



Lesson 3:

Introduction to Block-Based Programming

Smart Farming with Drones

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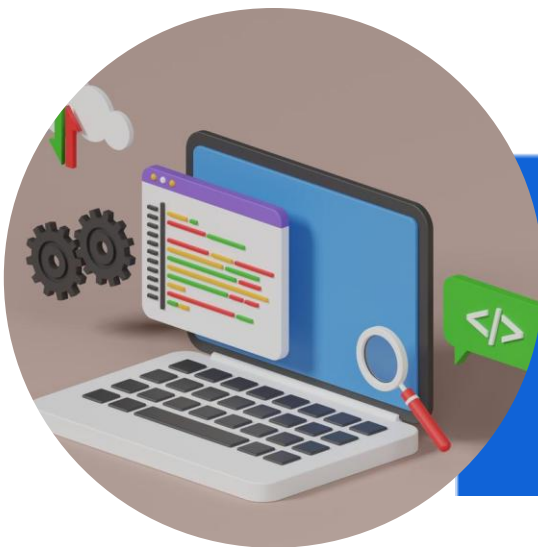
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Lesson Objectives

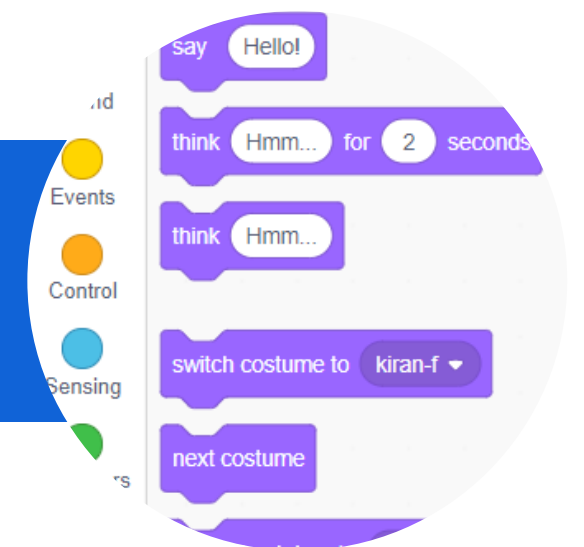
Understand the basics of block-based programming.

What is Block C



Learn how to use tools like Scratch or Mind+ for programming.

Design simple coding examples



TOPICS

Introduction to Block-Based Programming

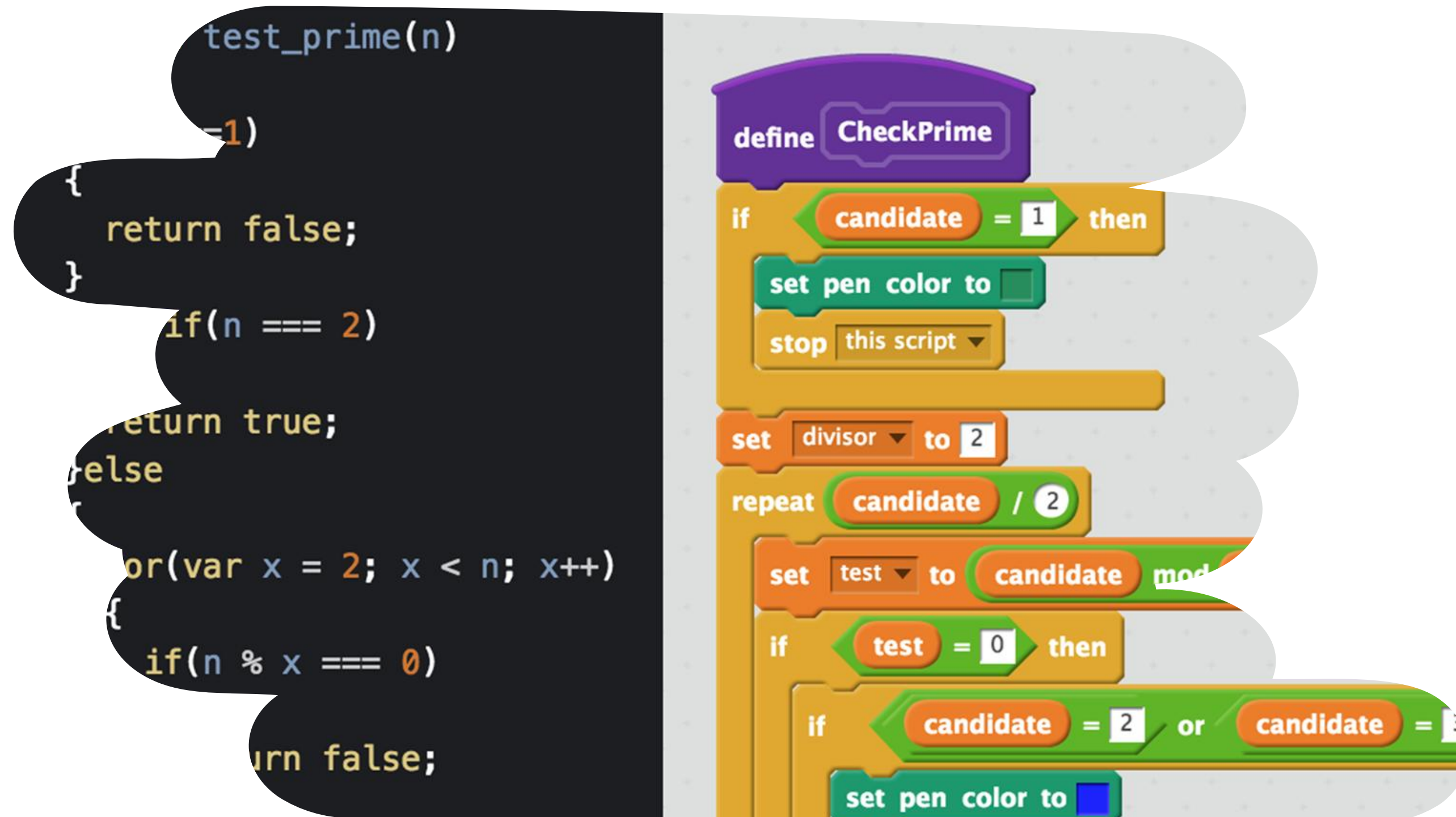
Mind+ and specific Drone Blocks

Simple coding

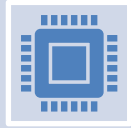
Examples

Discussion and Q&A

Introduction To Block Based Programming



What is Block Programming?



Block-based programming is a visual way of coding where users create programs by connecting blocks that represent code instructions.



Designed to be intuitive and easy for beginners, especially young learners.



