Lab Sheet

IA 3203 – DIGITAL SIGNAL PROCESSING

Department of Instrumentation and Automation Technology
University of Colombo

DSP 301 – Basic Operations on Discrete Time Signals

Exercise:

Consider the original signal given below for answering the Questions 01 and 02;

$x(n) = A \sin(\omega n + \theta)$
where,

$A = 1, \theta = 0$

$\omega = 2\pi f;\ f = \frac{1}{2}$

$0 \leq n \leq 2$

01. Display the above original discrete signal using a stem plot (step size = 0.1).

02. Write an Octave code;
    i. to apply a (time) delay of 0.5 units
    ii. to apply a (time) advance of 2.0 units
    iii. to perform a folding operation (time-reversal along x-axis)
    iv. to perform both a folding operation and a (time) delay of 0.5 units (display the original, folded, and folded+delayed plots)
    v. to perform both a folding operation and a (time) advance of 2.0 units (display the original, folded and folded+advanced plots)
    vi. to apply downscaling (compression): compression factor = 2
    vii. to apply upscaling (expansion): expansion factor = 2
    viii. to apply amplitude upscaling (amplification): amplification factor = 3
    ix. to apply amplitude downscaling (attenuation): attenuation factor = 3

    to/on the discrete signal given above and display the original and resulting signals using stem plots in the same figure.

03. Write an Octave code to add the two discrete signals, y1 and y2 given below and display the original signals and the resulting signal using stem plots in the same figure.
    y1 = sin(x1) where x1 = 0:0.2:2π
    y2 = 0.5×cos(x2 - π/4) where x2 = 0:0.2:2π

04. Write an Octave code to multiply the two discrete signals, y1 and y2 and display the original signals and the resulting signal using stem plots in the same figure.

05. List three (03) applications for each operation: time delay and amplification.