ME 401 Exam 2

Exercise 4.2:

Consider the longitudinal dynamics of a transport aircraft as given in Chapter 1, Exercise 1.2 Design an H-inf state feedback controller to track a constant speed command and a constant angle of attack command. Use the gamma-iteration approach outlined in Section 4.5.

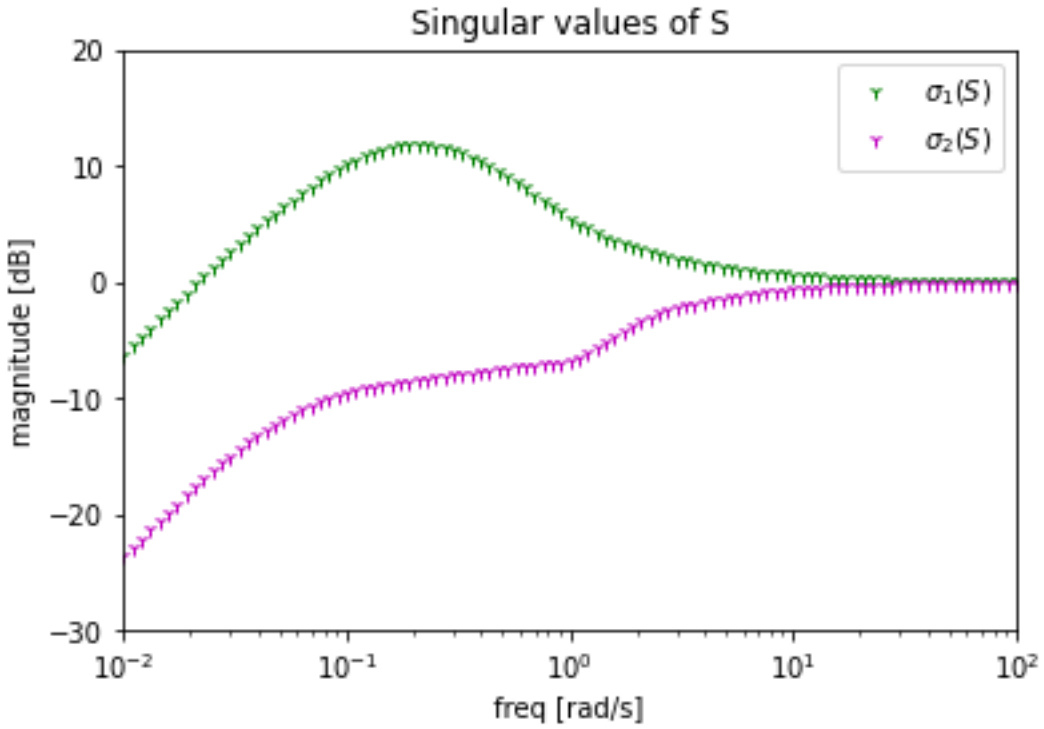
alpha = np.deg2rad(6)