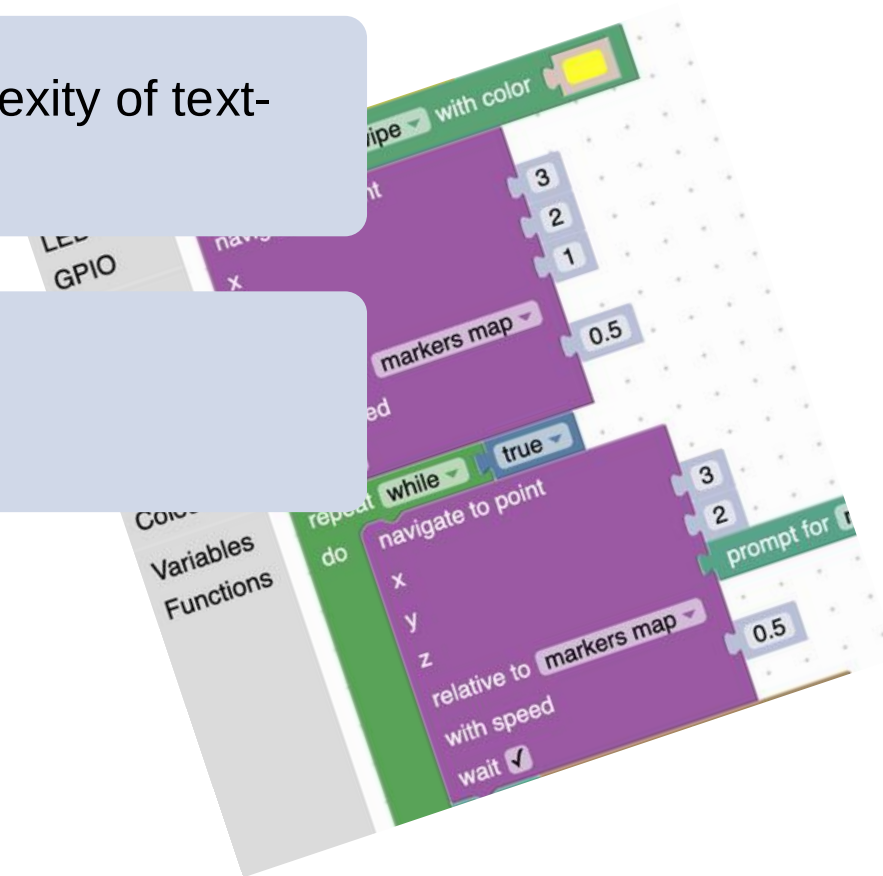
Block coding is considered “syntax-free”



Focusing on core concepts, structural logic, and problem solving, without getting bored or frustrated by the complexity of text-based coding.



Builds strengths in STEM through math, evaluation, and analysis



Type Of Blocks

MOTION

It allows you to position and move the sprite within the work area.

LOOKS

It allows you to change the appearance and let the sprite speak.

SOUND

It allows you to introduce sound effects.

EVENTS

It allows you to start the program according to the different events and manages the messages.

CONTROL

It allows you to make loops and insert conditional blocks.

SENSING

It allows you to manage interactions.

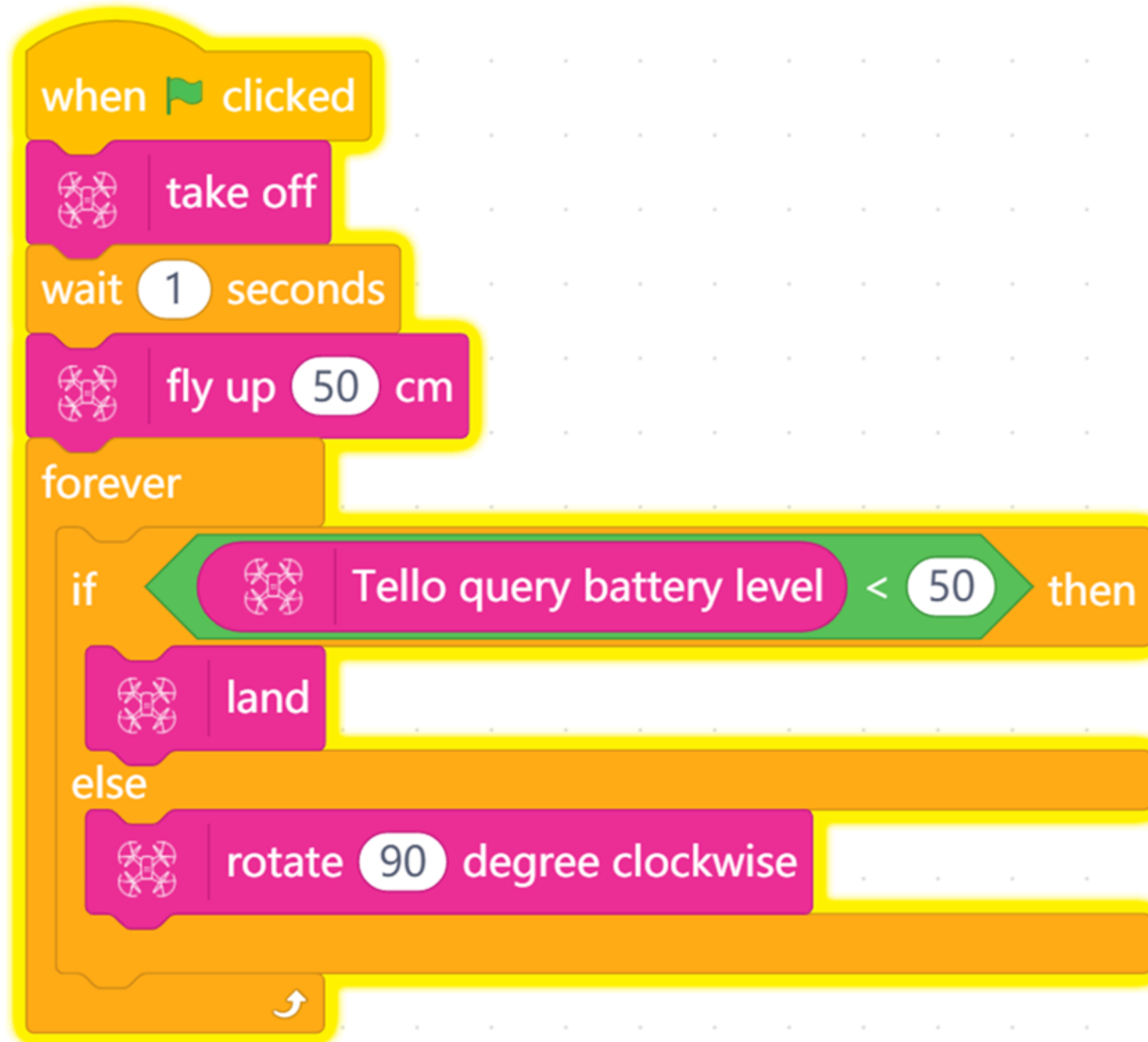
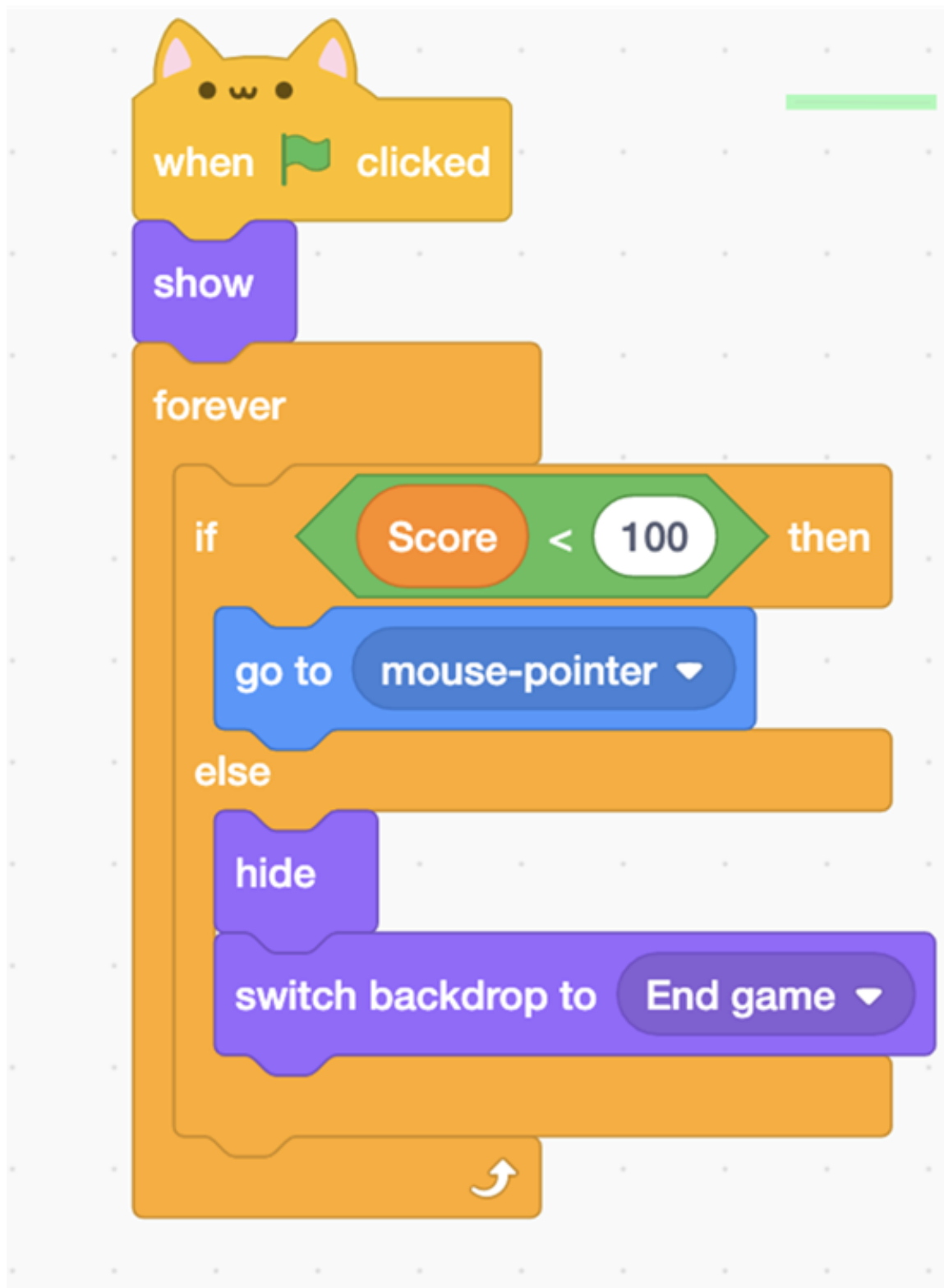
OPERATORS

