Introduction

July 28, 2015

Outline

Course overview

1. Introduction
2. Classification of systems
3. System modelling
4. Discrete-time systems
5. Continuous-time systems
6. Frequency response of dynamical systems
7. Sampling and reconstruction of signals
8. Discretizations of continuous-time systems
9. Introduction to control
10. Root Locus Analysis
11. Design in the frequency domain and Nyquist stability criterion
12. Lead and lag compensators
13. PID control

Methodology and evaluation

- Prof. dr. ir. Bart De Moor [Bart.DeMoor@esat.kuleuven.be]
- 20 lectures, 8 excercise sessions
- Learning platform: Sofia, Toledo
  `www.sofialearn.com`
  Course: Systems and control theory
  Material from the lectures (powerpoints, video's), assignments for exercise sessions and supplementary material (downloads, tutorials, books, links, journals, conferences)

Exam

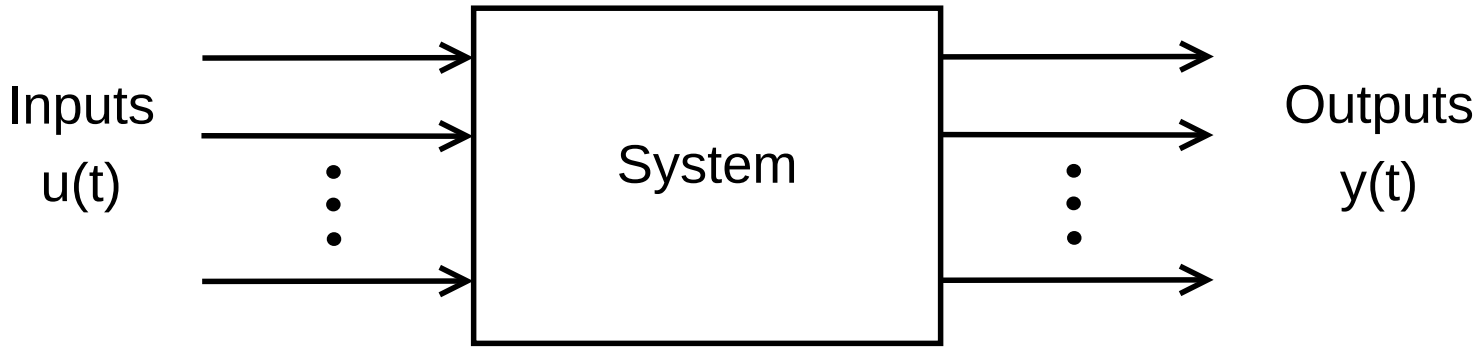
- Written exam
- You can bring: course book, calculator, notes from exercise sessions
- Duration: 4h

Chapter 1: Introduction

Outline

Systems theory

System theory occupies itself with the mathematical description and study of systems. Models describe the connections between input and output.



Systems theory

Next to inputs and outputs, states (denoted by $\mathbf{x}(t)$) are a third type of variable used to describe a system. They represent the internal state of the system at a given time.

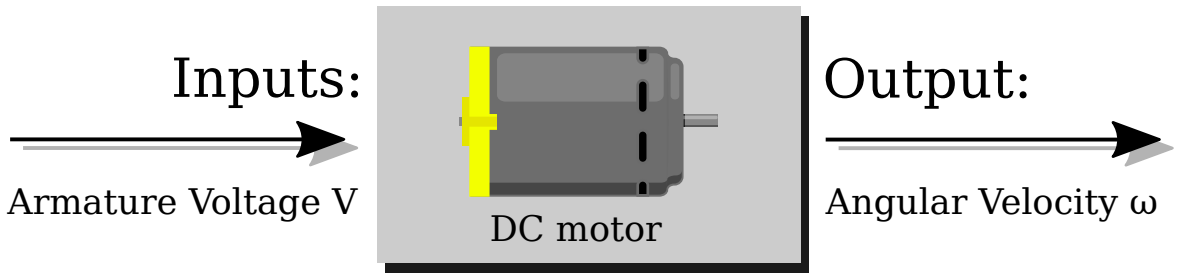
$$\dot{x}(t) = f(x(t), u(t))$$
$$y(t) = g(x(t), u(t))$$

The order of a system is the number of state-variables (i.e. the size of the vector $\mathbf{x}$).

Dynamical system

A dynamical system is a constantly changing system that connects outputs and inputs.
The word dynamical refers to the fact that its current output depends on past input, contrary to static systems where the current output only depends on current input. This means that in a dynamical system the output changes with time if the system is not in a state of equilibrium.

Everything is a dynamical system.
Example:



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