Laplace Transforms and their Applications

About the Laplace Transformation

The Laplace Transformation (named after Pierre-Simon Laplace (http://en.wikipedia.org/wiki/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:

- The Laplace Transformation
- The Inverse Laplace Transform
- Using Laplace Transforms for Circuit Analysis
- Transfer Functions
- Impulse Response and Convolution

Colophon

- The source code for this page is content/laplace_transform/index.md (https://github.com/cpjobling/eg-247-textbook/blob/master/content/laplace_transform/index.md).
- You can view the notes for this presentation as a webpage (HTML (https://cpjobling.github.io/eg-247-textbook/laplace_transform/index.html)).
- This page is downloadable as a PDF (https://cpjobling.github.io/eg-247-textbook/laplace_transform/laplace_transform.pdf) file.