

Digital Control via State Space Methods

Topics

Introduction to digital control
Review of continuous control
Digitization and effect of sampling
Linear difference equations
The z-transform
The discrete transfer function
Block & signal flow diagrams, state-variable descriptions
Transfer function related to pulse response
External BIBO stability
Discrete models of sampled-data systems
State transition equations for LTI systems
z-transform of the unit pulse and unit step functions
z-transform of the exponential and sinusoidal functions
Mapping between the z-plane and s-plane
The step response
Properties of the z-transform
Aliasing, Shannon's sampling theorem, hidden signals
Numerical Integration
Digital control design via state space methods
Pole placement in the z-plane
Controllability and observability
Estimator design, predictive and indicative (current)
*Reduced order estimators
Compensator design, separation principle, pole selection
Regulator design with reference input
Integral Control & disturbance estimation
Effects of sensor and actuator delays

*time permitting

Franklin, Powell & Workman

Ch. 1
Ch. 2: esp. 2.1, 2.2, 2.6, Eq(2.3), Eq(2.4).
Ch. 3: esp. 3.1 & 3.2
4.1
4.2.1
4.2.2
4.2.3
4.2.4
4.2.5
4.3, 4.3.1
4.3.3
4.4.1, 4.4.2
4.4.3, 4.4.4
4.4.5
4.4.6
4.6, 4.6.1
5.2
6.1
8.1
8.1.1, 8.1.3
8.1.2, 8.2.2
8.2, 8.2.1, 8.2.3, 8.2.4
*8.2.5
8.3, 8.3.1, 8.3.2
8.4, 8.4.1, 8.4.2
8.5, 8.5.1, 8.5.2
8.6, 8.6.1, 8.6.2