11TH INTER IIT TECH MEET 2023

DRONA AVIATION

PLUTO DRONE SWARM CHALLENGE

TEAM ID : 13
SECONDARY TEAM ID : 26

TIMELINE

Python Wrapper and MSP Packets

MSP Architecture

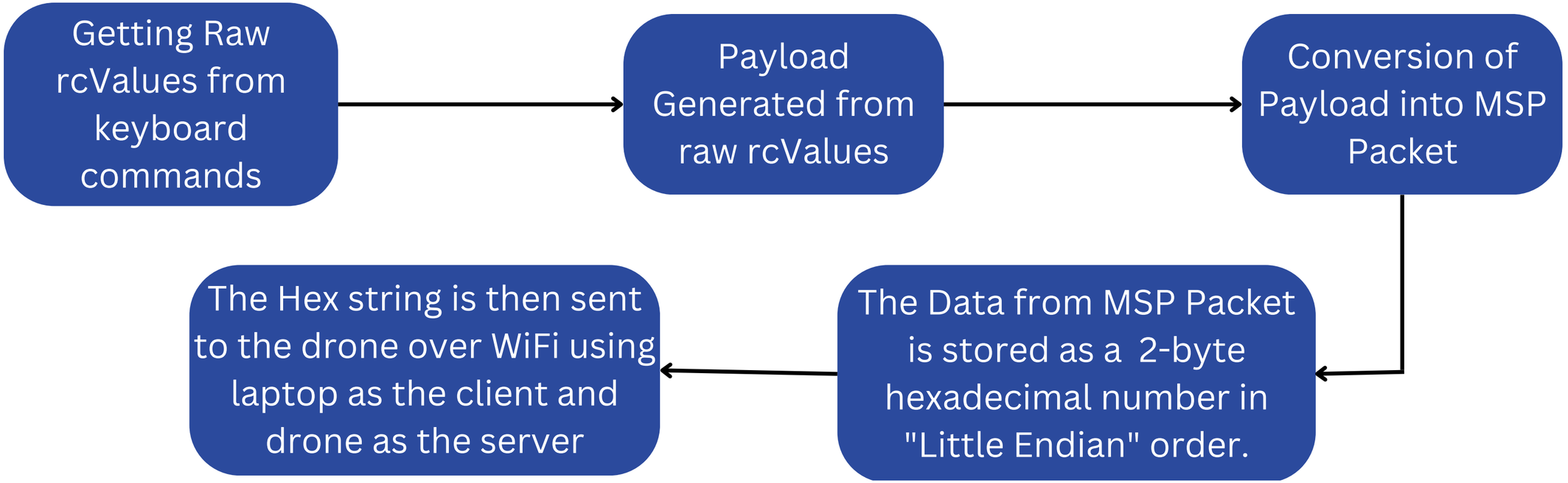
Controller tuning and estimation

Controller architecture

Swarm protocol

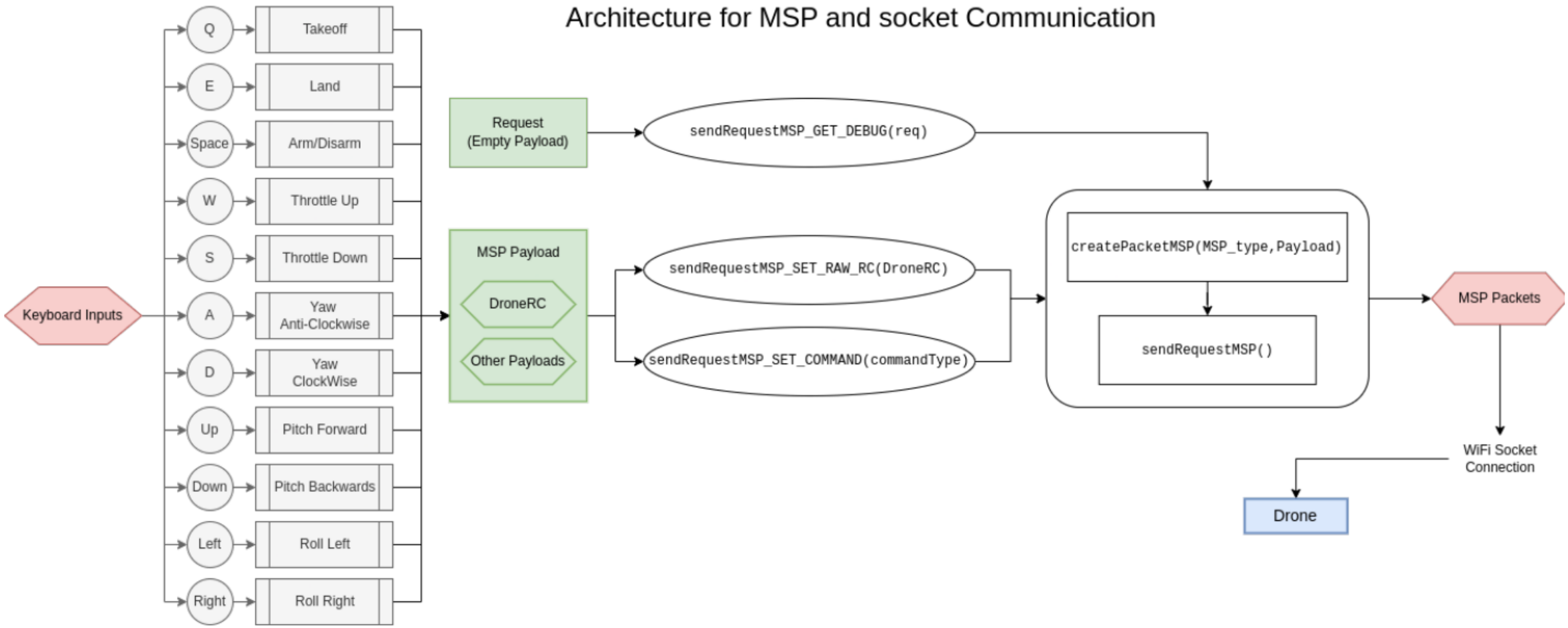
Swarm motion

MSP Packet Structure and Communication



	Header		Dir	Msg Length	Type	Payload														Check Sum
						Roll		Pitch		Throttle		Stick		AUX1		AUX2		AUX3		AUX4	
Value	$M		<	16	200	1500		1500		1000		1500		1500		1500		1500		1500		234
Hex Value	24	4d	3c	10	c8	dc	05	dc	05	e8	03	dc	05	dc	05	dc	05	dc	05	dc	05	ea

MSP and Socket Communication Architecture



Estimation Techniques and Controller Features

WE ALSO DEAL WITH A LOT OF SENSOR INCONSISTENCIES AND NOISE. THIS REQUIRES US TO ADD CERTAIN OTHER FUNCTIONALITIES TO THE CONTROLLER AS WELL THAT WILL ENABLE IT TO DEAL WITH THESE PROBLEMS BETTER. WE HAVE ALSO ADDED SAFETY FEATURES ONTO THE CONTROLLER

DERIVATIVE FILTERING	DEALS WITH NOISY AND DISCRETE SENSOR DATA	APPLIES A LOW PASS FILTER TO THE SENSOR NOISE TO SMOOTHEN IT OUT
iNTEGRAL ANTI-WINDUP	DEALS WITH CONTROLLING NONLINEAR SYSTMS	CAPS THE OUTPUT DUE TO INTEGRAL GAIN AND STOPS INTEGRATING THE OUTPUT
DYNAMIC FILTERING	DEALS WITH UNDETECTED CAMERA FRAME INSTANCES	FEEDS THE ESTIMATED VALUE INTO THE CONTROLLER FOR UNDETECTED FRAMES
AUTOMATED DISARMING	DEALS WITH INSTANCES WHERE THE DRONES GOES OUT OF RANGE	DISARMS THE DRONE FOR SAFETY