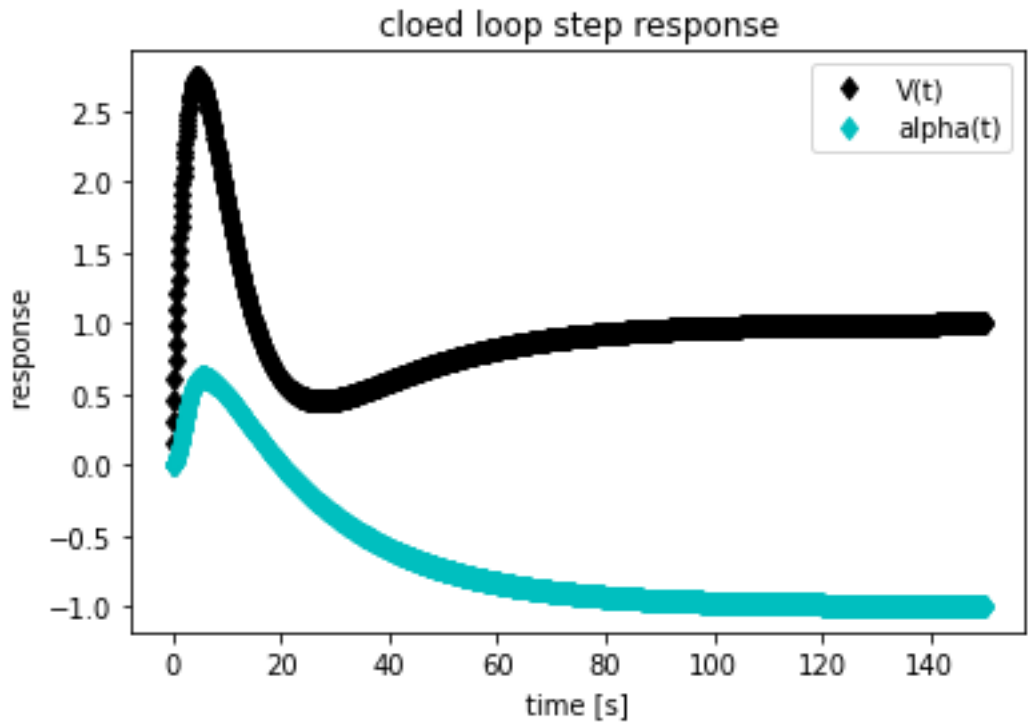
A = [[-.038, 18.984, 0, -32.17],[-.001, -.632, 1, 0],[0, -.759, -.518, 0],[0, 0, 1, 0]]

B = [[10.1, 0], [0, -.0086], [.025, -.011], [0, 0]]

C = [[250, 0, 0, 0],[0, alpha, 0, 0]]

D = [[0, 0], [0, 0]]





gamma 700

Exercise 4.3 in Lavretsky:

- Consider the lateral-directional dynamics of a transport aircraft as given in Chapter 1, Exercise 1.4. Design an H-inf state feedback controller to track a constant stability axis roll rate p_s command (See Equation 1.22) and regulate sideslip angle Beta. Assume alpha_0 = 6 deg.

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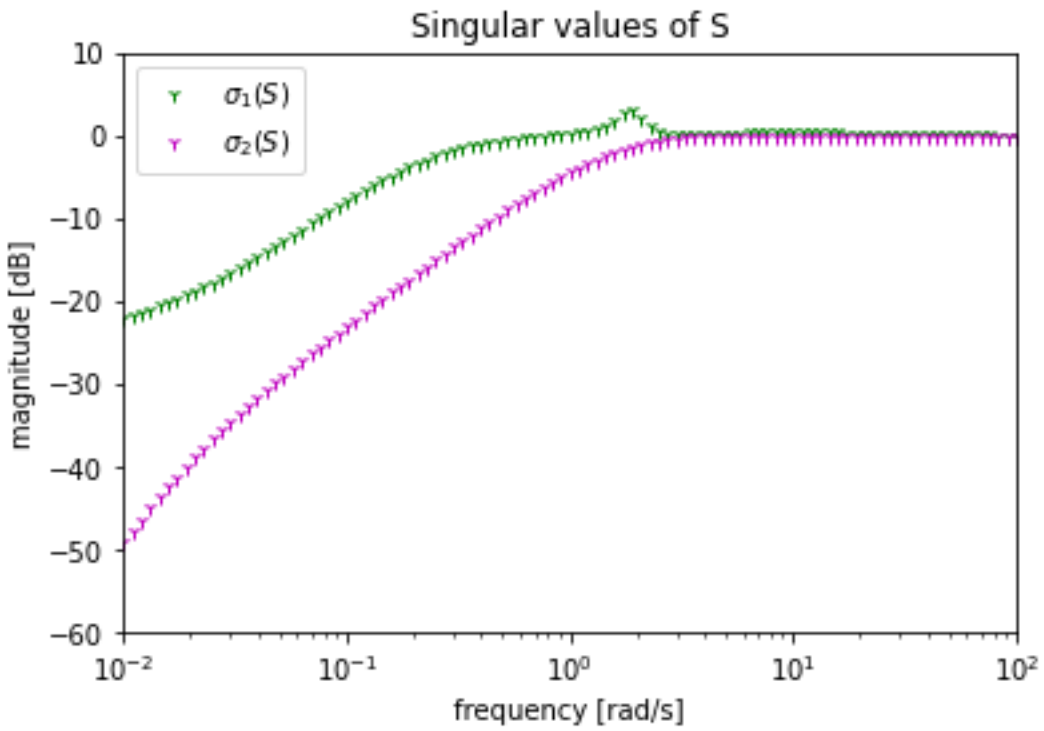
alpha = np.deg2rad(6)

