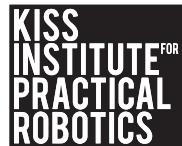


# Oklahoma Drone workshop

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# Today's Schedule

- Morning combined session
  - Drone safety
  - Drone catching
  - Connecting to the drones
  - Ensuring we can all fly
- Morning session novice
  - Variables and objects
  - Conditionals
  - Loop basics
- Morning session advanced
  - Variables and objects
  - User input
  - Conditionals
  - Looping
  - Sensors: Vision

# Turning: Two approaches

- Yaw-based turning

```
fly_direct(roll=0,pitch=0,yaw=#,vertical_movement=0,duration=#)
```

You can combine roll/pitch/yaw to fly curves

- Sensor-based turning

```
turn_degrees(degrees)
```

# Sample code

```
from pyparrot.Minidrone import Mambo

# create the drone object and connect
drone = Mambo(use_wifi=True)
drone.connect(num_retries=3)

# maximum speeds - DO NOT CHANGE
drone.set_max_tilt(10)
drone.set_max_vertical_speed(1)

drone.flat_trim()

# takeoff
drone.safe_takeoff(5)

# fly forward a small amount for one second
drone.fly_direct(roll=50, pitch=10, yaw=0, vertical_movement=0, duration=1)

# land and disconnect
drone.safe_land(5)
drone.disconnect()
```

# Your turn!

**Explore parameters**

**Test:**

**roll , yaw, vertical\_movement**

**from -100 to 100**

**Duration is in seconds (max of 2)**

**Explore turn\_degrees**

# Multiple Takeoffs/Landings/Turning

- Goal: deliver blood to two hospitals
- Task analysis:
  - Fly to first hospital
  - Land
  - Take off after first landing
  - Turn
  - Fly to the 2<sup>nd</sup> hospital
  - Land at 2<sup>nd</sup> hospital
  - Disconnect

# Your turn!

Get those drones delivering blood to BOTH hospitals in the same program! No touching your drone mid-way and no restarting your program after the first landing. Write ONE program to land at both hospitals.

Use what you just learned about turning and roll/pitch/yaw to move from the first hospital to the second



# Drone art

Winter Olympics

<https://www.youtube.com/watch?v=fCd6P7Ya160>

Time Magazine

<https://www.youtube.com/watch?v=JGjmRRTThdk>

# Getting started on conditionals

# Conditionals Part 1

If

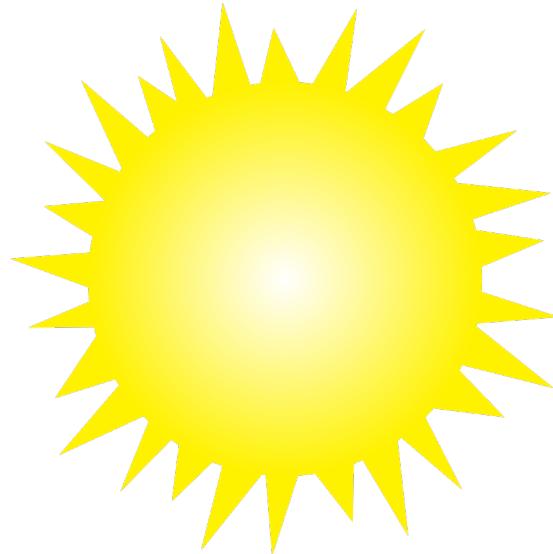


Then



# Conditionals Part 2

If



Then



Otherwise



# Conditionals in Python

```
num_sides = 4

if (num_sides == 3):
    print("I will make a triangle")
elif (num_sides == 4):
    print("I will make a square")
else:
    print("I don't know how to make this shape!")
```

Notice the use of colons here.

# Your turn!

Write a program that can fly either a triangle or a square (horizontally) using a conditional.

For the afternoon challenge, the number of shapes will increase (and you will want to use loops, our next tool!)

# Looping: While loop

- While teeth are not clean
  - Brush teeth
- While we have not reached the target
  - Fly forward



# Quick While Loop Practice

- Syntax in python is:

```
count = 1
while (count <= 10):
    # do something
    print("Count is %d" % count)
```

Notice the use of colon here.

- Your quick task:

- Use a while loop to have your drone fly forward for 3 seconds total but in small movements. Do NOT just do fly\_direct with a duration of 3!
- Max duration is 0.1
- Useful code

# Looping: `for` loop

- Can we loop a specific number of times?
- You can use while but `for` loops are designed for this
- Python syntax

```
for side in range(1,4):  
    # fly forward  
    # turn 60 degrees
```

- One key thing to remember for python: numbers are inclusive on the lower end but exclusive on the higher end
- `range(1,4)` gives you numbers 1, 2, and 3 but NOT 4!

# Looping: `for` loop

Example `for` loop:

```
for side in range(1,4):
    print("Flying side %d" % side)
```

- How can you draw a triangle using a drone?

- For side = 1 to 3
  - Fly forward
  - Turn 60 degrees

```
for side in range(1,4):
    # fly forward
    # turn 60 degrees
```

# Your turn!

Modify your conditional program for triangles/squares to use loops

# Afternoon challenges

## Regular challenges

1. Deliver blood to a single hospital
2. Deliver blood to multiple hospitals
3. Flying Art: N-sided Horizontal Polygons
4. Traversing obstacles (flying through hoops)

## Advanced challenges

1. Flying Art: N-sided Vertical Polygons
2. Vision Challenge: Looking for a marker
3. Vision Challenge: Using vision to navigate obstacles and land precisely