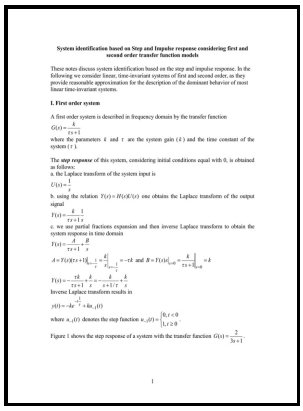
System identification in the time and frequency domains.

- - System Identification in Frequency Domain



System identification based on Step and Impulse response considering first and second order transfer function models

These notes discuss system identification based on the step and impulse response. In the following we consider linear, time-invariant systems of first and second order, as they provide reasonable approximation for the description of the dominant behavior of most linear time-invariant systems.

1. First order system

A first order system is described in frequency domain by the transfer function

$G(s) = \frac{k}{\tau s + 1}$

where the parameters k and τ are the system gain (k) and the time constant of the system (τ).

The *step response* of this system, considering initial conditions equal with 0, is obtained as follows:

a. the Laplace transform of the system input is

$U(s) = \frac{1}{s}$

b. using the relation $Y(s) = H(s)U(s)$ one obtains the Laplace transform of the output signal

$Y(s) = \frac{k}{\tau s + 1} \cdot \frac{1}{s}$

c. we use partial fractions expansion and then inverse Laplace transform to obtain the system response in time domain

$Y(s) = \frac{A}{\tau s + 1} + \frac{B}{s}$

$A = Y(s)(\tau s + 1)\Big|_{s=-\frac{1}{\tau}} = \frac{k}{s}\Big|_{s=-\frac{1}{\tau}} = -\tau k$ and $B = Y(s)\big|_{s=0} = \frac{k}{\tau s + 1}\Big|_{s=0} = k$

$Y(s) = -\frac{\tau k}{\tau s + 1} \cdot \frac{\frac{1}{\tau}}{s + \frac{1}{\tau}} + \frac{k}{s} = -\frac{k}{s + 1/\tau} + \frac{k}{s}$

Inverse Laplace transform results in

$y(t) = -ke^{-\frac{1}{\tau}t} + k u_{-1}(t)$

where $u_{-1}(t)$ denotes the step function: $u_{-1}(t) = \begin{cases} 0, t < 0 \\ 1, t \geq 0 \end{cases}$

Figure 1 shows the step response of a system with the transfer function $G(s) = \frac{2}{3s+1}$.

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Description: -
-System identification in the time and frequency domains.
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ThesesSystem identification in the time and frequency domains.
Notes: M.Sc. thesis. Typescript.
This edition was published in 1968

DOWNLOAD FILE

Filesize: 4.41 MB

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Nonlinear System Identification: NARMAX Methods in the Time, Frequency, and ...

For example, the robot starts in the maze and then the robots decides to move forward. One example uses the for microbial growth.

Frequency domain versus time domain methods in system identification

Each edge of the tree network is characterized by a linear, time-invariant dynamical system and additive white Gaussian noise. We start from the identification work loop in , Fig. Nonlinear System Identification: NARMAX Methods in the Time, Frequency, and Spatio-Temporal Domains describes a comprehensive framework for the identification and analysis of nonlinear dynamic systems in the time, frequency, and spatio-temporal domains.

[PDF] System Identification: A Frequency Domain Approach

A more recent technique is a for creating the forward model.

[PDF] System Identification: A Frequency Domain Approach

Under appropriate assumptions, we prove that the number of vector-valued samples from a single sample path required for consistent estimation is polylogarithmic in the number of nodes in the network. This is the case of direct. The reason why dedicated forward models are constructed, is because it allows to divide the overall control process.

Frequency domain versus time domain methods in system identification

The term is referencing to a forward model which doesn't provide the correct action but simulates a scenario.

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