

Mar 4th, 11:30 AM - 11:50 AM

## "Dark Ops": Programming and Hacking Drones

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# **Dark OPS™**

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# HISTORY / BACKGROUND

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# TRACK 1: Flight Simulation & Drone Basics



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# TRACK 2: Autopilot Python Programming



**AutoFlight**



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## TRACK 2: Flight Dynamics

- Roll Angle (bank left, right)
- Pitch Angle (climb, descend)
- Vertical Speed
- Left/Right Tilt Speed



roll



pitch



yaw

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# TRACK Program

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control.`move` (phi, theta, gaz, yaw)

`basicctl.move()`

`Move` s the drone. The parameters are fractions of the maximum allowed angle, and have to be in the range from -1.0 (corresponding to the maximum tilt into one direction) to 1.0 (corresponding to the maximum tilt into the other direction).

### Warning

This function will cause the drone to `move` with the specified parameters for an infinite amount of time. You will need to call the `hover()` command to stop it.

- Parameters:
- `phi` (float) – Roll angle (-1.0: full angle to left hand side; 1.0: full angle to right hand side)
  - `theta` (float) – Pitch angle (-1.0: full speed in forward direction; 1.0: full speed in backward direction)
  - `gaz` (float) – Vertical speed (Exception as it is no angle. -1.0 would then be full speed down, 1.0 full speed up)
  - `yaw` (float) – Yaw speed (Also no angle. -1.0 would be full speed in counterclockwise direction, 1.0 full speed in clockwise direction)



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**TRAC  
Progr**

```
toScript
Script Help
ESBORO FLIP.ascr | Script output | Documentation |
1 #
2 # Simple script with front and back flip
3 #
4 import time
5
6 basicctl.takeoff()
7 time.sleep(3)
8 basicctl.move_time(0,.25,0,0, 500)
9 time.sleep(2)
10 basicctl.flip("front")
11 time.sleep(2)
12 basicctl.land()
```

**Python**



**trinket**

FLIP

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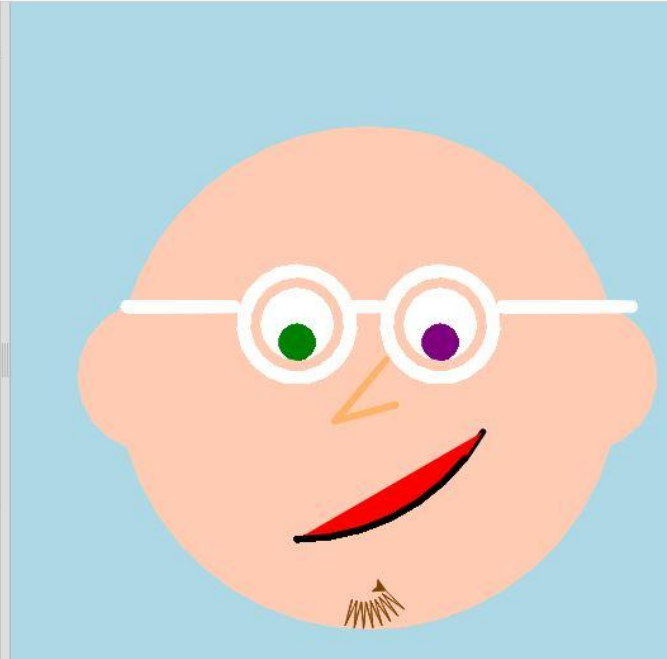
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## TRAC Program

