

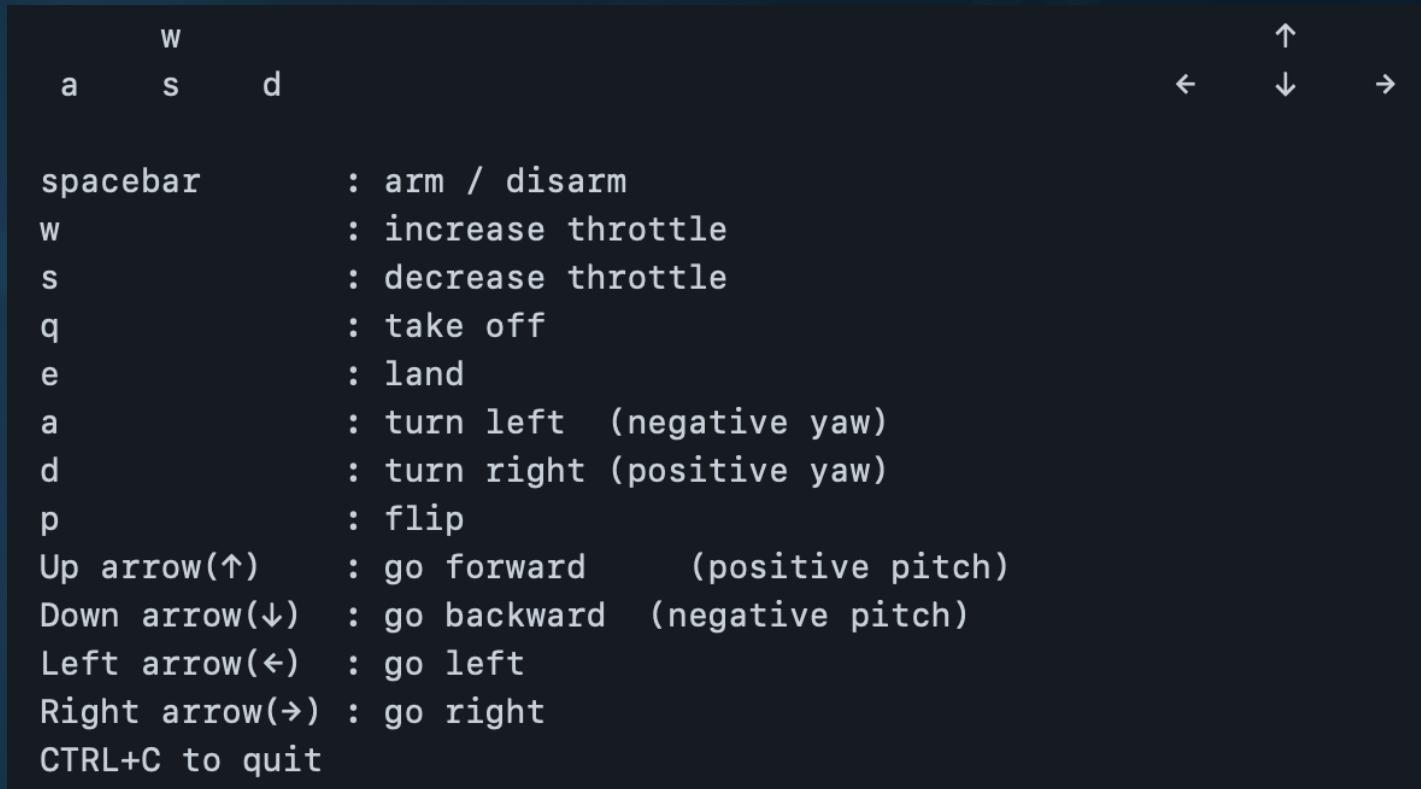
Task 1 - Python Wrapper

- Controlling the drone with python on a Windows/Unix machine
- Socket for establishing connection between drone and PC
- Commands for drone control and monitoring
- Maintainable and well-documented code

```
client.roll_speed(100,duration=2)
client.pitch_speed(100,duration=2)
client.throttle_speed(100,duration=2)
client.yaw_speed(100,duration=2)
```

Task 1 - What's special?

- Implemented almost all functionalities available in Drona Aviation's pluto-ros-package
- Sensor data reception
- Interactive Control - The Keyboard control.



