Feedback principles

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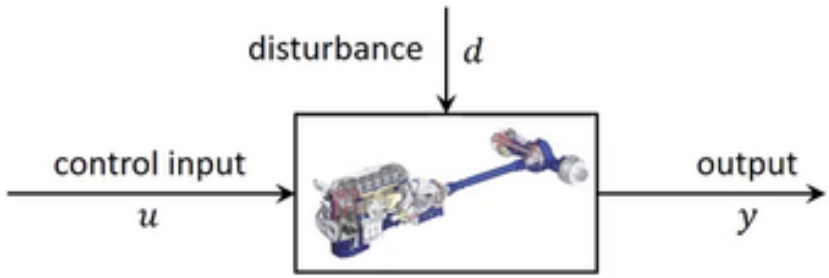
Feedback principles – model based design

Control objectives (specification)

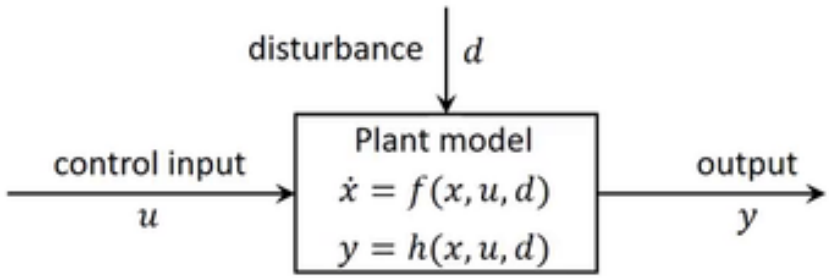
- Qualitative – minimize energy
- Quantitative – response time