It allows you to perform mathematical and comparison operations.

VARIABLES

It allows you to create and manage variables.

Blocks are shapes that can combine



Motion Blocks

Motion

move 10 steps

go to x: -8 y: -156

go to random position ▼

glide 1 secs to x: -8 y: -156

glide 1 secs to random position ▼

turn ↻ 15 degrees

turn ↺ 15 degrees

point in direction 90

point towards mouse-pointer ▼

change x by 10

set x to 104

Color-coded light blue

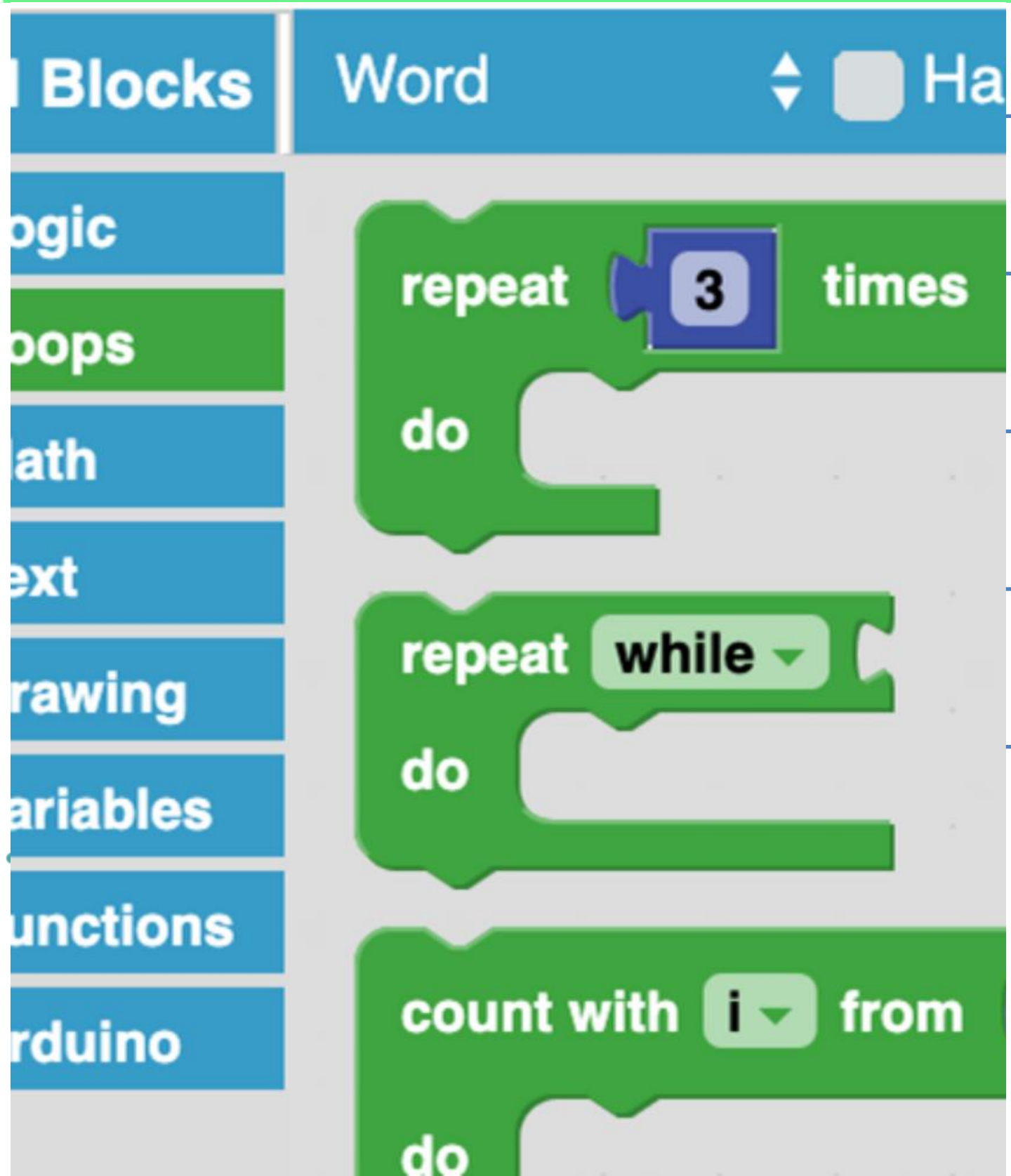
Motion blocks are the building blocks that move the drone

