Design, Modeling and Tuning of Modified PID Controller for Autopilot in MA V s

1) School of Electrical Engineering and Automation

2) Paper Overview

The dangers of poor pilot performance as well as time and place conditions, low altitude and climate, damage critical aircraft control system. The use of Unmanned Aircraft Vehicle or (UA V) in sensitive and important Operation is required and there is a need for autopilot that can tune the MAV in different environment conditions. Furthermore, designing the controller system is one of the main discussed Dynamic issues in Flying Objects. In this paper an attempted is made to determine the optimal coefficients of PID controller that can reject disturbances and still operate the MAV in stable positions. Basic PID controller is designed and is adopted to control the MAV, a modified techniques incorporating ISA-PID is designed to reject disturbances. The PID parameters are determined to be reduce the rise time less than 3 seconds, .settling time to be less than 8 seconds and overshoot to be less than 5% . The developed model is suitable for PID controller in autopilot.

3) Main research contents and innovation points:

A. Mathematical Models Of Unmanned Aircraft Vehicle (UAV)

B. Design, Modeling And Tuning Of Modified PID Controller For Autopilot In MAVs

Tuning the controller requires knowledge of the relationship between the input and output variables of the system to be controlled. Since the VA V is a complex nonlinear system, this relationship between the input signal and the output signal is not so simple. However around some operating point, the relationship between the signals can be described by a linear model. The results were obtained through simulations in Matlab and experiments on the model. The simulations possessed a key role, contributing to the tuning of the PID controller in a controlled environment. Both the simulations and the experiments, used the same reference signal or set point signal, which is equivalent to performing a shift of the UA V in X and Y directions, returning to the initial position afterwards. Although PID controllers work well on Miniature Air Vehicles (MAVs), they require tuning for each MAV. Also, they quickly lose performance in the presence of actuator failures or changes in the MA V dynamics. Adaptive control algorithms that self tune to each MA V and compensate for changes in the MA V during flight need to be explored.

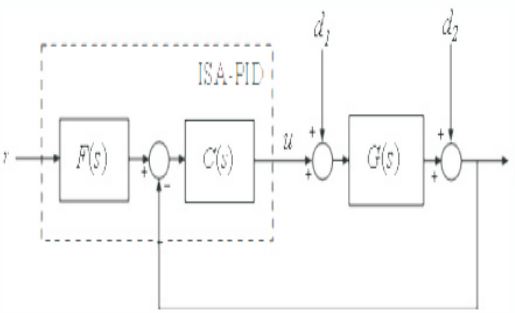


Figure 1: Modified PID controller with ISA-PID algorithm

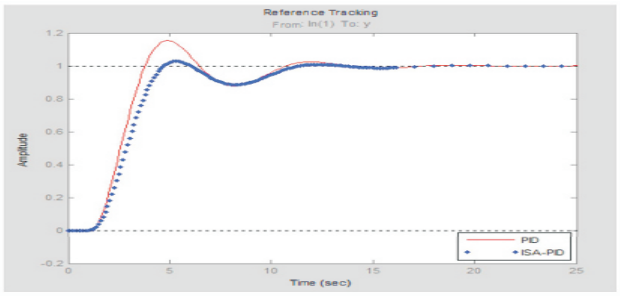


Figure 2: Transient response of ISA-PID controller

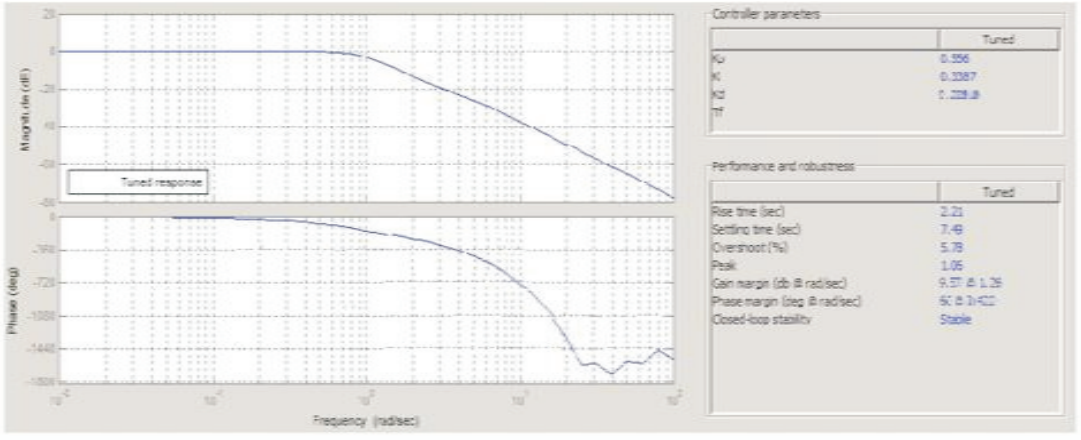


Figure 3: PID controllers with case 2 MAV configuration