Project – Controlled landing on moving platform

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ABSTRACT

The objective of this project is to make the Parrot Mambo Drone to hover and land over a moving landing platform attached to a line following robot.

1. INTRODUCTION

This lab focuses on developing a Simulink-based model that enables the Parrot Mini drone to hover on top-of-the-line following robot attached with a landing pad on which the drone should land.

2. METHOD

The Parrot Mambo drone is connected to the host computer via Bluetooth, ensure the connection by pinging the IP "**192.168.3.1**", the MATLAB application is opened and the **parrotMinidroneKeyboardControl** command is prompted and the Simulink instance is started.

By opening the Flight control system model and going to then to the path planning sub model. We can observe that we already vision-based data and the Landing enable. These are the sub models which we are going to work with. We are going to introduce a state flow chart which will handle the drone movement.

2.1 Position Control Logic Override

From the stateflow chart the outputs xestimate, yestimate, yawestimate, x_command, y_command and targetdetectflag are then feeded to the state flow chart acting as inputs. The outputs for the state flow chart are xout, yout, zout, yawout, visionland and controlflag. Here I have decided to remove the functionality of yawout.

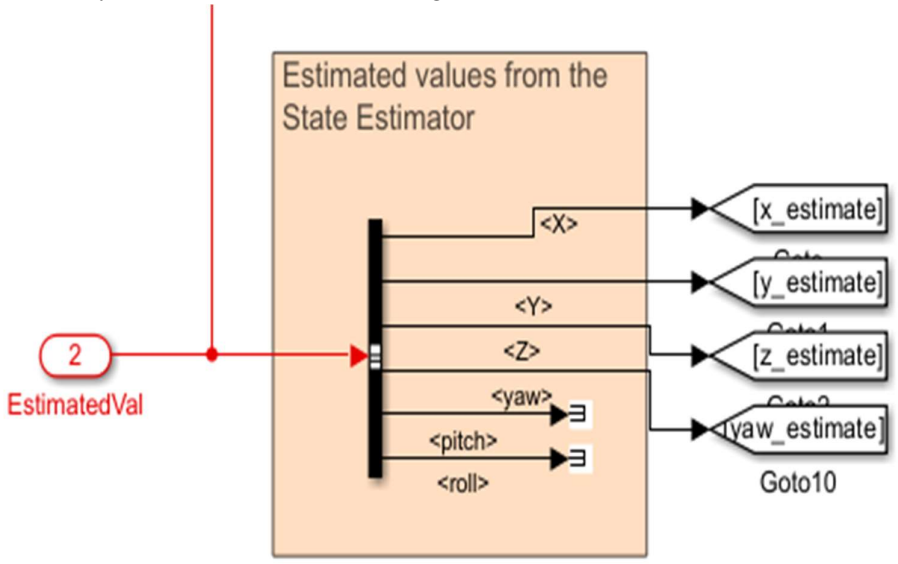

Fig 2.1 State estimator

2.2 Image Processing System

The image processing system holds the logic where the image capture function from drone camera, image masking function and the Boolean output. Introduction of video viewer is to view both the RGB and BW images for cross verification. The createMask is a MATLAB function used to process the image from the camera and process by targeting the green color and changing them to white. Once the number of white pixels the area of the pixels is calculated to determine the center position of the landing pad. The coordinates are sent to path planning.

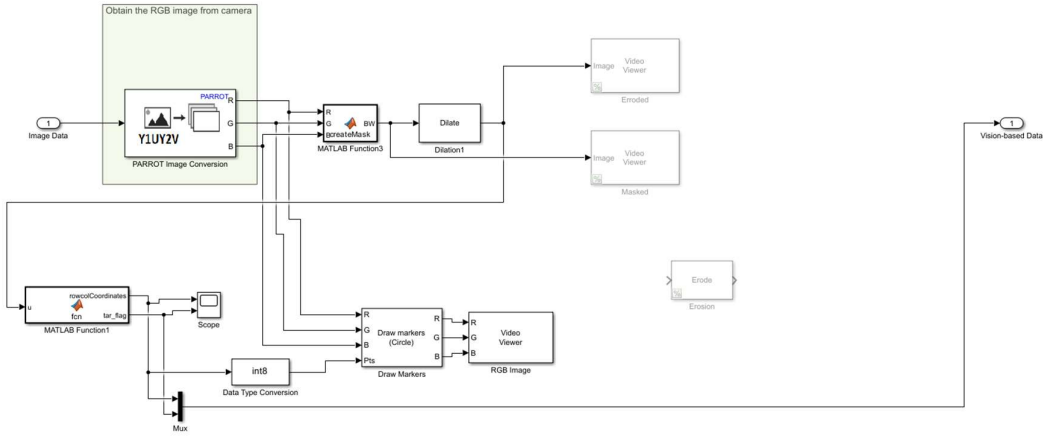

Fig 2.2 Image Processing System

2.3 Landing Enable

The landing enable logic is considered to trigger a landing flag of the Parrot Mambo drone Flight control system. By introducing the Boolean output of the vision-based data from the Image processing system, The OR block of then sub model is modified to take in q input ports. Once upon running the flight control system we are controlling the drone by the keyboard command and then detecting upon the colored block, we can observe that the landing flag has been triggered, and the drone initiates the landing operation.