Take off / Land

Move Forward / Backward

Rotate Clockwise/Counterclockwise

Loop Blocks



Color-coded green

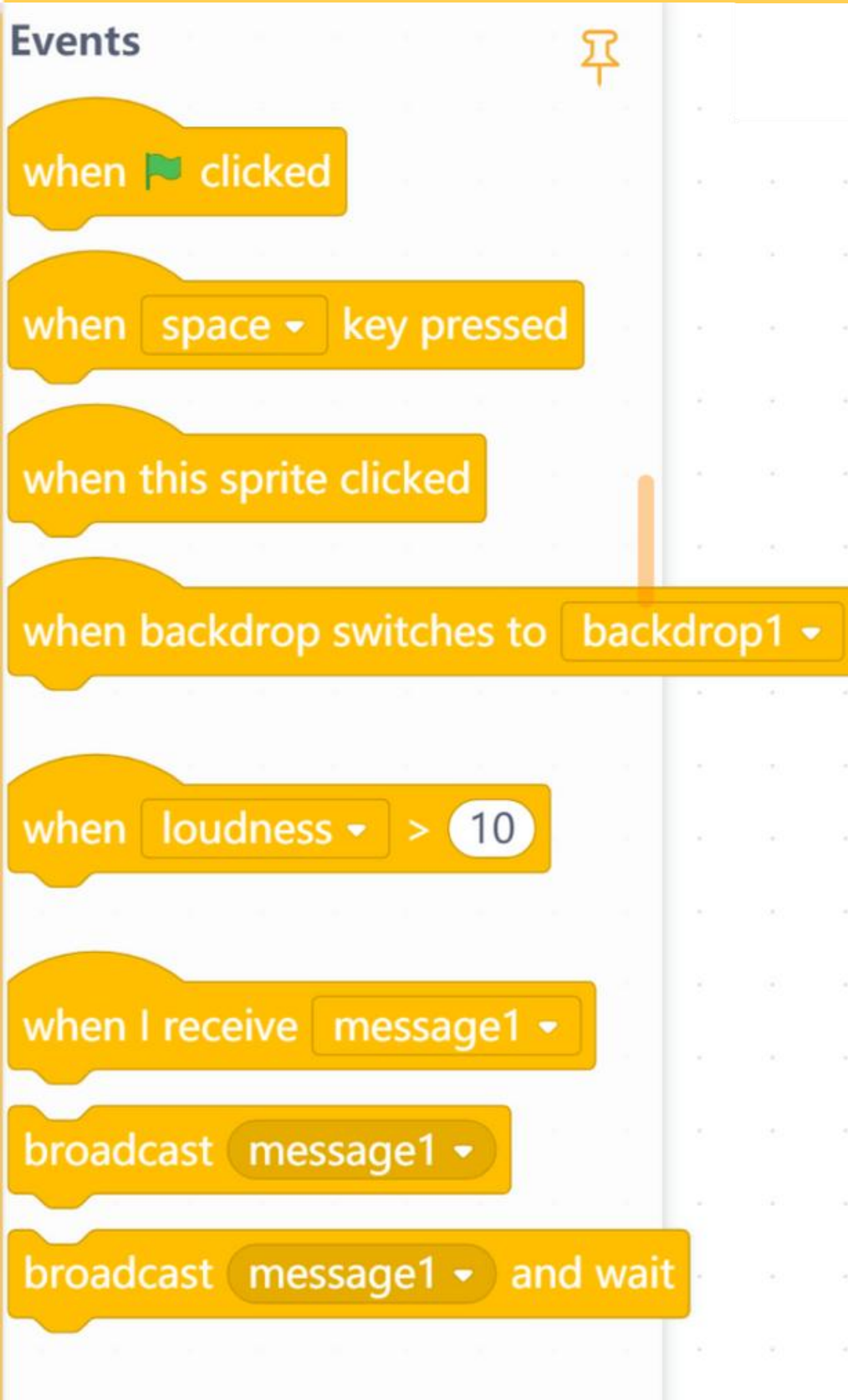
Loops are foundational to programming, allowing tasks to be repeated multiple times efficiently. In block coding,

