INTER-IIT HIGH PREP

DRONA AVIATION

TASK 1 REPORT

PRIMARY ID: 17

SECONDARY ID: 34

Working Principles

Sockets

We connected to Pluto first by connecting our device to the drone's hotspot, then we used TCP sockets to connect to the drone using IPV4 scheme and `socket` library in python to do the same. The server is hosted at `192.168.4.1:23` We sent the MSP Packet data encoded as bytes to Pluto using sockets, the details about the packet is explained below.

MSP Packets

We used MSP Packet scheme to communicate with Pluto, ie send commands, request data and calibrate the drone. The data of the packet was first encoded into bytes and then sent as a byte stream (array of bytes) to the drone. The basic structure of the packet has been explained below.

Structure of the Packet

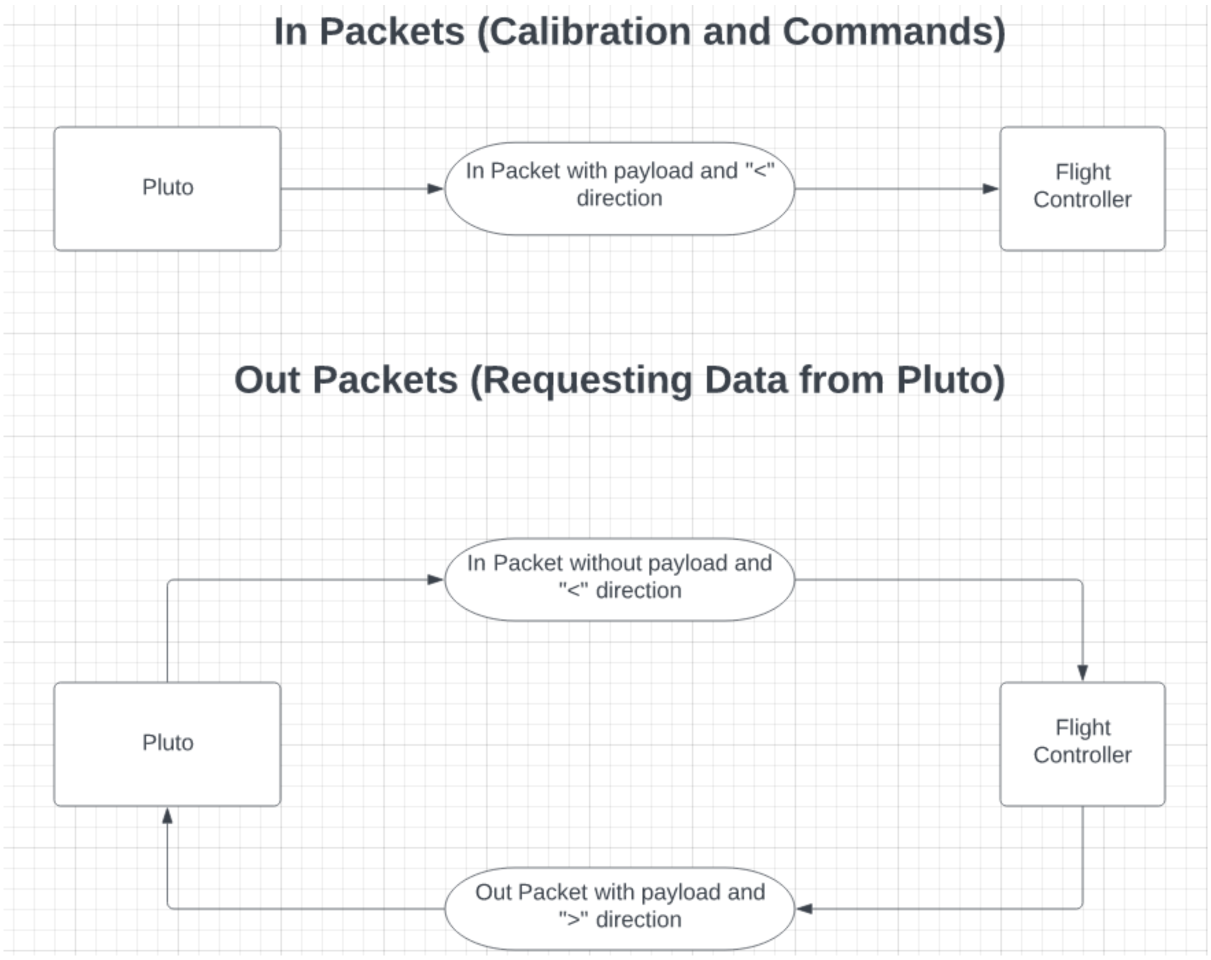
Header	Direction	Message Length	Type of Payload	Message Data	Checksum
2 Bytes	1 Byte	1 Byte	1 Byte	N Bytes	1 Byte

Details of the Packet

Type of Byte	ASCII	Hexadecimal
Header	$M	0x24 0x4d
Direction	'<' or '>'	0x3c (to the drone) or 0x3e (from the drone)
Message Length		0x00 - 0xff
Type of Payload		0x01 - 0xff
Payload		Message Body encoded into N bytes
Checksum		XOR of Bytes of "Msg length", "Command" and all bytes of "Payload"

As defined in the [MSP Packet scheme](), every packet has a different packet code, along with it's direction, packet size and payload format specified.

