Green University of Bangladesh
Department of Computer Science and Engineering (CSE)

Faculty of Sciences and Engineering

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Lab Report NO :02

Course Title: Data Communication Lab

Course Code: CSE 308/312 Section: 231_D1

Lab Experiment Name: Create a MatLab Script to plot the selected function and Implement the delta modulation (DM).

Student Details

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Lab Date : 09-03-2025

Submission Date : 06-04-2025

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Lab Report Status

Marks: …… **Signature:.....**

Comments:..... **Date:.....**

1. TITLE OF THE LAB REPORT EXPERIMENT

Create a MatLab Script to plot the selected function and Implement the delta modulation (DM).

2. OBJECTIVES

The objectives of this experiment are :

1. To develop a MATLAB script that allows user input to plot sine or cosine functions.
2. To implement Delta Modulation (DM) on a selected signal.
3. To analyze and compare the original signal with the DM-encoded and reconstructed signal.

3. PROCEDURE

Part 1: Function Plotting

1. Prompt the user to input the desired function (sin or cos).
2. Accept the minimum and maximum range for the x-values.
3. Generate corresponding y-values based on the selected function.
4. Plot the function using MATLAB.

Part 2: Delta Modulation Implementation

1. Define parameters such as amplitude, signal frequency, sampling frequency, and step size (delta).
2. Generate a sine wave based on the given parameters.
3. Implement a loop to compare each sample with the previous estimate.
4. Generate a bitstream where:
    - 1 indicates the signal increased.
    - 0 indicates the signal decreased.
5. Reconstruct the signal from the DM bitstream.
6. Plot and compare the original and reconstructed signals.

4. IMPLEMENTATION

Part 1: MATLAB Code for Plotting sin(x) or cos(x)

```
type = input('Enter sin or cos: ', 's');
min_val = input('Enter the min value of x: ');
max_val = input('Enter the max value of x: ');
x = linspace(min_val, max_val, 1000);
ploting(type, x);


function ploting(Type, x)
    if strcmpi(Type, 'sin')
        y = sin(x);
        plot(x, y, 'b', "LineWidth", 2);
```

```
        title("fllot of sin(x)');
    elseif strcmpi(Type, 'cos')
        y = cos(x);
        plot(x, y, 'r', "LineWidth", 2);
        title("fllot of cos(x)');
    else
        error('Invalid input!');
    end xlabel('x');
    ylabel('Function Value');
    grid on;
    axis tight;

end
```

Part 2: MATLAB Code for Delta Modulation (DM)

```
a = 2;
fm = 1000;
T = 1 / fm;
fs = (2 * 1000) * 20;
ts = 1 / fs;
t = 0:ts:T;
x = a * sin(2 * pi * fm * t);
l = length(x);
del = 0.2;
y(1) = 0;

for i = 1:l
    if x(i) > y(i)
        d(i) = 1;
        y(i+1) = y(i) + del;
    else
        d(i) = 0;
        y(i+1) = y(i) - del;
    end
end

plot(x, 'k'); % Original signal
hold on;
stairs(y, 'r'); % Reconstructed signal
legend("Original Signal', 'Delta Modulated Output");
title('Delta Modulation Implementation");
xlabel("Sample Index');
ylabel("Amplitude");
```

```
grid on;
```

