Experiment no - 8

Name Pratik Rajesh Jade

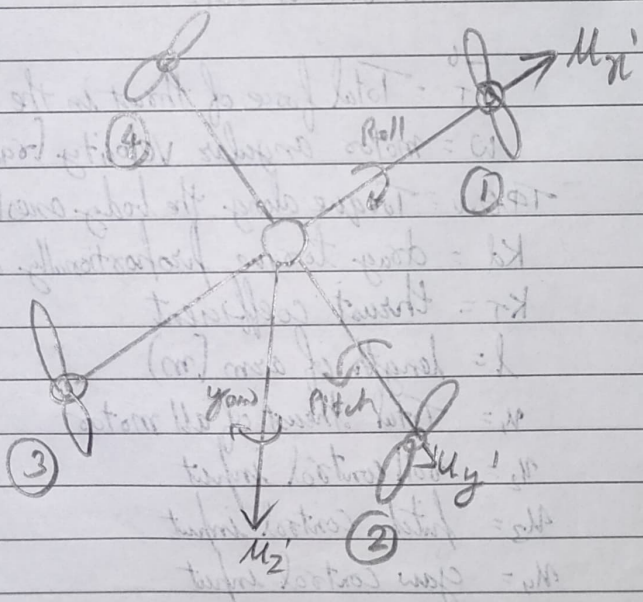
Rollno - A72

Title - Experimental Study of Role of Roll control in Balancing

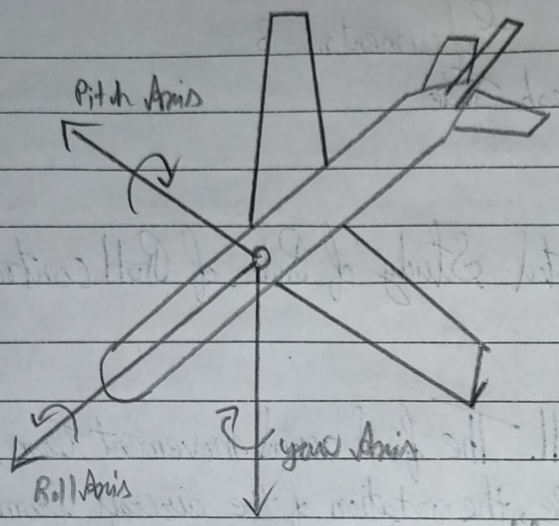
Introduction -

Roll. The final aerial movement term, roll is exactly what it sounds like, the rotation of the aircraft from nose to tail (front to back on a copter). Basically, roll refers to the movement of the droone forward, backward, left and right along a horizontal axis.

Roll control.



On the outer rear edge of each wing, the two ailerons move in opposite directions, up & down, decreasing lift on one wing while increasing it on the other. This causes the airplane to roll to left or right. To turn the airplane, the pilot uses the ailerons to tilt the wings in the desired direction.



Example of Roll Control

Mathematics Behind Roll control

F_T^b = Total force of thrust in the body coordinate frame (N)

ω = motor angular velocity (radians/sec)

$T_{\phi,\theta,\psi}$ = Torque along the body axes (N-m)

K_d = drag torque proportionally constant

K_T = thrust coefficient

l = length of arm (m)

u_1 = Total thrust of all motor

u_2 = roll control input

u_3 = pitch control input

u_4 = yaw control input

$$\begin{bmatrix} F_T^b \\ T_\phi \\ T_\theta \\ T_\psi \end{bmatrix} = \begin{bmatrix} K_T & K_T & K_T & K_T \\ 0 & -lK_T & 0 & lK_T \\ lK_T & 0 & -lK_T & 0 \\ K_d & -K_d & K_d & -K_d \end{bmatrix} \begin{bmatrix} \omega_1^2 \\ \omega_2^2 \\ \omega_3^2 \\ \omega_3^2 \end{bmatrix} = \begin{bmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \end{bmatrix}$$

The final aerial movement term, roll is exactly what it sounds like, the rotation of the aircraft from nose to tail (front to back on a copter). Basically, roll refers to the movement of the drone forward, backward, left and right along a horizontal axis. Unless you're an advanced, acrobatic UAV pilot (and why would you be reading this articles if you were?) you will want to keep yaw, pitch & roll in as stable a position as possible.

Summary - In this experiment balancing using Roll control has been studied.