Design and Implementation of A Position Tracking Control Law for A 3DOF Helicopter

Dawood Al Kharusi

Abstract

This project is an attempt to design and implement a control law for the well known control problem of the Three-Degree-Of-Freedom Helicopter. It was intended to design the simplest possible controller that can drive the helicopter to its desired yaw and pitch trajectories. Three main reasons were behind designing the simplest possible controller. These are: cost savings, the use of the linear model of the system for control and to make the problem more challenging. The 3DOF Helicopter has the same mathematical model as that of the VTOL 1 aircraft which was used and linearized around equilibrium points. Many controller trials were then applied to the linear model based on state feedback, linear quadratic regulator (LQR) approach and pole placement. The designed controller was then implemented in the helicopter and tuning of the simulation gains was carried out to adjust the gains so that they account for any un-modeled dynamics. Successful implementation was achieved with results and discussions presented throughout the context of the report. The conclusion of the report will make an insight about the system behavior under the implemented controller and the various interpretations of the results.