Repeat EVENTS

Move forward UNTIL you find an obstacle

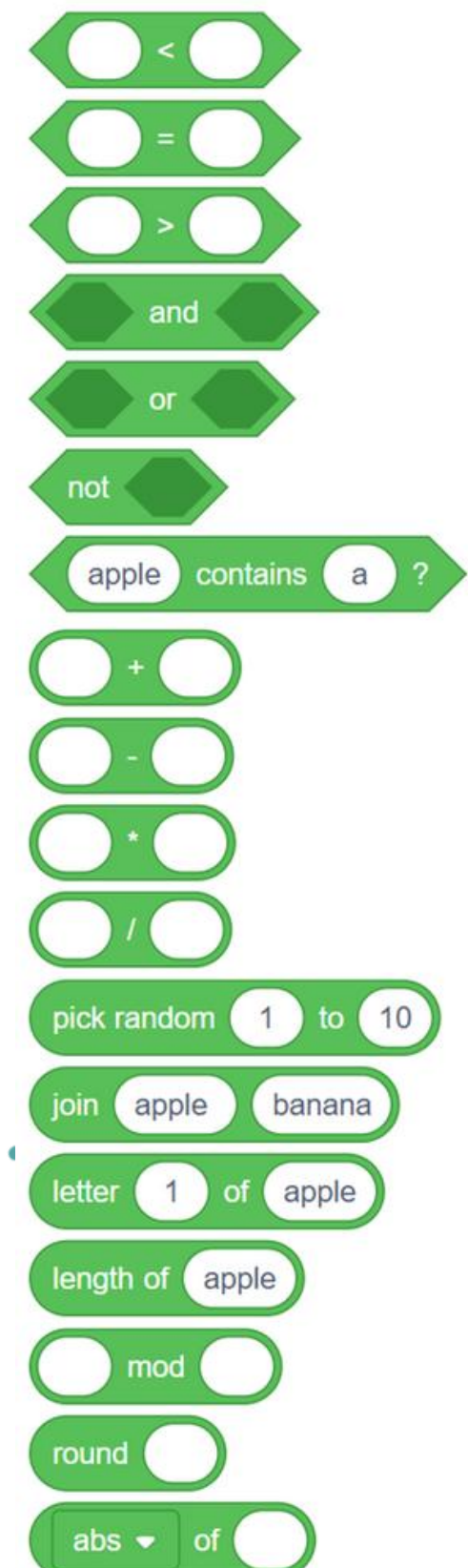
Fly UNTIL variable battery > 20%

Event Blocks



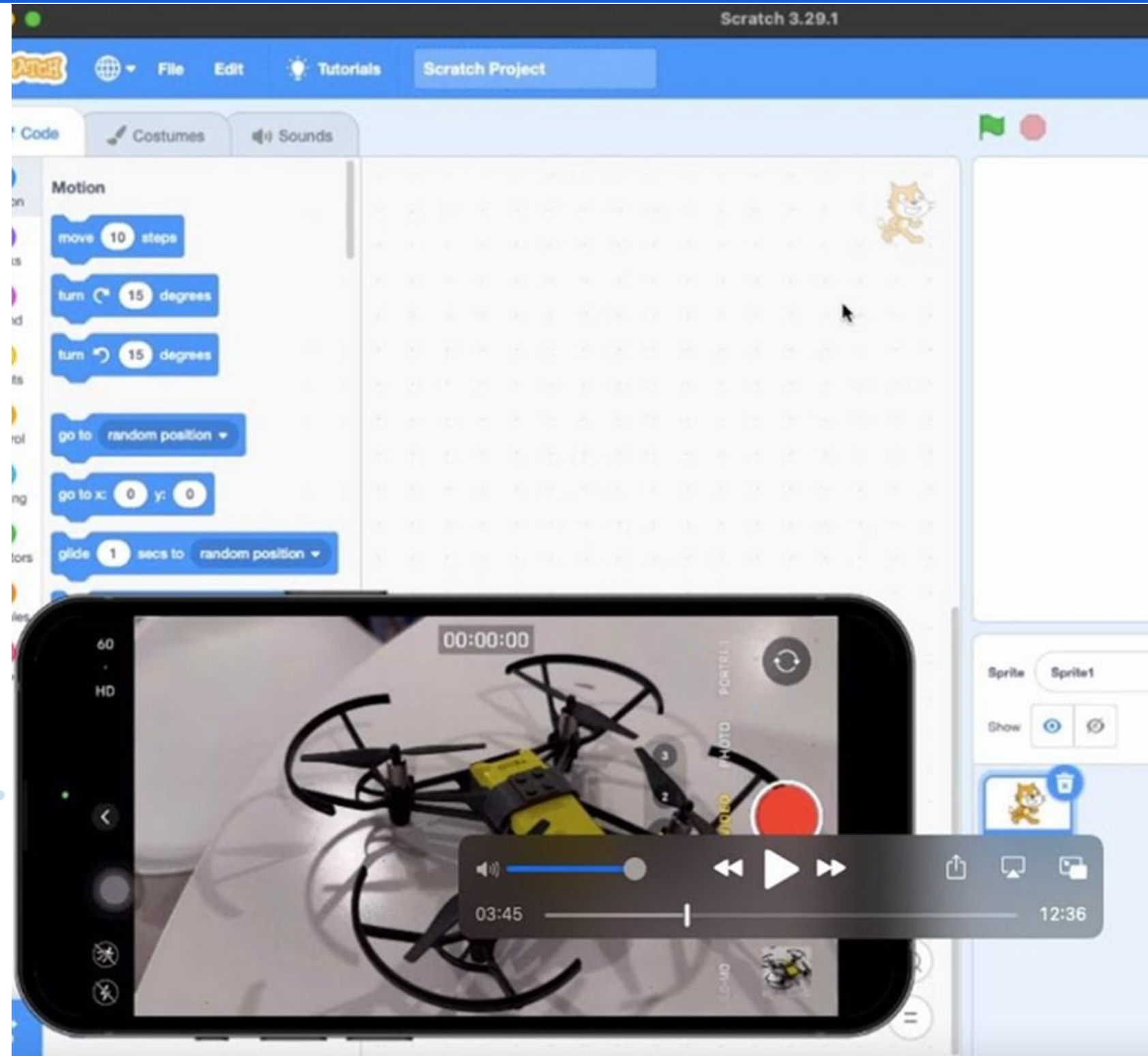
- **Color-coded light yellow**
- **Events are triggers that start actions in a program, such as pressing a key, clicking the mouse, or even receiving a message from another part of the program.**
- **These blocks are used to define when a script is to be run.**

Operator Blocks



- **They are color-coded light-green,**
- **Are used to script math equations and string handling**
- **If battery < 20%**
- **If infrared value = 10**

More Information



<https://en.scratch-wiki.info/>

<https://scratch.mit.edu/>

Mind+ and Drone Blocks

The screenshot displays the Mind+ software interface, which is used for programming drones. On the left, a vertical sidebar lists various block categories: Sound, Events, Control, Sensing, Operators, Variables, My Blocks, and Functions. Each category is represented by a colored circle. The main workspace on the right shows a script for a drone. The script begins with a 'when clicked' event block, followed by a 'take off' block, a 'wait 1 seconds' block, and a 'fly up 50 cm' block. These four blocks are grouped within a yellow 'forever' loop. Inside the loop, there is an 'if' conditional block. The 'if' block checks the condition 'Tello query battery level < 50'. If the condition is true, it executes a 'land' block. If the condition is false, it executes a 'rotate 90 degree clockwise' block. The script ends with a curved arrow indicating the loop continues.

