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Jörg Lange · Tatjana Lange

Fourier Transformation for Signal and System Description

Compact, Visual, Intuitively Understandable

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Preface

As students, we had not really understood the Fourier transform. We could handle the formulas quite well, but we had not really internalized the meaning of the whole thing. This was probably because we, who live in time and space, simply could not imagine a "frequency or image domain" into which the Fourier transform would take us, and consequently could not think and "feel" in this category.

The wonderful and often very helpful world of the Fourier transform was first recognized by us as young assistants, when we tried to teach it to the students ourselves, who then let us know in the evenings in the pub that for them this Fourier transform is a single horror.

Already at that time, ideas arose about how the Fourier transform and its technical applications, especially in signal and system theory and in control engineering, could be clearly conveyed. In the meantime, these approaches have been further developed using today's design possibilities and are now summarized in this booklet.

They are intended to help STEM (science, technology, engineering, mathematics) students in particular, and of course also graduated professionals to better understand the subject matter and, in particular, to grasp it emotionally.

We consider this to be particularly important because all modern digital technologies, be it digital sound and image recording and storage, digital radio and digital television, digital mobile telephony, digital signal transmission, without which there would be no Internet (!), the modern control technologies, without which no car can drive and no airplane can fly today, are largely based on the findings of the Fourier transformation.

We are sincerely grateful to our colleague Karl Mosler for his critical review of the text.