Controller Tuning Methodology

WE FOLLOWED THE ZEIGLER NICHOLS APPROACH FOR TUNING OF THE PID TO PERFORM HOVERING AND THE SUBSEQUENT RECTANGULAR MOTION

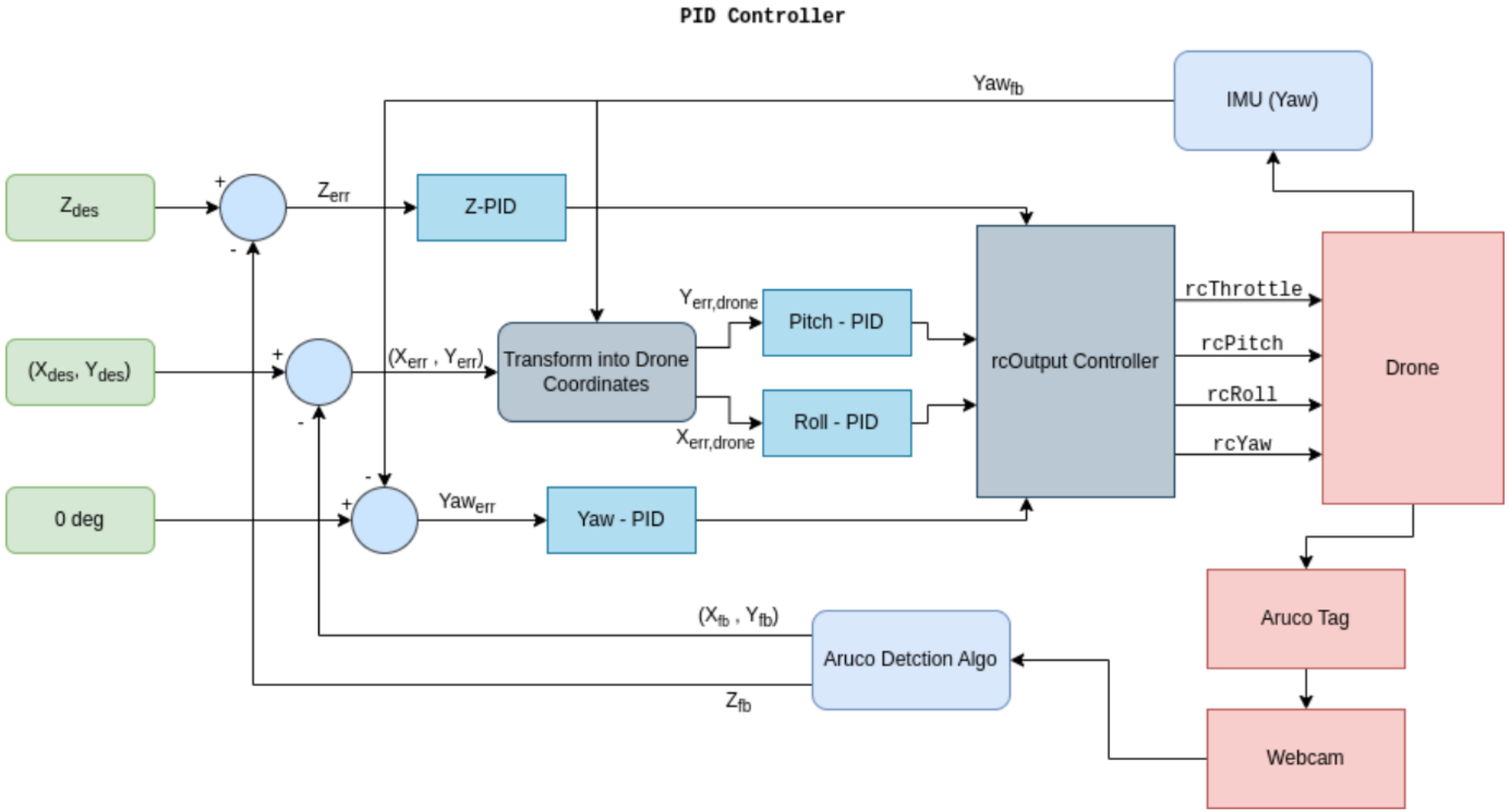
Open loop response test

Closed loop response test

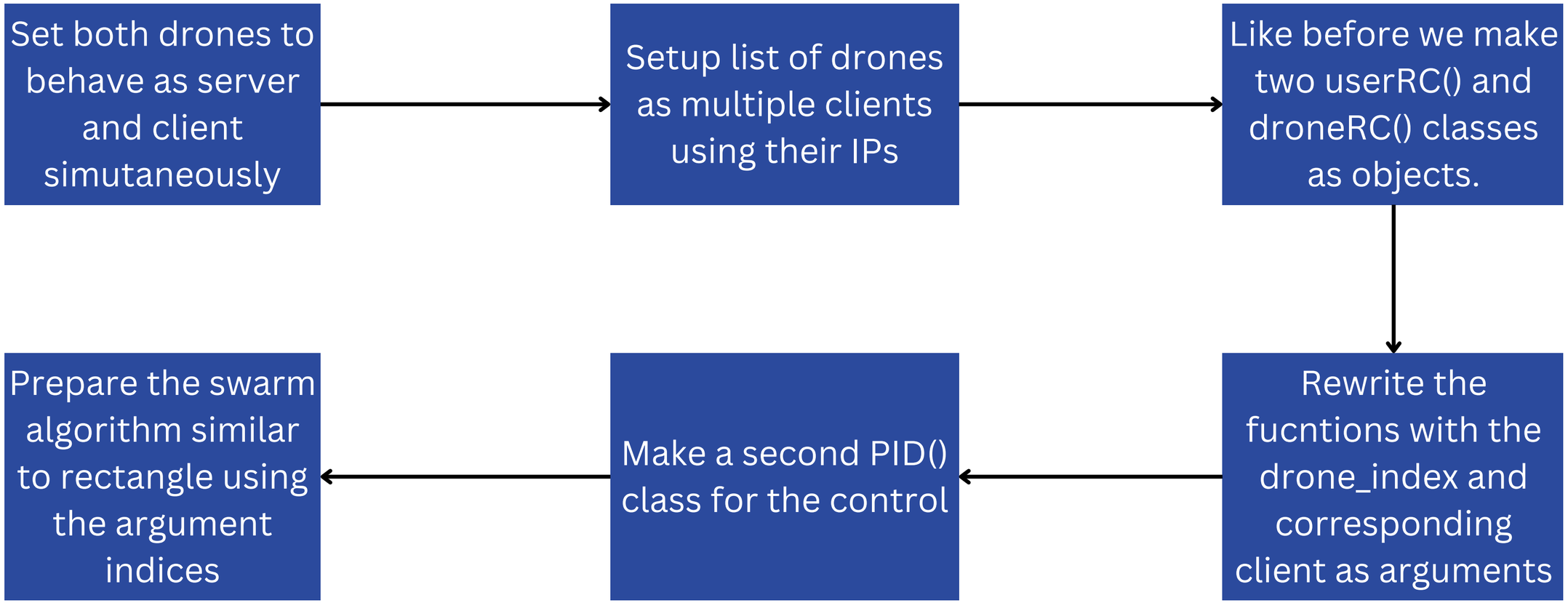
Calculation of Control Parameters

Iterative implementation and evaluation

Controller Architecture