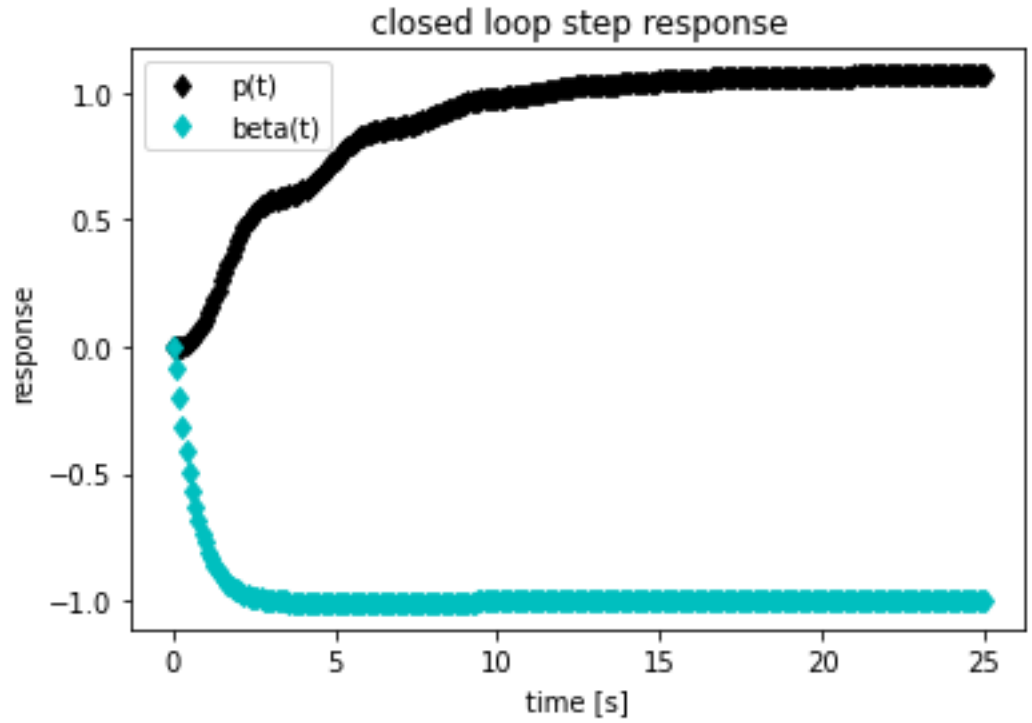
A = [[0, 0, 1, 0],[ .0487, -.0829, 0, -1],[ 0, -4.546, -1.699, .1717],[ 0, 3.382, -.0654, -.0893]]

B = [[0, 0], [0, .0116], [27.276, .5758], [ .3952, -1.362]]

C = [[0, 1, 0, 0],[ 0, 0, m.cos(alpha), m.sin(alpha)]]

D = [[0, 0], [0, 0]]
```


Singular values of S
$\sigma_1(S)$
$\sigma_2(S)$
magnitude [dB]
frequency [rad/s]


closed loop step response
p(t)
beta(t)
response
time [s]

gamma 2.6