A terminal window showing sensor data output. The data is displayed in the following format:

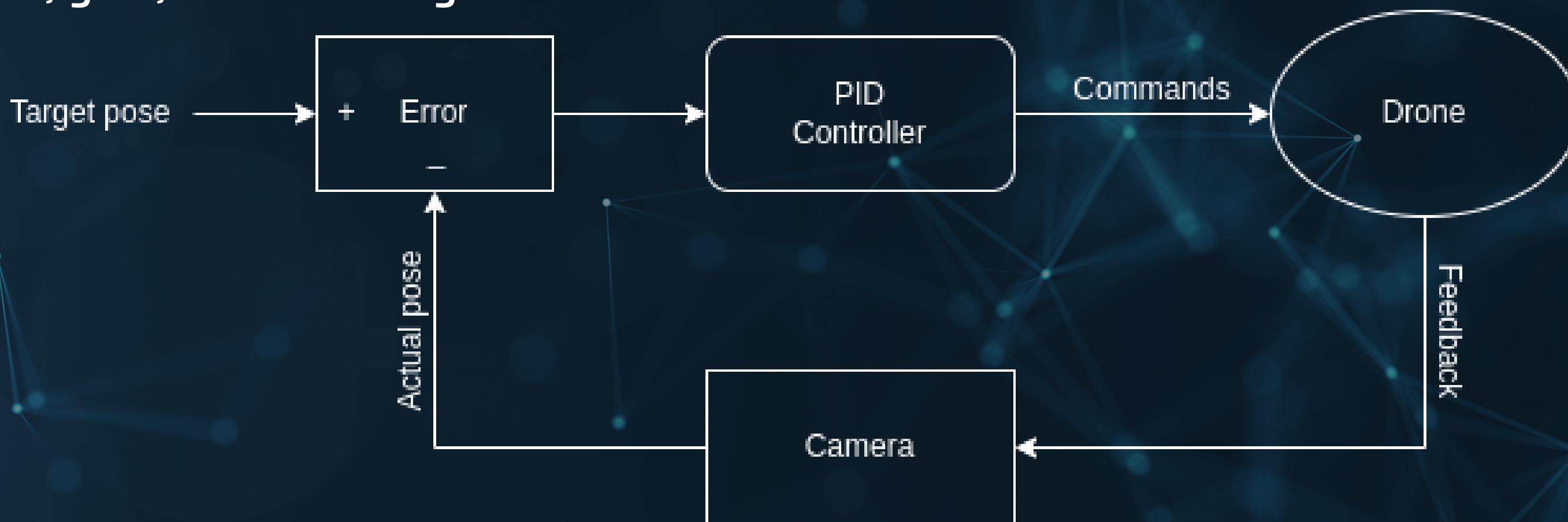
Parameter	Value
Roll	0.1
Pitch	-0.1
Yaw	52
Battery	3.8

This pattern repeats several times, indicating continuous sensor data being received.

```
client.get_height()
client.get_vario()
client.get_roll()
client.get_pitch()
client.get_yaw()
client.acc_x()
client.acc_y()
client.acc_z()
client.get_gyro_x()
client.get_gyro_y()
client.get_gyro_z()
client.get_mag_x()
client.get_mag_y()
client.get_mag_z()
client.get_battery()
```

Task 2 - Hover and Control

- ArUco markers detection using OpenCV.
- Custom height estimation
- Target coordinates and the current pose is passed to the PID function which calculates the values of roll, pitch, yaw, throttle using error.



Task 2 - Experimental Setup

The screenshot shows a Python development environment with several open files in the Explorer pane:

- marker.py
- PIDmain.py
- master.py (highlighted)
- main.py

The master.py file contains the following code:

```
import matplotlib
import multiprocessing
from multiprocessing import Pipe
```

A camera feed window titled "Image" displays a grayscale video stream of a white surface with blue circular markers arranged in a grid. A small green and red crosshair is visible near the top-left marker. The text "distmax:0.038" is overlaid on the image.