Feedback principles – model based design

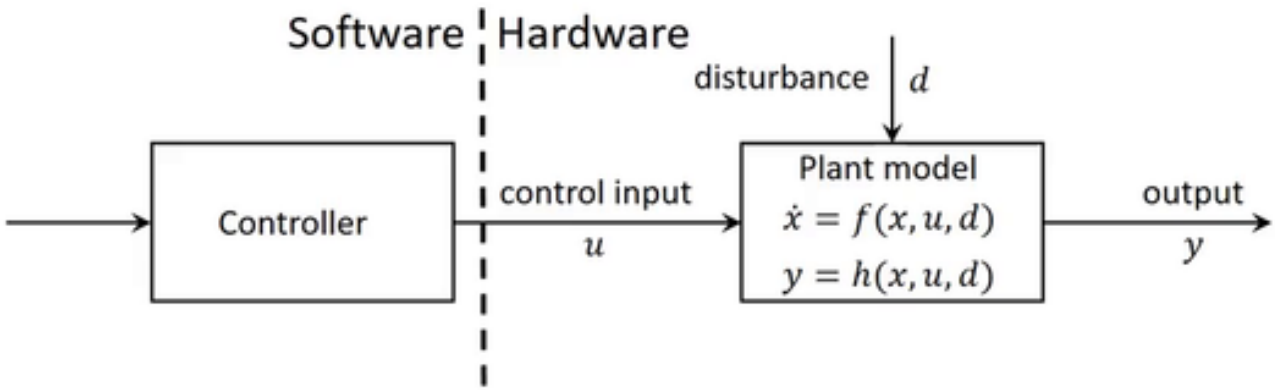
Description of the system/plant

- Level of abstraction
- Modeling – physical modeling or from measured data



Feedback principles – model based design

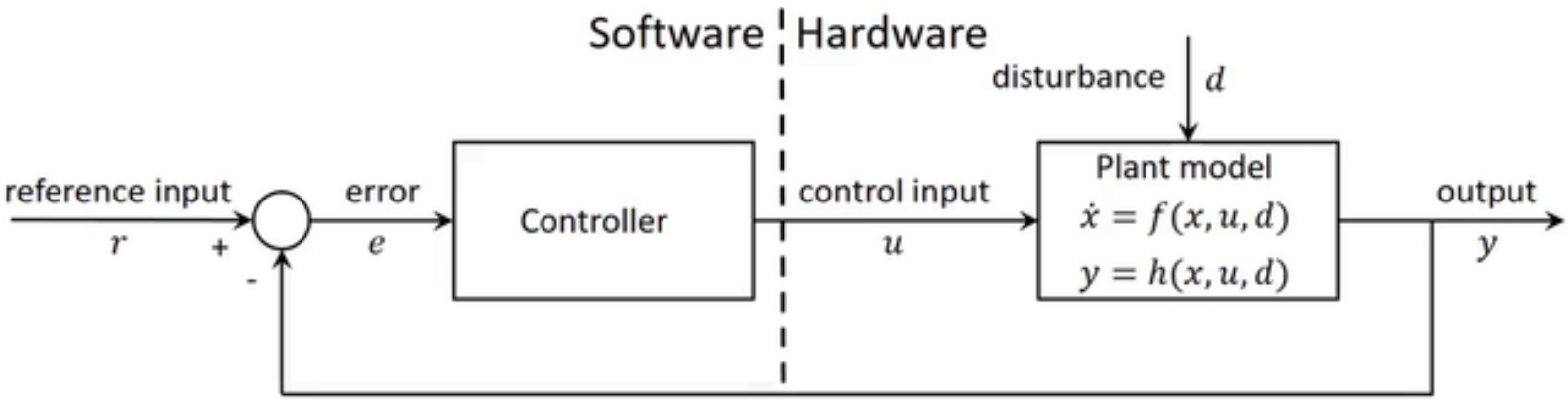
Design controller



Feedback principles – model based design

Design controller

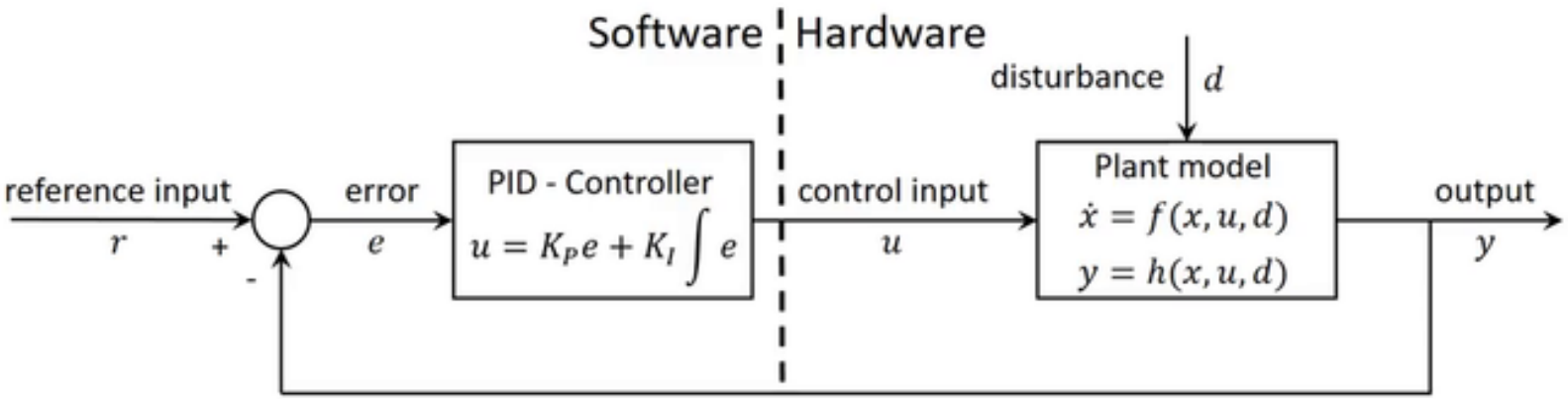
- Select technique – Open loop or closed loop



Feedback principles – model based design

Design controller

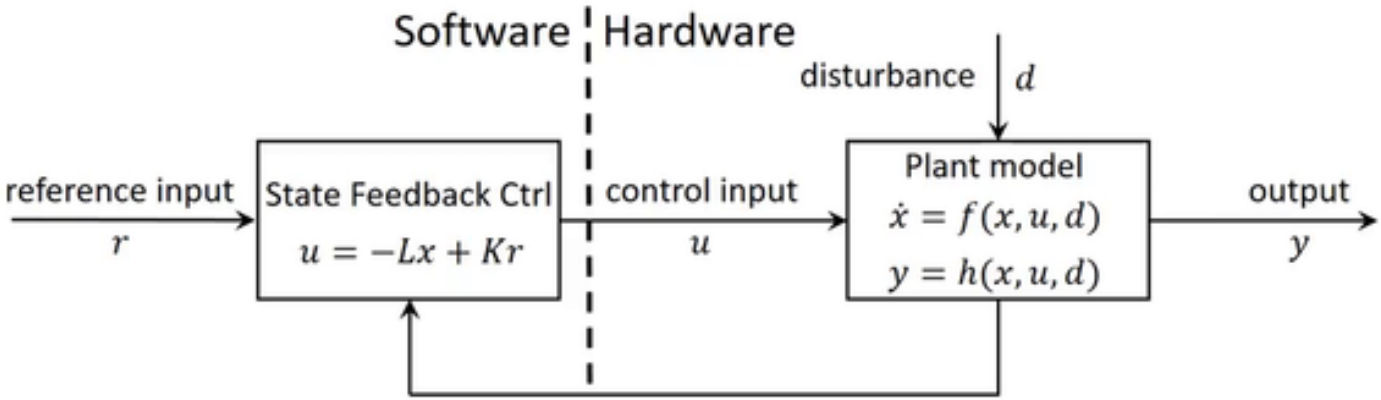
- Select technique – Open loop or closed loop
- Classical methods or state-space methods



Feedback principles – model based design

Design controller

- Select technique – Open loop or closed loop
- Classical methods or state-space methods
- Choose parameters (trial-and-error, design method, optimization)



Control design methods

Classical control methods

- works well for simple systems,
- can be tuned based on trial-and-error or engineering intuition,
- do not require a mathematical model of the system

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- do not require a mathematical model of the system

but

- are typical iterative,
- are difficult to use for larger-scale systems (complex systems) with multiple inputs and outputs (MIMO),

Control design methods

State-space methods

- can easily handle larger-scale systems (complex systems) with multiple inputs and outputs (MIMO),
- tuning can be formed as an optimization problem,
- are easy to implement

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Bibliography

- Karl J. Astrom and Richard M. Murray *Feedback Systems*. Version v3.0i. Princeton University Press. September 2018. Chapter 11.
- Ogata, Katsuhiko. Modern Control Engineering. Fifth Edition. Prentice Hall. 2009. Chapter 8.