

CSE 591: Theoretical Aspects of CPS

Verification: Infinite state systems
Reference: Tabuada Ch 7.1

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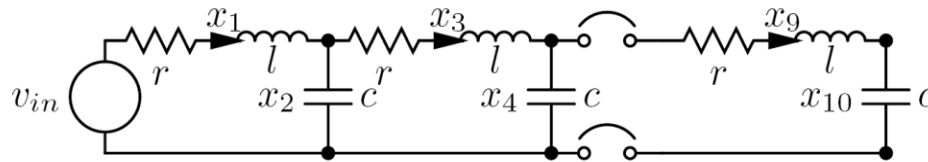
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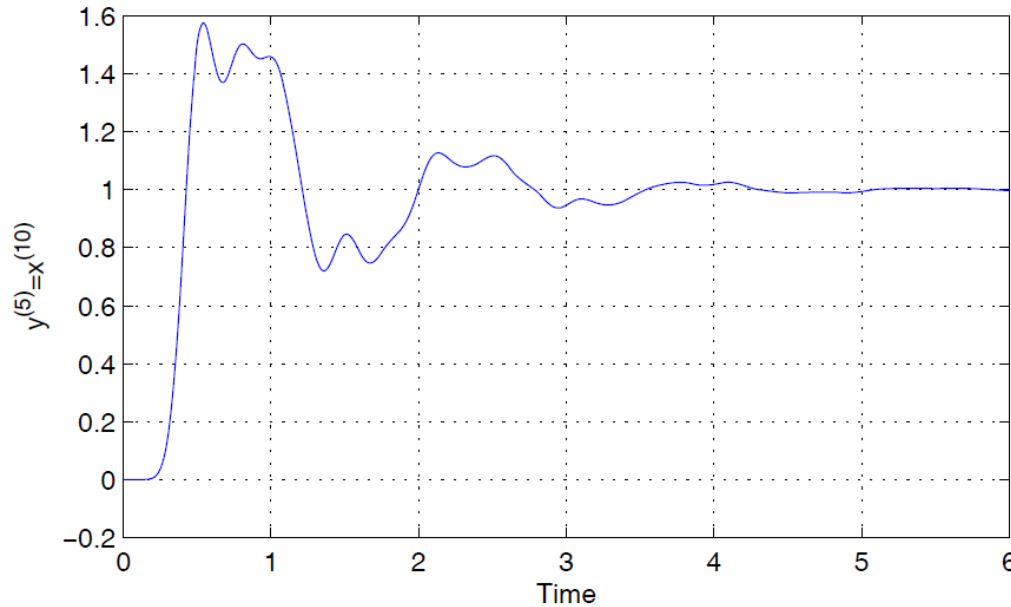
Example : Transmission line