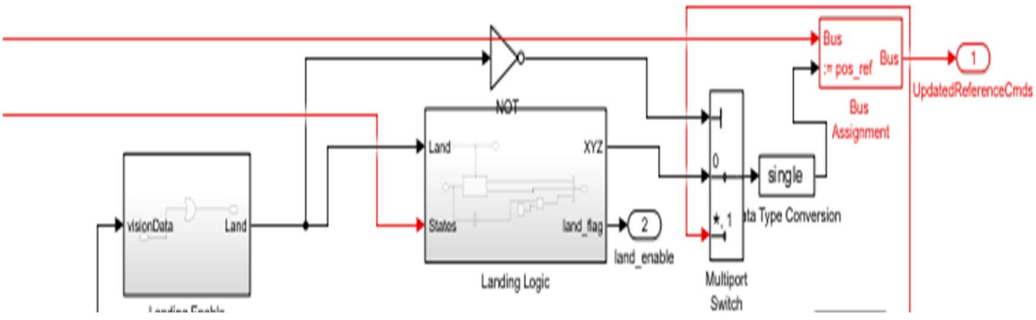

Fig 2.3 Landing Enable Logic

2.4 State Flowchart for Drone movement

The state flow chart represents the sequential decision-making process that enables the Parrot Mambo drone to autonomously follow a colored line and land upon detecting a circular marker. The Takeoff state will make the drone hover at 1.1 m height, MoveForward state will make the drone move forward and finally the Land state will initiate the land flag which initiates the landing procedure for the drone.

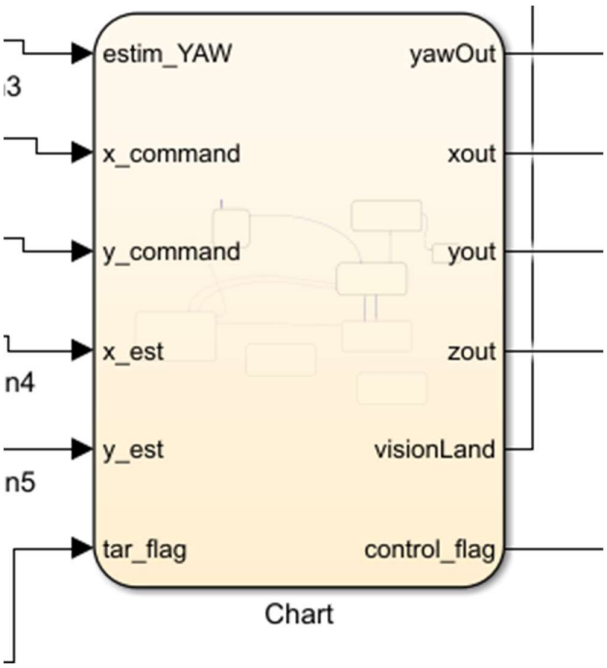

Fig 2.4 State Flow chart overlay

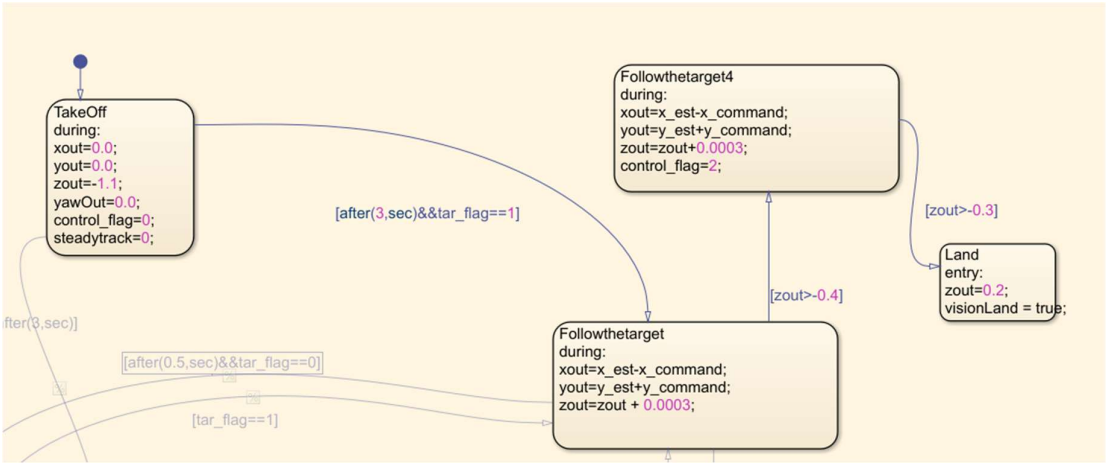

Fig 2.5 State Flow chart Logic

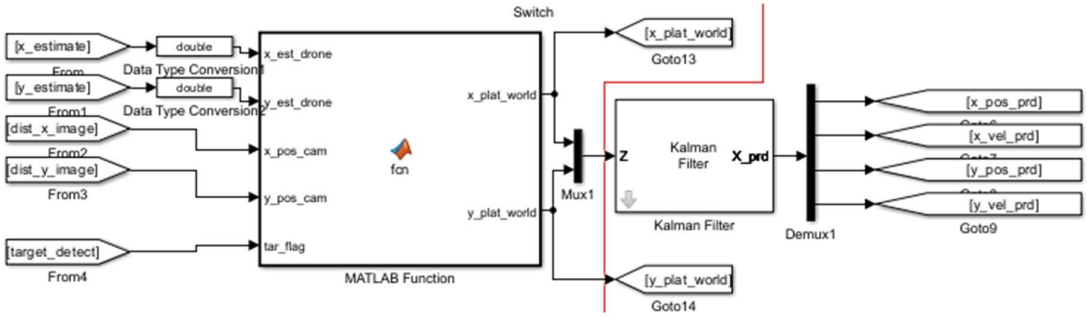

Fig 2.6 X,Y Position prediction to follow the line following robot

3. RESULTS

It is observed that when the program is loaded to the drone starting the flight control system will control the drone towards the landing pad on top of the line following robot. And upon detection, the drone will slowly descend and after it reaches a certain altitude it enables the land flag resulting in completion of the flight.