Sound

- turn Tello's video open ▾

Events

- Enter propeller mode

Control

- Exit the propeller mode
- take off

Sensing

- Throw away in 5 seconds

Operators

- land

Variables

- fly up 50 cm

My Blocks

- fly down 50 cm
- fly left 50 cm

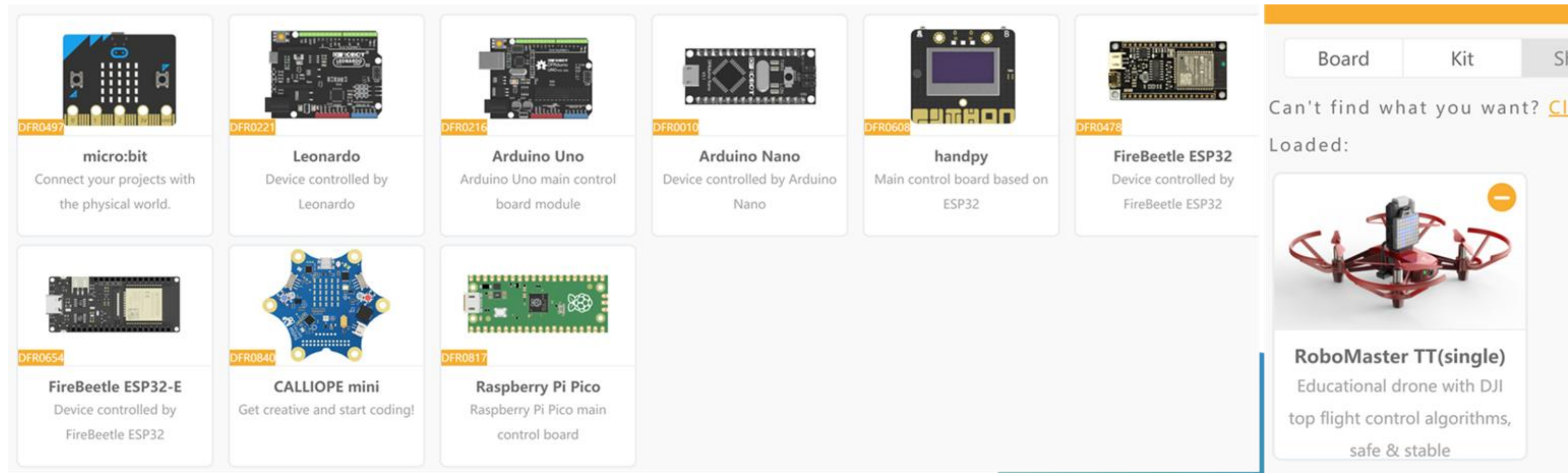
Functions

when clicked

- take off
- wait 1 seconds
- fly up 50 cm
- forever
 - if Tello query battery level < 50 then
 - land
 - else
 - rotate 90 degree clockwise

What is MIND+

- **Mind+ is a Scratch 3.0-based programming software that supports various open-source hardware such as Arduino, micro: bit, mPython-esp32 and all kinds of controller boards.**
- **Mind + has already supported dozens of commonly-used extension module libraries.**



Robomaster TT Drone Functions

RoboMaster TT(single)

turn Tello's video open ▾

Enter propeller mode

Exit the propeller mode

take off

Throw away in 5 seconds

land

fly up 50 cm

fly down 50 cm

fly left 50 cm

fly right 50 cm

fly forward 50 cm

fly backward 50 cm

rotate 90 degree clockwise

rotate 90 degree clockwise

rotate 90 degree counter clockwise

flip forward(f) ▾

set speed to 50 cm/s

Fly (relative to the aircraft) x 50 cm y 50 cm z 0 cm speed 100 cm/s

Flying curve warp x1 20 cm y1 20 cm z1 0 cm and x2 40 cm y2 60

Emergency Stop

Stop motion and hover

☐ Relative Height (cm)

☐ Barometer Height (m)

☐ TOF Height (cm)

☐ Motherboard minimum temperature (°C)

☐ Motherboard maximum temperature (°C)

☐ Pitch axis attitude angle (°)

☐ Roll axis attitude angle (°)

☐ Roll axis attitude angle (°)

☐ Pan axis attitude angle (°)

☐ X-axis acceleration (0.001g)

☐ Y-axis acceleration (0.001g)

☐ Z-axis acceleration (0.001g)

☐ X-axis speed (cm/s)

☐ Y-axis speed (cm/s)

☐ Z-axis speed (cm/s)

☐ power?

Turn on ▾ Challenge Card Detection

Set the detection position Down View ▾

fly to MissionPad x 50 cm y 50 cm z 80 cm with 50 cm/s Mid m-1 ▾

Flying arc line under challenge card x1 20 cm y1 20 cm z1 80 cm and x2

Jump along challenge card x 100 cm y 0 cm z 80 cm speed 50 cm/s ya

The aircraft rotates to the 0 angle relative to the challenge card m-1 ▾

Robomaster TT Drone Functions (continued)

The aircraft rotates to the angle relative to the challenge card

☐ Challenge Card Number

☐ Challenge Cardx(cm)

☐ Challenge Cardy(cm)

☐ Challenge Cardz(cm)

☐ Reply to Command

☐ Current Speed

☐ Motor running time(s)

☐ Wi-Fi SNR

☐ Tello SDK Version

☐ Tello SN Code

☐ Get Hardware Version

☐ Tello firmware version

☐ Tello query battery level

☐ Display pattern

☐ Rolling display pattern direction frequency pattern

☐ Display a single character color

☐ Scroll display text direction frequency text color

☐ Set the boot pattern

☐ Restore the default boot pattern

☐ Set screen brightness

☐ Read TOF(mm)

☐ Send custom command

☐ Received string message

☐ Customized response value received

☐ Send a clear message

☐ LED color

☐ LED color R: G: B:

☐ LED breathing light color frequency (Hz)

☐ LED breathing light R: G: B: frequency: (Hz)

☐ LED flashes color 1 and color 2 frequency (Hz)