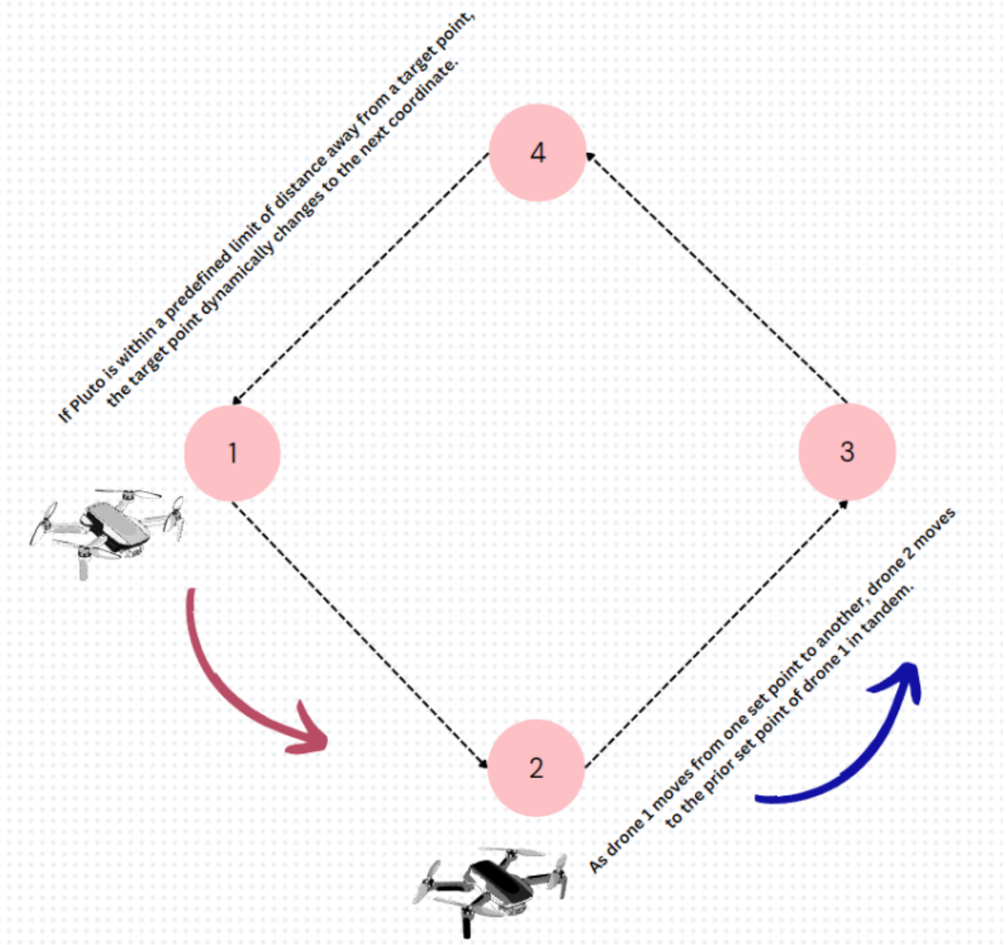


Swarm Protocol



Swarm Motion

OUR SWARMING ALGORITHM PERFORMS THE FOLLOWING TASKS:



CREATING TOLERANCE LIMITS AROUND THE FOUR CORNERS

GUIDING THE DRONES CONTINUOUSLY TO THE NEXT POSITION AND FLAGGING THEIR REACHING

CHANGING THE TARGET POSITIONS TO THE NEST POSITION WHEN BOTH THE DRONES HAVE REACHED

THANK YOU

Any Questions ?