

Homework 2

Question 4: Project: System dynamics

- In previous assignment you identified the type of system you would like to design controller for. Find atleast 3 research articles where other researchers have designed control system for same or similar task that you are interested in. What assumptions do they make regarding the dynamics of the system?
- Identify the states and controls for your system dynamics.
- Obtain differential equations describing the dynamics of the system. Are the system dynamics equation linear or nonlinear? Have other researchers used linearizing methods to design controllers for this task?
- Identify the specific tasks you would like your system to perform? Tracking, regulator, set-point.

Answer

One of the main assumptions for UAV quadcopter is that since it has 6DOF and only 4 control inputs that it is under-actuated and therefore unstable. I however intend to design a novel aircraft based in part on typical UAV design and that of a tandem rotor helicopter.

The states of my system (in 3DOF) is position, velocity, rotation, pitch of each (of 2) rotor, and the yaw of each rotor. I unfortunately did not have time to fully develop my system dynamics equations, however I know already that they are non-linear since they will depend on trigonometric functions. Typically researchers have used PID control. I would like my system to perform tracking control based on desired trajectories input by the user.