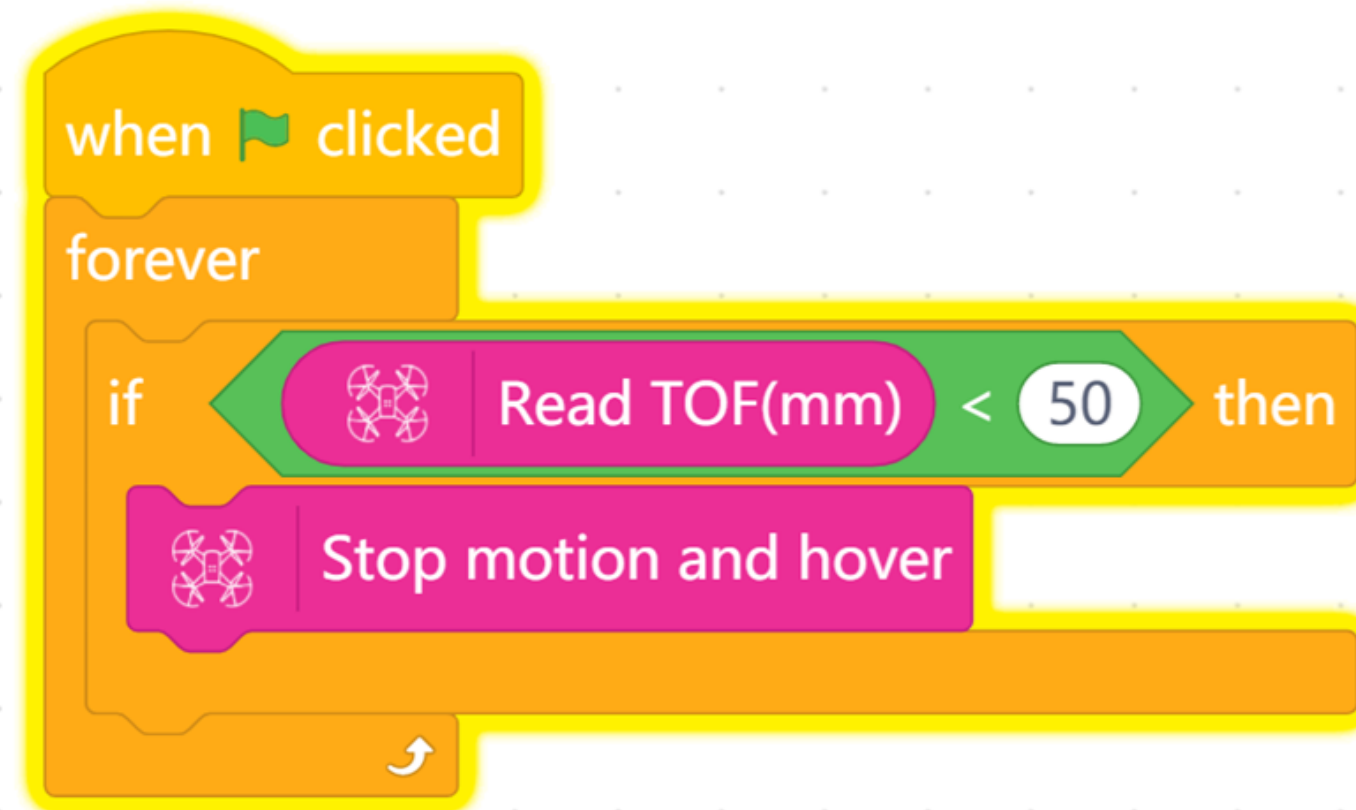
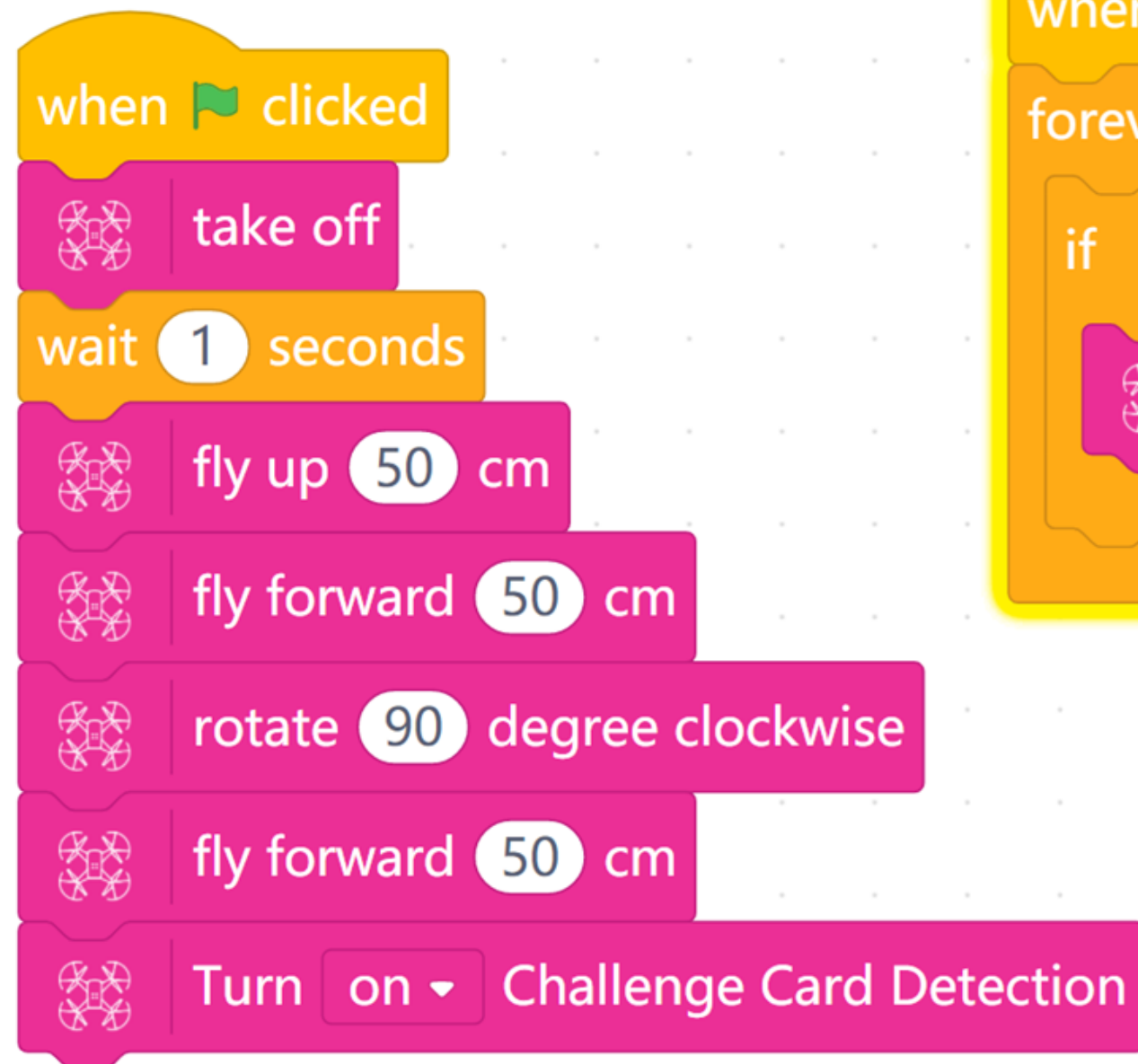
☐ LED flashing R1: G1: B1: - R2: G2: B2: frequency: (Hz)