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```
trinket ▶ Run ? Modules  
main.py  
95 wade.forward(65)  
96 wade.pendown()  
97 wade.forward(20)  
98 wade.penup()  
99 wade.forward(65)  
100 wade.pendown()  
101 wade.forward(72)  
102 wade.penup()  
103  
104 #left-and-rtlenses  
105 wade.goto(-40,50)  
106 wade.right(180)  
107 wade.color("white")  
108 wade.pendown()  
109 wade.circle(30)  
110 wade.penup()  
111 wade.goto(40,50)  
112 wade.pendown()  
113 wade.circle(30)  
114 wade.penup()  
115  
116 #beard from rtlense  
117 wade.right(285)  
118 wade.forward(190)  
119 wade.pendown()  
120 wade.color('#804000')  
121 wade.pensize(1)  
122 #loop for beard  
123 for i in range(8):  
124     if True:  
125         wade.forward(15)  
126         wade.left(170)  
127         wade.forward(15)  
128         wade.right(160)
```

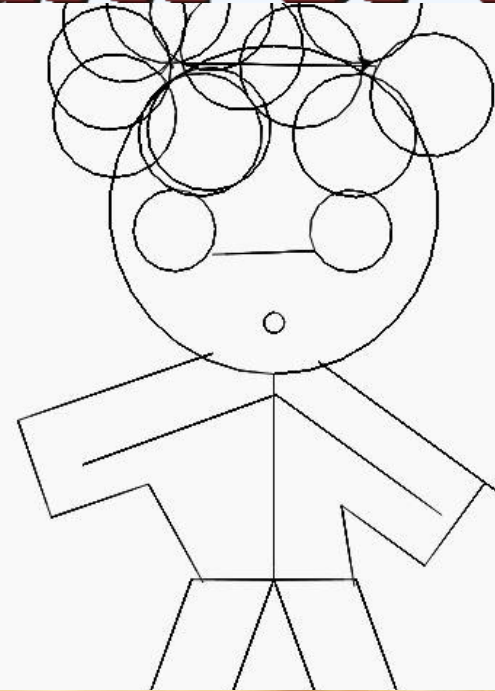


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## TRAC Program

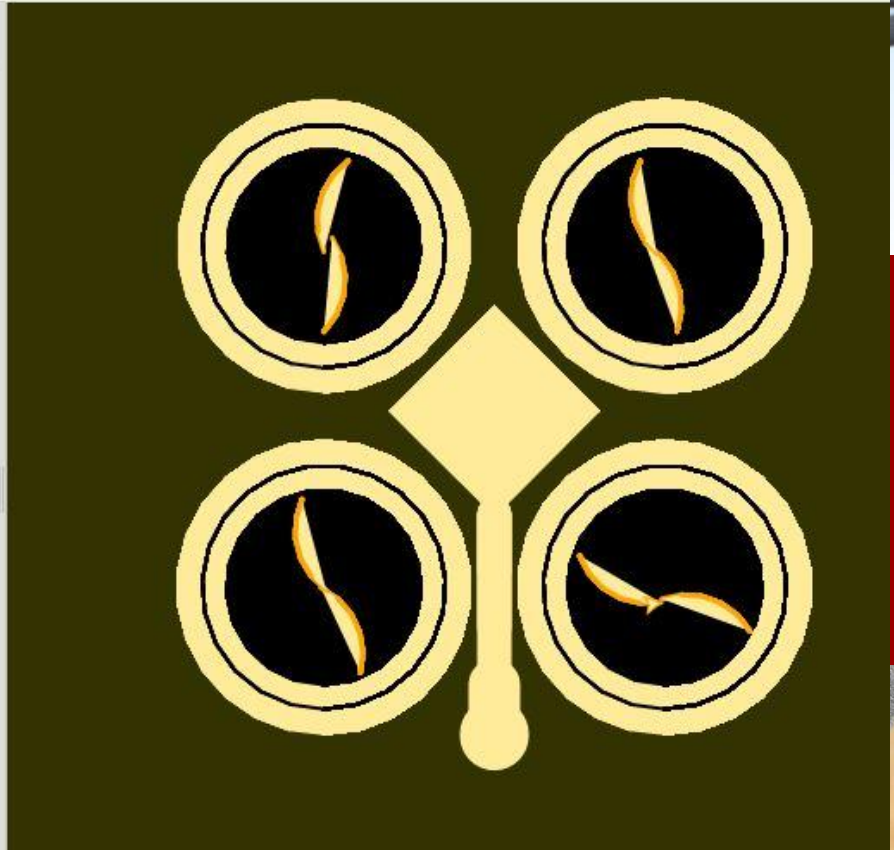
```
1 import turtle
2 turtle.circle(80)
3 turtle.goto(0,-100)
4 turtle.right(70)
5 turtle.forward(100)
6 turtle.back(100)
7 turtle.right(40)
8 turtle.forward(100)
9 turtle.back(100)
10 turtle.right(70)
11 turtle.forward(40)
12 turtle.left(70)
13 turtle.forward(98)
14 turtle.left(110)
15 turtle.forward(40)
16 turtle.penup()
17 turtle.goto(0,-100)
18 turtle.pendown()
19 turtle.forward(40)
20 turtle.right(70)
21 turtle.forward(98)
22 turtle.right(110)
23 turtle.forward(40)
24 turtle.penup()
25 turtle.goto(1,-10)
26 turtle.left(20)
27 turtle.pendown()
28 turtle.forward(100)
29 turtle.back(100)
30 turtle.left(124)
31 turtle.forward(100)
32 turtle.penup()
33 turtle.goto(30,0)
```



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```
trinket Run ? Modules
main.py
1
2 import time
3 import turtle
4 drone = turtle.Turtle()
5 #setBgColor
6 wn = turtle.Screen()
7 wn.bgcolor('#333300')
8 drone.speed(100)
9
10
11 #TOP PROPS
12 #leftTopPropeller
13 #outer
14 drone.penup()
15 drone.color('#ffeb99')
16 drone.goto(-70,40)
17 drone.begin_fill()
18 drone.pendown()
19 drone.circle(60)
20 drone.penup()
21 drone.end_fill()
22 #inner
23 drone.color('black')
24 drone.goto(-70, 60)
25 drone.begin_fill()
26 drone.pendown()
27 drone.circle(40)
28 drone.penup()
29 drone.end_fill()
30 #line
31 drone.goto(-70,50)
32 drone.pensize(2)
33 drone.pendown()
```



