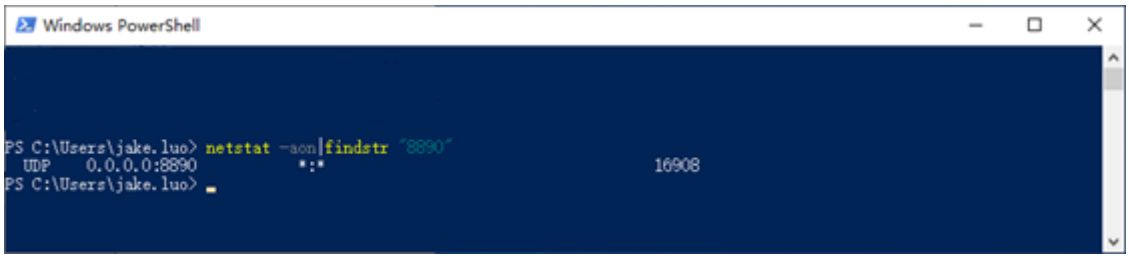
2. If the following error occurs when launching Scratch, it means another software is occupying Port 8890. To fix, close the software and restart Scratch.



Detailed steps:

(1) Press ***win+R*** to launch Command Input and enter ***powershell*** to open up the Windows Terminal;

(2) Enter ***netstat -aon|findstr "8890"*** in the Terminal to get the program pid;



(3) Enter ***taskkill /T /F /PID 16908*** in the Terminal (16908 is the pid value returned in the last step), close the program and restart Scratch.