Simple Examples



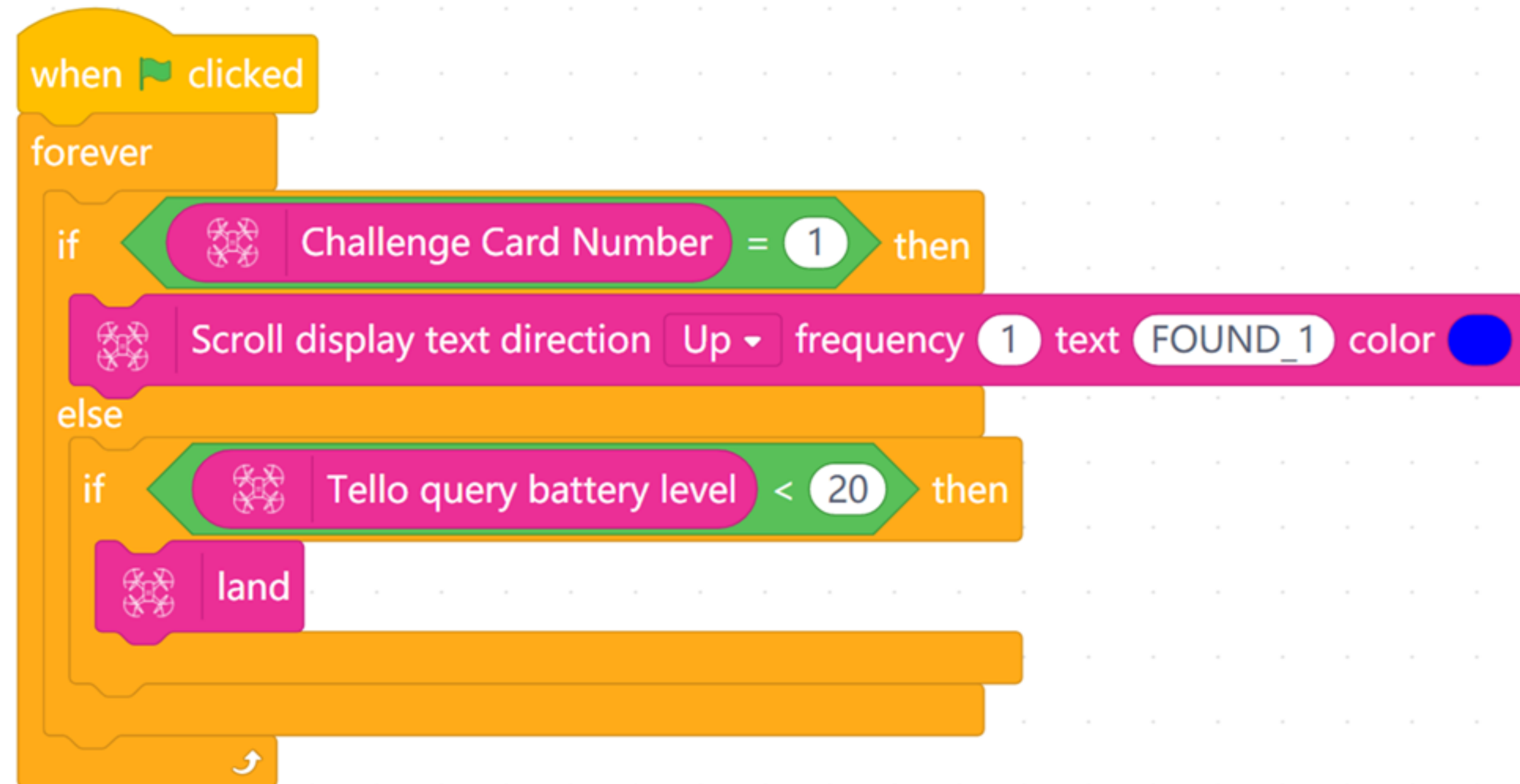
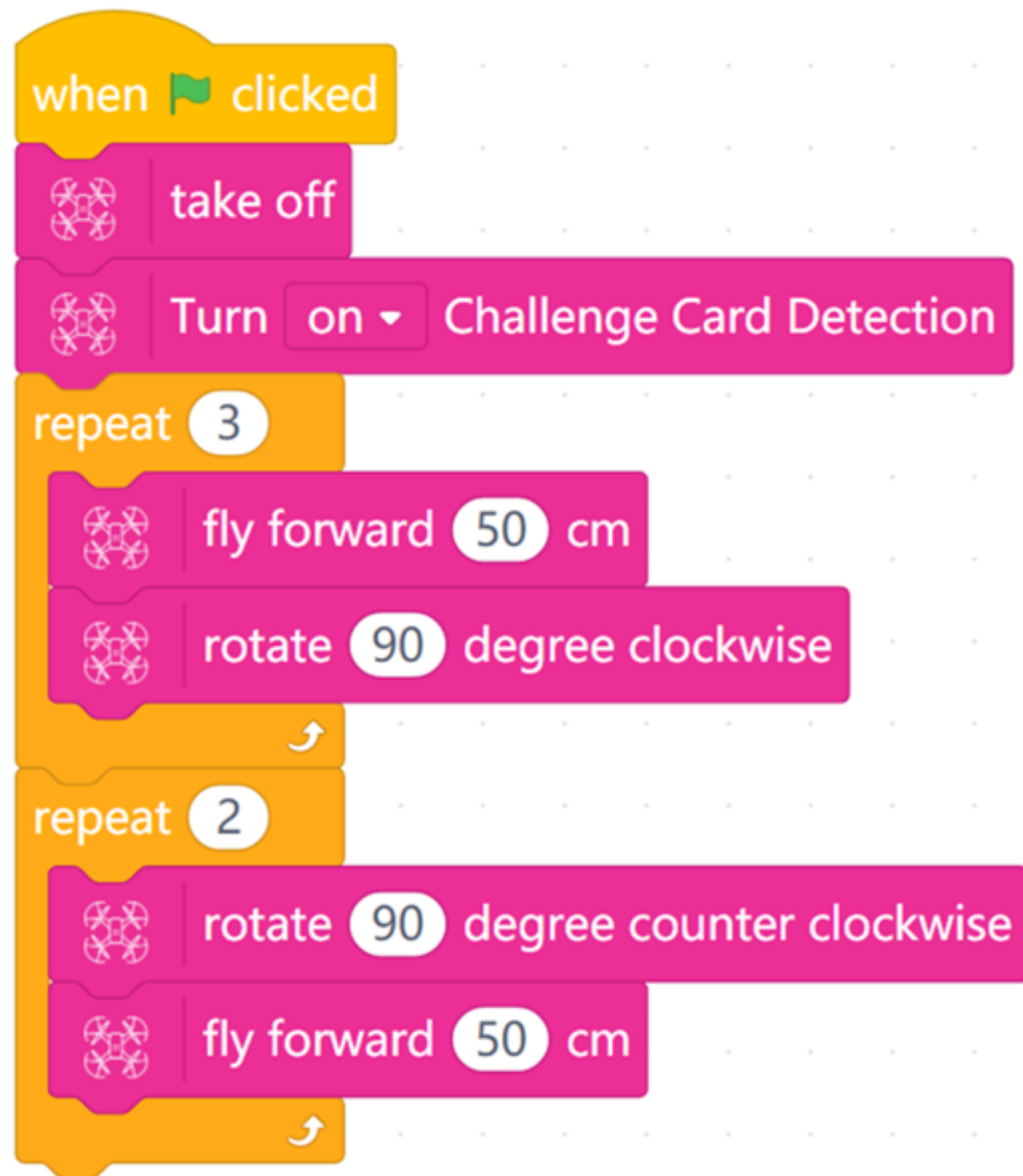
Take Off and Do Magic

Simple Examples



Simple pattern

Simple Examples



Read QR

Question & Answer

What is a "script" in Scratch?

Why do we use loops?

What is the "green flag" used for in Scratch

What are "events" in Scratch?

Why do we use MIND+

Further Reading

Mindplus Wiki

<https://mindplus.dfrobot.com/RMTT>

Introducing Mind+ : A Sctrach 3.0 Programming Software

www.youtube.com/watch?v=_C32KQD3JZw



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