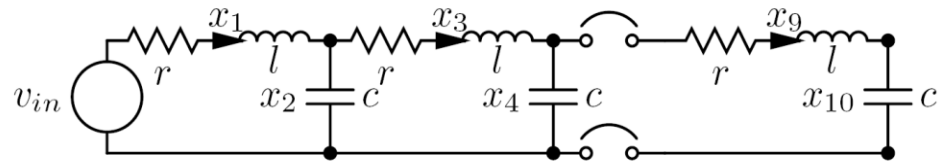
Solution is of the form

$$\dot{x}(t) = \exp(A't)x'_0$$

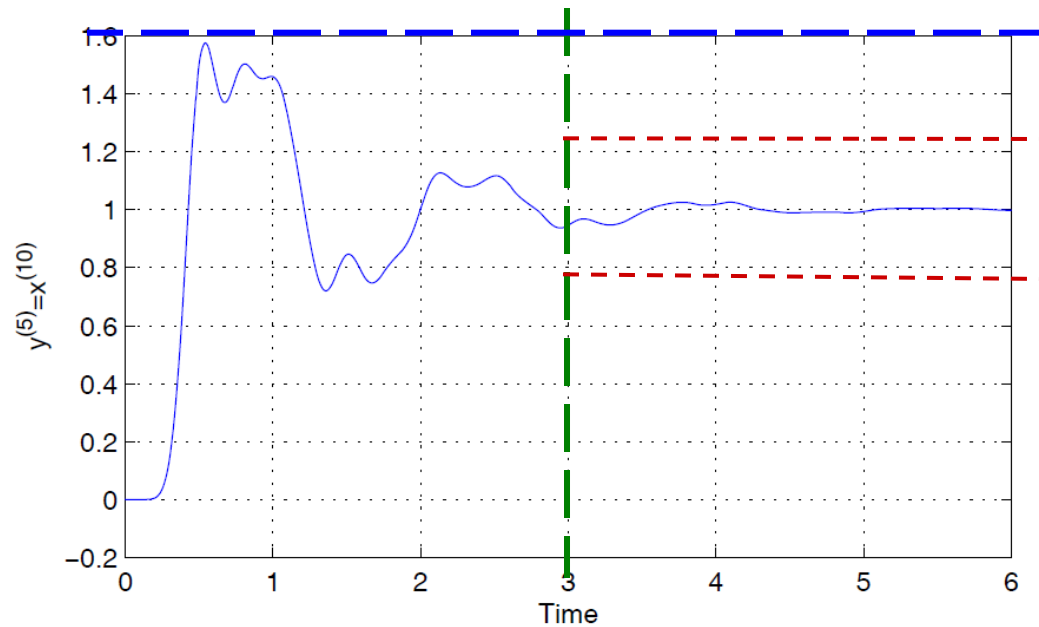
$$x(t) = x'(t) - A^{-1}b$$



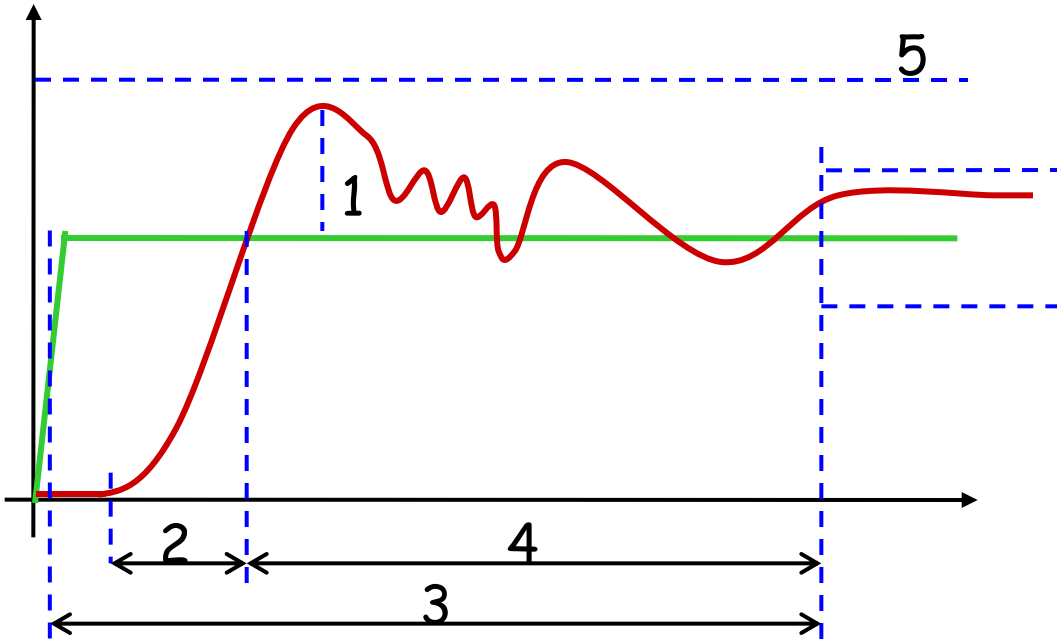
Example : Transmission line



Requirements on the system trajectories



Traditional Control Specifications



Desired Performance Characteristics

1. Overshoot
2. Rise time
3. Delay time
4. Settling time
5. Constraints on input/states
6. Response sensitivity
7. Stability
8. ...

Beyond Traditional Control

- Sequencing of events
 - The temperature should reach thresholds T_1 , T_2 and T_3 in that order
- Response requirements
 - If switch is on, then steady state should be reached in 5 sec
 - If switch is on, then fail safe mode should be reached in 0.5ms
- Safety and Reachability
 - The temperature should always be within $[T_1, T_2]$ until threshold T_3 is reached
- Periodicity
 - The temperature should be less than T degrees every 1 hr
- Many more ...