Laboratory report

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1 Objectives

• Understand and plot specific signals: signum, rectangular, triangular, sinc, impulse, step, square, discrete exponential, and discrete cosine. • Use subplots to analyze the relationship between frequencies for discrete cosine and exponential signals. • Calculate inner products of signals and use them to compute energy and power, comparing hand calculations with code results. • State and verify the Cauchy-Schwarz inequality. • Classify systems based on linearity, time-invariance, causality, and stability. • Perform advanced signal operations and analyze their properties

2 Introduction

2.1 Continous and discrete signals

A continuous signal x(t) take a value at every instant of time. A discrete signal [t] is defined only at particular instants of time.

2.2 Periodic and aperiodic

A signal x(t) is said to be periodic if for some positive constant T0 x(t) = x(t +T0) for all t The smallest value of T0 that satisfies the periodicity condition of the equation is the fundamental period of x(t) .A signal is aperiodic if it is not periodic. By definition, a periodic signal x(t) remains unchanged when time-shifted by one period.

2.3 Energy and Power signals

A signal with finite energy is an energy signal, and a signal with finite and nonzero power is a power signal.Power is the time average of energy. Since the averaging is over an infinitely large interval, a signal with finite energy has zero power, and a signal with finite power has infinite energy. Therefore, a signal cannot be both an energy signal and a power signal.

2.4 Even and Odd signals

A signal is called an even function if x(t)=x(-t) or x[n]=x[-n] A signal is called an odd function if x(t)=-x(-t) or x[n]=-x[-n]

2.5 Specific signals