

Laplace ...

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June 30, 2019

(a functional transformation, function \rightarrow function)
(a complex, more specifically, analytic function)
(a generating function, analog with $\int dt$ in place of \sum)
(approximation relations with discrete generating functions, aka “z-transform”).
Digital signal processing implements or is approximately related to analog signal processing.)

(When we relate a continuous to discrete transform, try to relate that to

- The discrete function gives approx. samples of the continuous.
- The analytical properties of the transform affect the form (growth rate) of the functions.

1)

(a formal ratio of an extensor’s Plucker coordinates)
(eigenvalue of eigenvector e^{st} under a differential operator eg $(a\frac{d}{dx}^2 + b\frac{d}{dx} + c)(e^{st}) = (as^2 + bs + c)e^{st}$)
(formal expression for impedances $R, 1/Cs, Ls$)
(linear differential operator $s(f) = \frac{d}{dx}f$)
(deletion/contraction, “capacitor shorts out on high s , inductor opens on low s ” [6])
(characterization of “responses” defined among port variables)
(?? Indicator of a step response)
(asymptotic expansions as $s \rightarrow \infty$ and $s \rightarrow 0$)

More and more

(asymptotic behavior of a generating function’s coefficients, which are the generated function’s values, determined by analytic properties of the generated function. Relate EE, circuits and signals literature to statistical mechanics and combinatorics. [2,3,5])

in [5]: p.287 (Perspective of Ch. IV): analytics: assign values to the generating function’s variable. “Singularities and growth. ... singularities provide essential information on the growth rate of a function’s coefficients. ... “First Principle” relates exponential growth to the location of singularities.”

within $[z^n]F(z) = A^n\Theta(n)$:

- First Principle: Location determines A^n (exponential growth).

- Second Principle: Nature determines the associate subexponential factor $\Theta(n)$.

must relate THIS to all the EE Laplace transform, Bode diagram, etc stuff.

(random generation: [4])

(geometry of phase shifts)

(risetime related to basic topology, graph theory, topology of lumped networks expressed by oriented matroids)

(FUTURE hopefully not too much: Complex oriented matroids of Anderson, et. al. [1])

Fourier series as (1) elements of a group algebra, so group algebra product is Fourier series convolution; (2) linear combination of group characters, which are mutually orthogonal.

References

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