Unit 3: Laplace Transforms and their Applications

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About the Laplace Transformation

The Laplace Transformation (named after Pierre-Simon Laplace) is a useful mathematical tool that is used in many branches of engineering including signals and systems theory, control theory, communications, mechanical engineering, etc.

Its principle benefits are:

- it enables us to represent differential equations that model the behaviour of systems in the time domain as polynomials in s which facilitates their solution
- it converts time convolution (which is how we determine the time-response of a system to a given signal) into a simple multiplication in the s domain
- it allows us to model linear time-invariant (LTI) system components using transfer functions and systems by block diagrams
- block diagram analysis allows us to readily compute system responses to complex signals.

The only downside is that time t is a real value whereas the Laplace transformation operator s is a complex exponential $s = \sigma + j\omega$.

In this section of the course we will cover:

- Unit 3.1 The Laplace Transformation
- Unit 3.2 The Inverse Laplace Transform
- Unit 3.3 Using Laplace Transforms for Circuit Analysis
- Unit 3.4 Transfer Functions
- Unit 3.5 Impulse Response and Convolution

Colophon

- The source code for this page is laplace_transform/index.md.
- You can view the notes for this presentation as a webpage (HTML).
- This page is downloadable as a PDF file.

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