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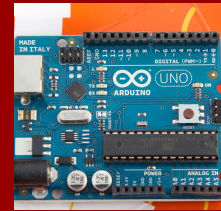
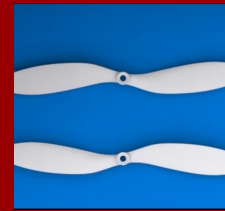
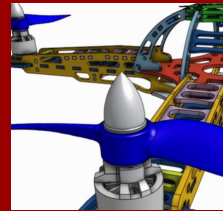
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## **TRACK 3: Model 3D Print & Build DIY**



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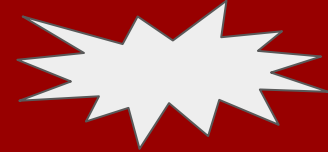
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**TRACK 4: Leaders, Points, & Obstacles**



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**Discussion &/or Questions**

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# LINKS:

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## (Track.1)

<https://itunes.apple.com/us/app/ardrone-sim-zombies/id665889184?mt=8>

<https://itunes.apple.com/us/app/ardrone-sim-zombies/id665889184?mt=8>

## (Track.3)

<https://www.tinkercad.com/>

<https://www.onshape.com/>

<http://www.thingiverse.com/thing:43064>

<https://www.arduino.cc/en/Guide/HomePage>

<http://www.instructables.com/id/DIY-Drones/>

## (Track.2)

<https://itunes.apple.com/us/app/freeflight/id373065271?mt=8>

<http://electronics.kitchen/docs/autoflight/>

<https://trinket.io/python>

## (Track.4)

[https://docs.google.com/document/d/1QGfP-0sruUvkRR91v98GGM\\_m7LdQhohxY6vZdn27xl8/edit?usp=sharing](https://docs.google.com/document/d/1QGfP-0sruUvkRR91v98GGM_m7LdQhohxY6vZdn27xl8/edit?usp=sharing)

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