Dynamics in (position):

Dynamics in (pitch) given by transfer function with (reference pitch) as input and as output:

Combine dynamics:

## Steady state error

If is a step input, , then

Steady state error is given by

We have , so

The steady state error is 50%, as seen in simulations…

For zero steady state error, we need to actually have .

* This is confirmed to be true in simulations
* These values were chosen according to data from experiments performed with quadrotors

# Numerical integration

* Forward Euler becomes unstable even for relatively small time steps (), so use Backwards Euler:
* Backwards Euler is unconditionally stable, but involves solving a matrix equation
* Apparently cvx can handle this kind of constraint very quickly
* Larger time steps will speed up MPC computations since fewer constraints will be present