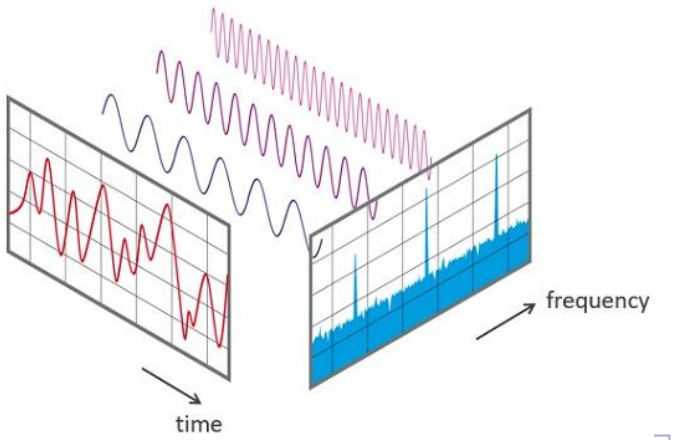
FESTO

Fast Fourier Transformation (FFT)

How-to implement a FFT in Real Time

Rainer Nitsche / February 2024



FFT Objectives

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General objectives of the discrete fourier transformation

- Numerisch effiziente Methode zur Berechnung einer diskreten Fouriertransformation
- Mein FFT Arbeitsverzeichnis für die Simulationen liegt `C:/workspace/1027_pJoint_squeakVEAE/SCALEXIO/myDevelop` bzw. `FFT4dSpace.slx` und Postprocessing `VisFFTsimResults.m`

Some Remarks on FFT

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This is a text in second frame. For the sake of showing an example. See also [1]

- Good youtube videos from Steve Brunton about Fourier Transformations: ▸ Link

The goal is to analyze to following signal:

$$\boxed{A(t) = c + a_1 \sin(\omega t) + a_2 \cos(\omega t)} \tag{1}$$

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A motivating Example for SMC

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Example

Sliding mode of the system [2]:

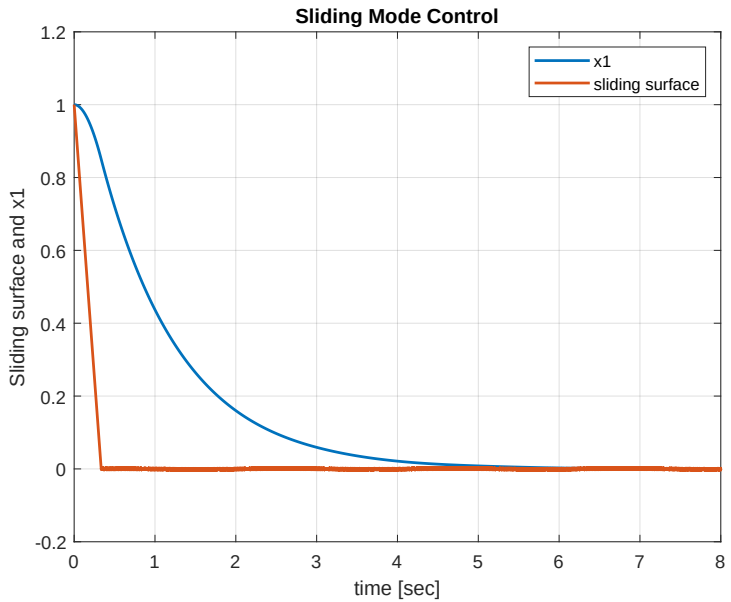
$$\ddot{x} = \sin(3t) + u \tag{2}$$

with sliding surface

$$s = c\dot{x} + x \tag{3}$$

with control law

$$u = -M\,\mathrm{sgn}(s) \tag{4}$$



Simulation results for $M = 3$ and $c = 1\,\mathrm{s}^{-1}$

If the system is in sliding mode, *i. e.* $s = 0$, the dynamics is $s = \dot{x} + x = 0$ and therefore independend of system parameters or disturbance $\rightsquigarrow$ robust !

Sample frame title

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In this slide, some important text will be highlighted because it's important. Please, don't abuse it.

