SC Prakt_RT2_03SC	Course: Automatic Control Theory Exercise: State control	Fakultät Elektrotechnik und Informatik

Prof. Dr.-Ing. habil. Proske **March 2010**

Lab. Eng.: DI Sbieschni

1 Objective

Calculation and adjustment of state controller parameters, analysis of the characteristics of state controlled systems.

2 Preparation

2.1 Repeat the methods for parameter estimation of delay elements by use of the unit step response!

2.2 Repeat the lecture chapters „2. State space description of linear systems“ and „3. Design and characteristics of state controllers“!

2.3 Ascertain the coefficients of the state representation with $\underline{g}_m$ according to the lecture for a drive with separately excited dc motor using the following parameter sets a und b!

a) T_A = 27,5 ms T_M = 549 ms $k\Phi$ = 2,02 Vs R = 8,1 Ω K_S = 31,9
$C_i = 1\ V^{-1}A$ $C_\omega = 18{,}4\ V^{-1}s^{-1}$

b) T_A = 25,2 ms T_M = 219 ms $k\Phi$ = 2 Vs R = 8,45 Ω K_S = 32,5
$C_i = 1\ V^{-1}A$ $C_\omega = 16{,}6\ V^{-1}s^{-1}$

2.4 Dimension a state controller with the characteristics $\omega_{Gr} = 25\ s^{-1}$ und $\alpha = 2$ for a drive with separately excited dc motor and the state representation with $\underline{g}_m$ according to exercise 2.3!

2.5 Calculate for the drive with state controller according to exercise 2.4 the magnitude of the steady state error and calculate a cascaded compensator to eliminate this steady state error!

2.6 Design a state controller without steady state error for the drive according to exercise 2.3 with the characteristics $\omega_{Gr} = 25\ s^{-1}$ und $\alpha = 2$!

3 Duties

3.1 Investigation of the behaviour of the drive with state controller and cascaded compensator according to 2.4/2.5

a) Measure for the steady state the voltages u_ω and the armature currents in the operating point U_{e0} = 3,6 V with the braking torque settings 5,0; 6,5; 8,0 at the inverter and calculate R_{z2}.

b) Investigate the transient behaviour in the operating point U_{e0} = 3,6 V and with the step amplitude Δu_e = 0,2 V, braking torque setting 5,0.

3.2 Investigation of the behaviour of the drive with state controller without steady state error according to 2.6

a) Measure for the steady state the voltages u_ω and the armature currents in the operating point U_{e0} = 3,6 V with the braking torque settings 5,0; 6,5; 8,0 at the inverter and calculate R_{z2}.

b) Investigate the transient behaviour in the operating point U_{e0} = 3,6 V and with the step amplitude Δu_e = 0,2 V, braking torque setting 5,0.

4 Report (Interpretation)

Evaluate the exercise results and compare them with the values given in the lecture!