The terminal pane at the bottom shows the following output:

```
Frequency checker(sending) , rcmd: -100, pcmd: -70, tcmd:8, yawcmd:70
Target Reached.
Task Completed
Landing
```

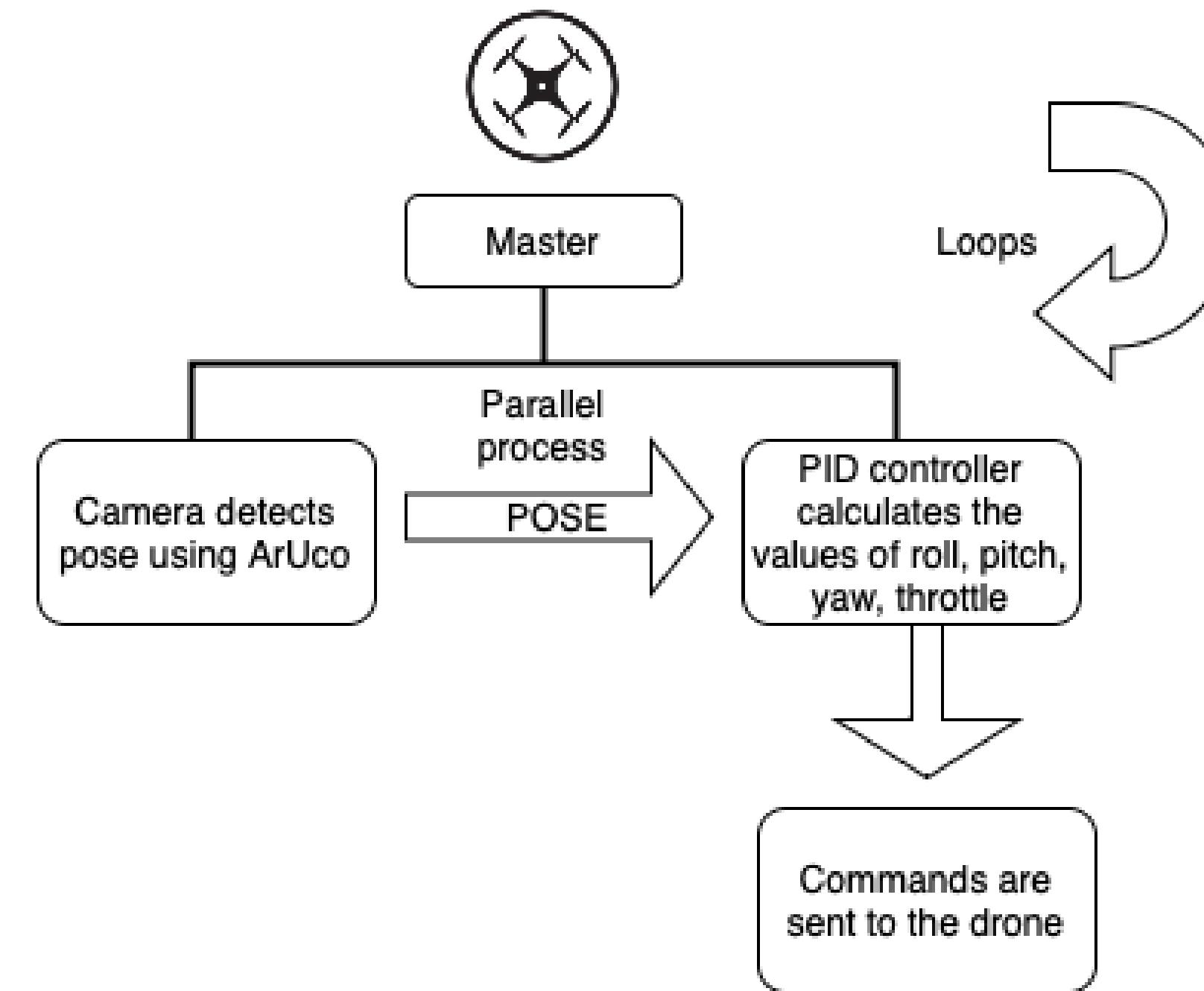
The status bar at the bottom indicates:

