

# 1 10.4 - Optimal Control of Pitch/Travel and Elevation with Feedback

We have to add the equation for elevation

$$\ddot{e} + K_3 K_{ed} \dot{e} + K_3 K_{ep} e = K_3 K_{ep} e_c$$

to the system defined in ??

$$\underbrace{\begin{bmatrix} \dot{\lambda} \\ \dot{r} \\ \dot{p} \\ \ddot{p} \\ \dot{e} \\ \ddot{e} \end{bmatrix}}_{\dot{x}} = \underbrace{\begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & -K_2 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & -K_1 K_{pp} & -K_1 K_{pd} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -K_3 K_{ep} & -K_3 K_{ed} \end{bmatrix}}_{A_c} \underbrace{\begin{bmatrix} \lambda \\ r \\ p \\ \dot{p} \\ e \\ \dot{e} \end{bmatrix}}_{x} + \underbrace{\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ K_1 K_{pp} & 0 \\ 0 & 0 \\ 0 & K_3 K_{ep} \end{bmatrix}}_{B_c} \underbrace{\begin{bmatrix} p_c \\ e_c \end{bmatrix}}_u \quad (1)$$

## 1.1 The continuous model

Answer 10.4.1.1

## 1.2 The discretized model

Answer 10.4.1.2

## 1.3 Experimental results

Printouts of data from relevant experiments (plots). Discussion and analysis of the results. Answer 10.4.2.6 here.

## 1.4 Decoupled model

Answer 10.4.2.7

## 1.5 MATLAB and Simulink

Code and diagrams go here

## 1.6 Optional exercise

Which constraints did you add? What was the results? Plots? Discussion?