REPORT

Classes: Analog and Digital Electronic Circuits

Presenter: prof. dr hab. inż. Vasyl Martsenyuk

Laboratorium No. 1 Date: 28.10.2023 Topic: „Spectral Analysis of Deterministic Signals" Version 6	Adam Kubliński Informatyka II stopień, niestacjonarne, zaoczne, I semestr, gr. 1A

GitHub Repository:
https://github.com/Adamadacho/Analog_and_Digital_Electronic_Circuits.git

1. Topic of the laboratory

The objective is to use discrete Fourier transform and its implementation with the help of matrix multiplication.

2. Task

Synthesize a discrete-time signal by using the IDFT in matrix notation for different values of N. Show the matrices W and K. Plot the signal synthesized.

6.

$$\mathbf{x}_\mu = [7, 2, 4, 3, 4, 5, 0, 0, 0, 0]^{\mathrm{T}} \tag{22}$$

The code used to solve the task:

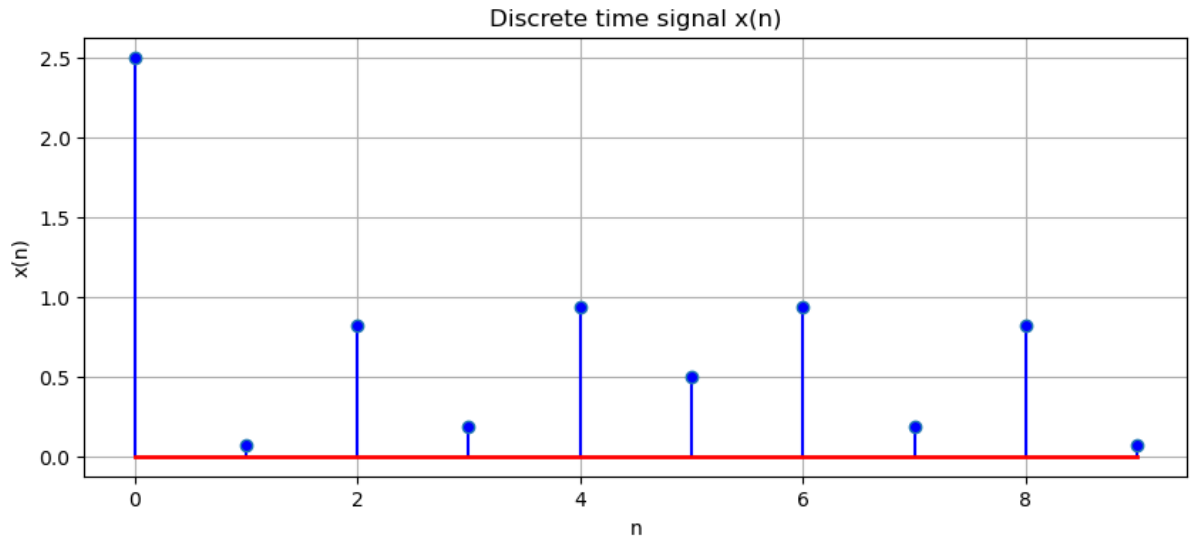
```python
import numpy as np
import matplotlib.pyplot as plt

#Variant 12
N = 10
x_mu = np.array([7, 2, 4, 3, 4, 5, 0, 0, 0, 0])


n = np.arange(N)
x_n = np.zeros(N, dtype=complex)

for k in range(N):
    x_n += (1/N) * x_mu[k] * np.exp(2j * np.pi * k * n / N)

x_n = np.real(x_n)

print(x_n)

plt.figure(figsize=(10, 4))
markerline, stemlines, baseline = plt.stem(n, x_n)
plt.setp(markerline, 'markerfacecolor', 'b')
plt.setp(stemlines, 'color', 'b')
plt.setp(baseline, 'color', 'r', 'linewidth', 2)
plt.title("Discrete time signal x(n)")
plt.xlabel("n")
plt.ylabel("x(n)")
plt.grid(True)
plt.show()
```

Marix of the synthesized discrete-time signal:

[2.5 0.0690983 0.8190983 0.1809017 0.9309017 0.5 0.9309017

0.1809017 0.8190983 0.0690983]

Plot of the synthesized signal:



3. Wnioski

The goal of the laboratory was to obtain a synthesized signal for a selected example using IDFT. Created and implemented code via Jupyther Notebook and obtained both matrix and signal graph.