Remark

Sample text

Important theorem

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Examples

Sample text in green box. The title of the block is "Examples".

TikZ Test

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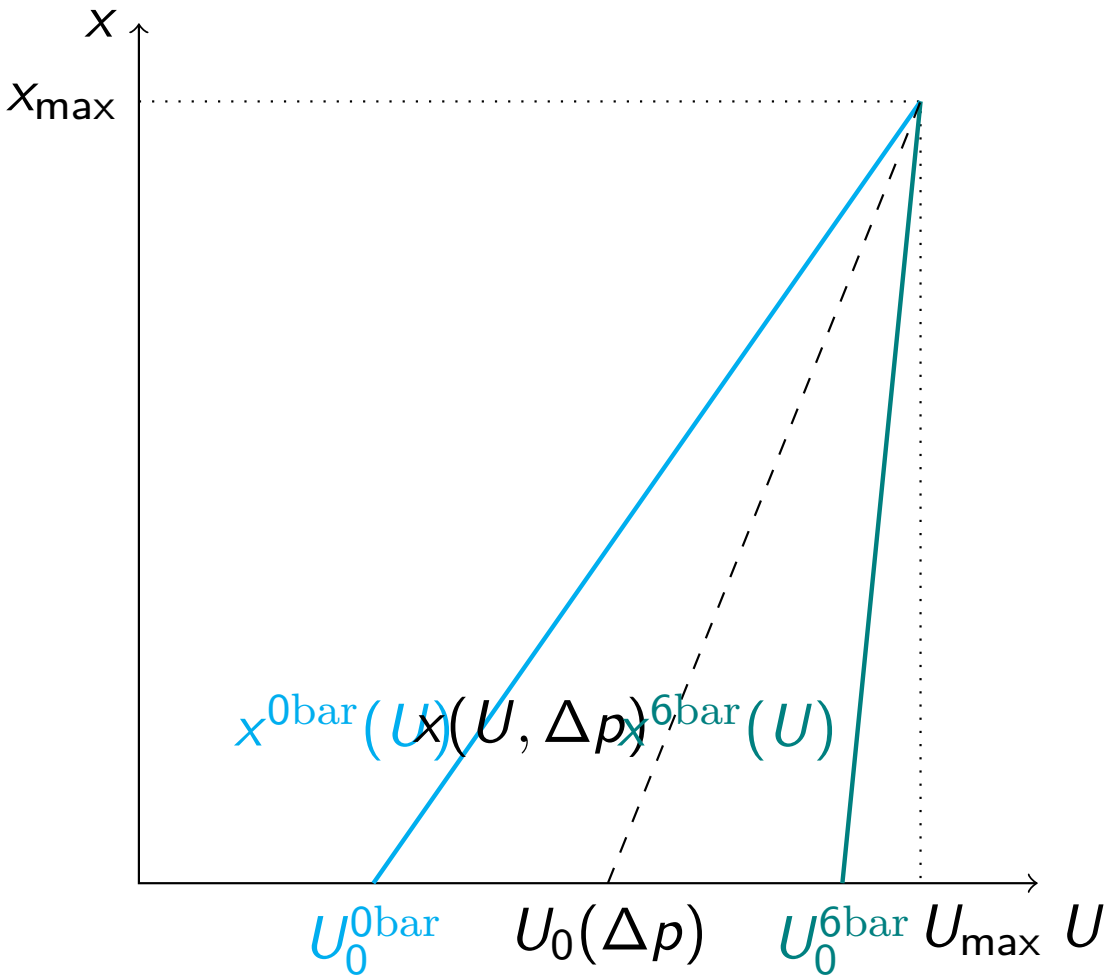
Hello world



References

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[1] S.L. Brunton and J.N. Kutz. *Data-Driven Science and Engineering: Machine Learning, Dynamical Systems, and Control*. Cambridge University Press, 2022. ISBN: 9781009098489. URL: https://books.google.de/books?id=rxNkEAAAQBAJ.

[2] Vadim I. Utkin et al. *Road map for sliding mode control design*. 6330 Cham, Switzerland: Springer, 2020. ISBN: 978-3030417086. DOI: 10.1007/978-3-030-41709-3.