Ln 8, Col 1 Spaces: 4 UTF-8 CRLF { Python 3.8.10 64-bit

Task 2

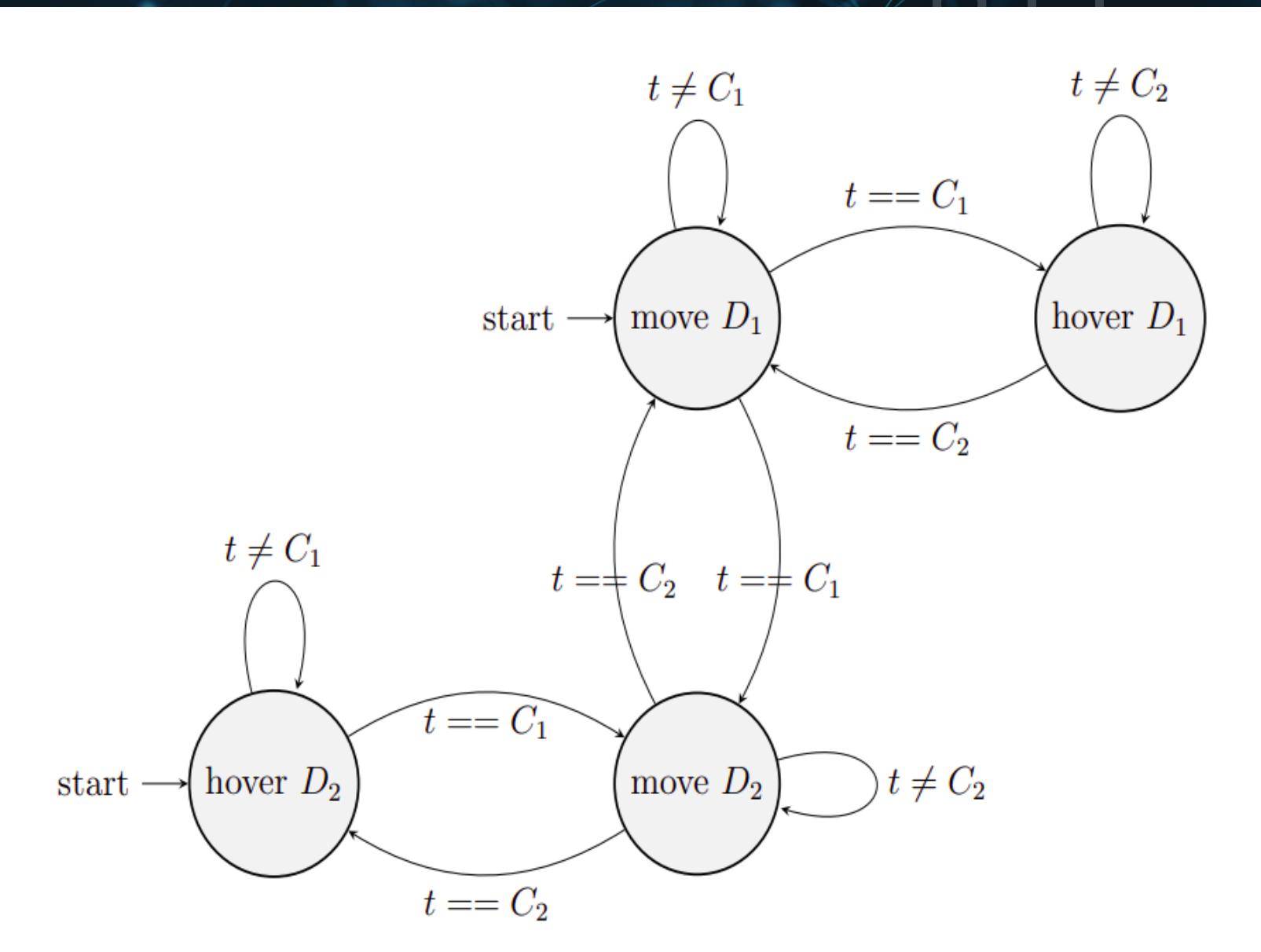
- Ziegler-Nichols method for calculating PID gains
- Trial and Error - for fine-tuning PID gains
- PID made responsive and fast.
- Commands composed and sent as a single MSP_SET_RAW_RC message
- Multiprocessing

Task 2



Task 3- Pluto Swarm

- Extension of Task 2, but not exactly !
- Shell script to connect drones to PC Hotspot
- Multi-threading



Challenges Faced

- Drone's Battery Life
- The trim values of the drone
- Unexpected Hardware Failure

Future Work

- Generalize the approach to n-drones
- Motion planning and better control algorithms
- Providing a gesture controlled support to pluto drone.