



Intro. Computer Control Systems: F12

Summary

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What was this course about?



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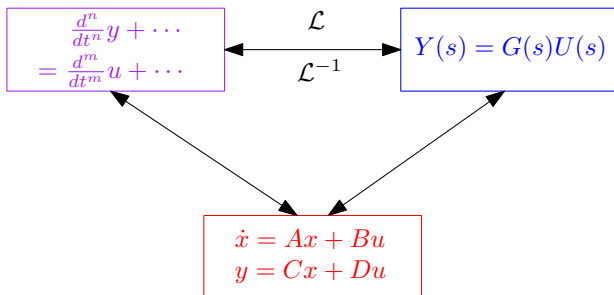
We want to **control** dynamical **systems** in a **good** way



Control dynamical systems in a good way

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Systems: Linear time-invariant system models



Control dynamical systems in a good way

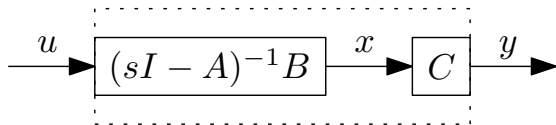
Systems: Linear time-invariant system models



Complex-valued *transfer function* is compact (assumes initial values 0)

Control dynamical systems in a good way

Systems: Linear time-invariant system models

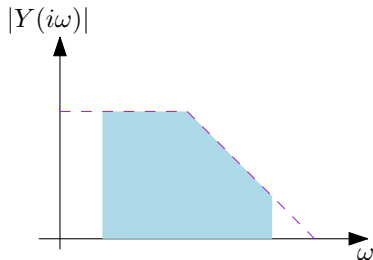
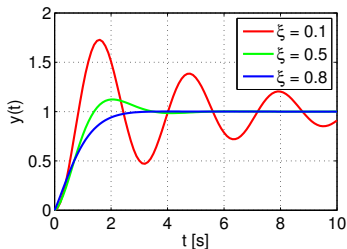


State-space description with matrices and arbitrary initial values

Control dynamical systems in a good way

Systems: Linear time-invariant system models

Interpretations in *time-* and *frequency* domain



Control dynamical systems in a good way

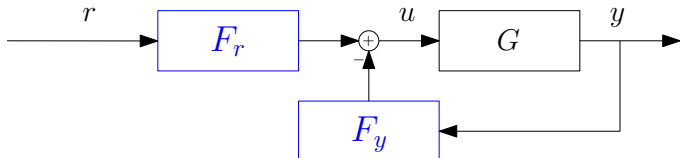
Control: Feedback controllers to achieve $y(t) \approx r(t)$

- ▶ PID-controller
- ▶ Frequency-based controller
- ▶ State-feedback controller (with observer)

Closed-loop systems from $r(t)$ to $y(t)$

Control dynamical systems in a good way

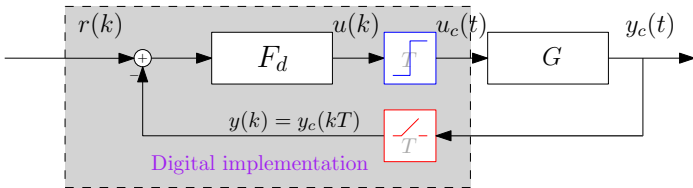
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Structure of general linear feedback (See F5+F10)

Control dynamical systems in a good way

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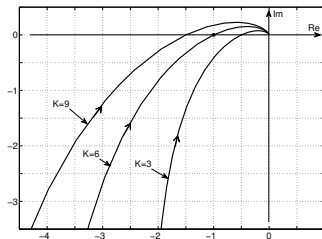
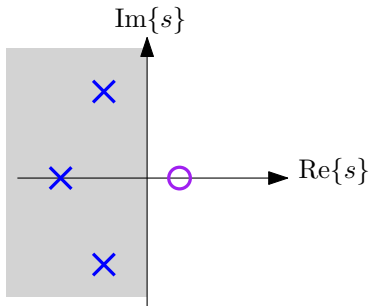


Discrete-time models for digital implementation

Control dynamical systems in a good way

Good: Control criteria for closed-loop system

Stability

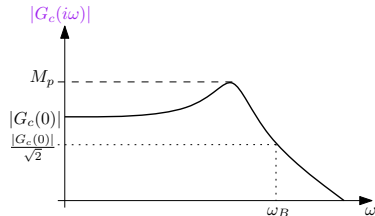
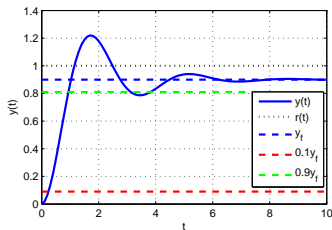


Methods: i) compute *poles*, ii) *Routh's algorithm*. iii) *root locus*, special case iv) *Nyquist curve* $G_0(i\omega)$

Control dynamical systems in a good way

Good: Control criteria for closed-loop system

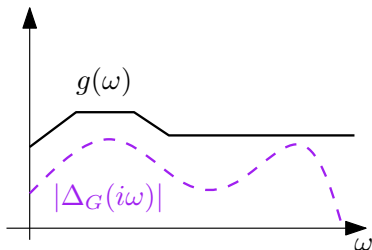
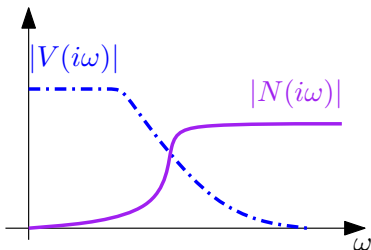
- ▶ Quickness
- ▶ Damping
- ▶ Accuracy



Control dynamical systems in a good way

Good: Control criteria for closed-loop system

- ▶ Sensitivity towards disturbances and noise
- ▶ Robustness towards model errors





Written exam

Individual estimate of attained knowledge goals



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Each problem solution evaluated using **three criteria**:

1. **submitted** solution
2. **demonstrates** understanding of problem
3. provides a reasonable and **reproducible** solution



Written exam

Individual estimate of attained knowledge goals

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 - ▶ **Formula sheet**: Key formulae handed out with exam. BETA and Pocket calculator allowed.
 - ▶ **Bonus points** from assignments can eliminate half or the entire first problem.



Written exam

Individual estimate of attained knowledge goals

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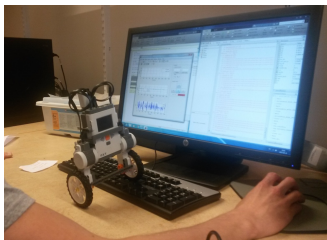
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[Board: problems from exam]

The future

Related courses:

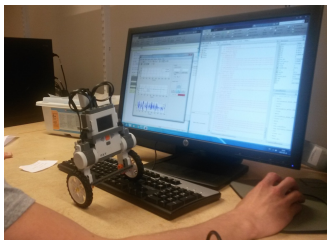
- ▶ Empirisk modellering
- ▶ Automatic Control II: MIMO systems and optimal controllers
- ▶ Automatic Control III: nonlinear systems, limitations and trade-offs



The future

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Good luck!