The parameters of the payload are encoded according to byte sizes specified by it's data types.


In Packets (Calibration and Commands)
Pluto
In Packet with payload and "<" direction
Flight Controller
Out Packets (Requesting Data from Pluto)
In Packet without payload and "<" direction
Pluto
Flight Controller
Out Packet with payload and ">" direction

NOTE: THE DRONE REQUIRES PACKETS CONTINUOUSLY TO FUNCTION PROPERLY, AS SOON AS THE PACKETS STOP COMING TO THE DRONE, IT STOPS TAKING INSTRUCTIONS AND LANDS, RENDERING THE FURTHER DELAYED COMMANDS USELESS AND INEFFECTIVE. TO AVOID THIS, RUN THE SCRIPT PROVIDED IN OUR TUTORIAL, WHICH WILL CONTINUOUSLY SEND PACKETS TO THE DRONE SO IT DOES NOT RUN OUT OF COMMANDS.

FOR PROPER FUNCTIONING OF THE DRONE DO REFER TO OUR TUTORIAL VERY THOUROUGHLY

[Link to the Tutorial]()

Our Approach

Code

We have used Classes in Python to make modules for different functionalities, The two of tbe most important class which will be used for connecting to the drone and controlling the drone are PlutoConnection and PlutoControl.

PlutoConnection

This module is inherited from the socket class in python,

Hence it inherits the socket module's connect function which we utilise to connect to our Pluto Drone's server at 192.168.4.1:23, while being connected to the drone's network.

Hence, the object of this class becomes a connection object to the drone which will be used to send the messages to the drone in the form of bytes as already discussed above.

PlutoControl

This module will be used to control the drone, it has certain functions defined, like **take_off, land, pitch_forward, pitch_backward, roll_right, roll_left, yaw_right and yaw_left.**

This modules takes in the PlutoConnection object as a parameter to communicate with the drone.

This module utilises two other modules namely SetRawRC and SetCommand.

- **SetRawRC:** This module sets the RC Params (Roll, Pitch, Yaw and Throttle) to the drone and sends it via the connection object defined above.
- **SetCommand:** This module set's the type of operation we need the drone to perform, Take Off and Land being the common examples.

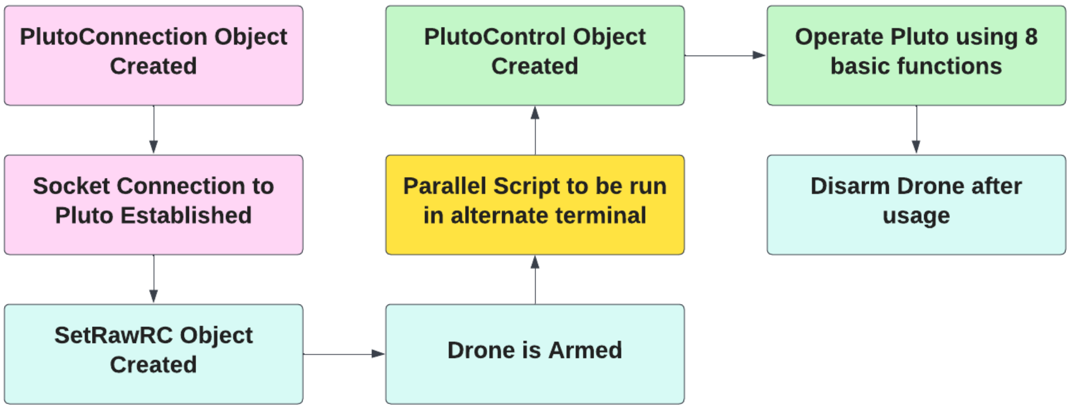
Internally, as we initialise the object for the PlutoControl class, within it, two objects one of SetRawRC module and one for SetCommand module are initialised.

The take_off() function first arms the drone using SetRawRC object and then sets the command type to TAKE_OFF using the SetCommand object,

Similarly the land() function sets the command type to LAND.

The other commands for Roll, Pitch and Yaw simply utilise the SetRawRC object to control the drone using RC Params.

The following flowchart may help you to understand the basic flows to operate Pluto.


PlutoConnection Object Created
Socket Connection to Pluto Established
SetRawRC Object Created
Drone is Armed
Parallel Script to be run in alternate terminal
PlutoControl Object Created
Operate Pluto using 8 basic functions
Disarm Drone after usage