5. TEST RESULT

1. Function Plotting Outputs:

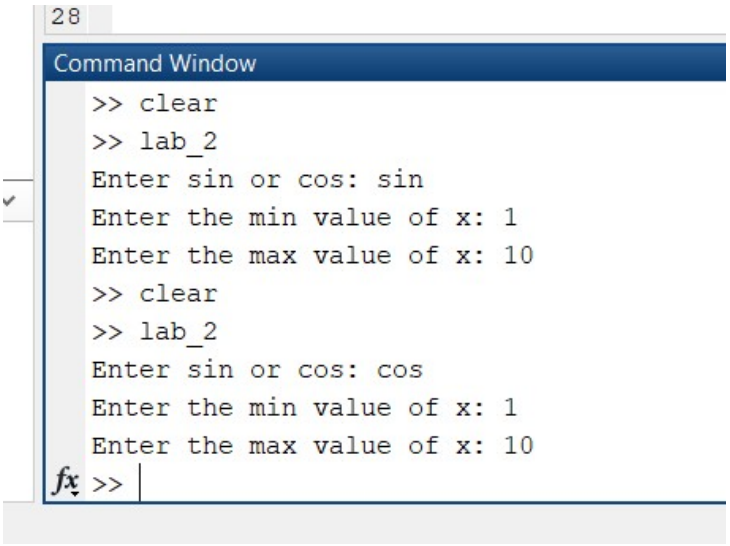

Figure 1:Inserting data for sin and cos

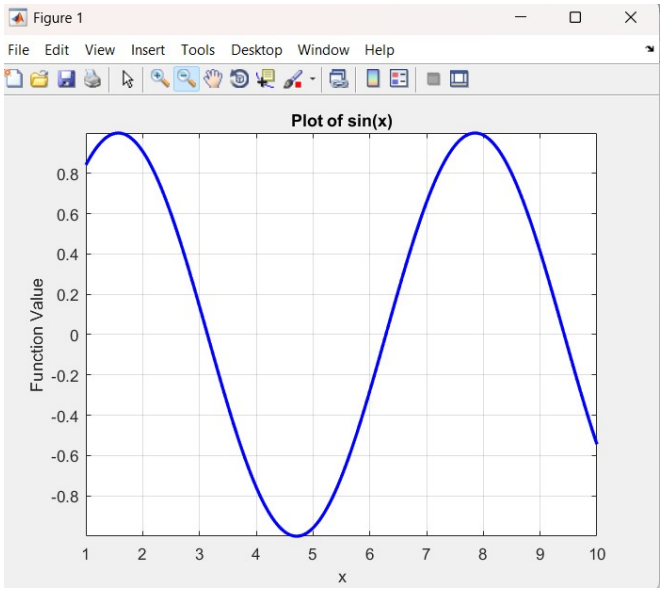

Figure 2:- Sine wave

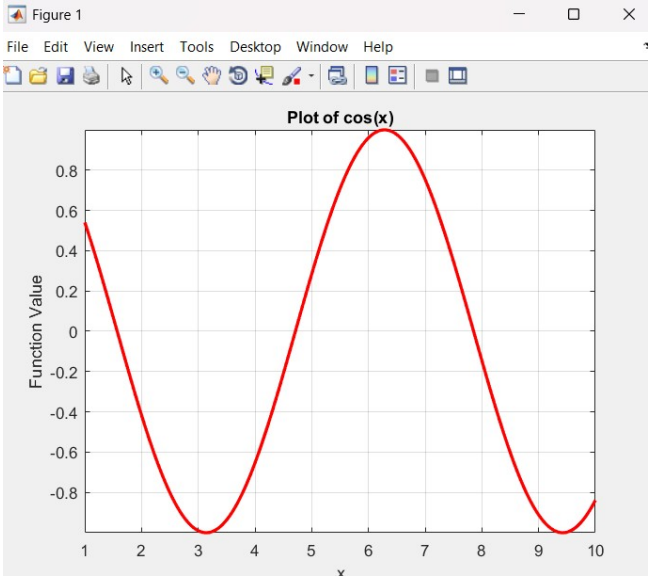

Figure 3:-Cosine wave

2. **Delta Modulation Output:**

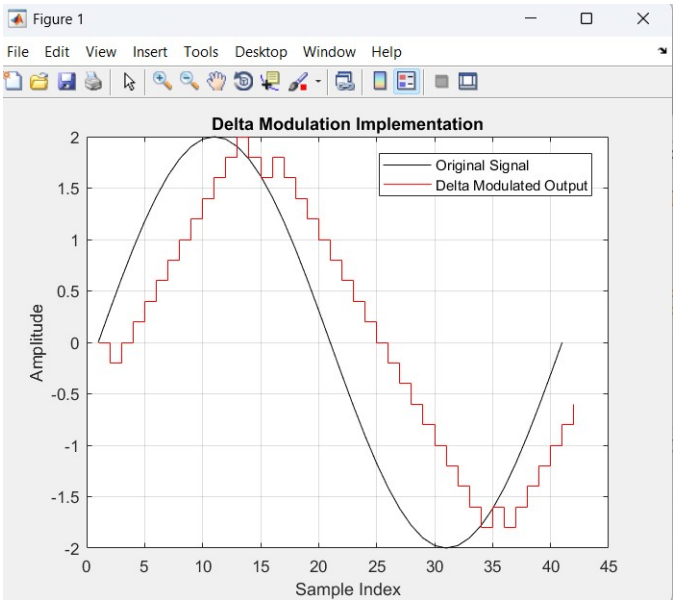

Figure 4:-Delta Modulation

6. ANALYSIS AND DISCUSSION

The lab successfully demonstrates two key concepts in signal processing:

1. **Function Visualization:**
    - MATLAB's plotting capabilities allow dynamic visualization of mathematical functions based on user input.

- The interactive aspect enhances understanding of waveform properties and their behavior over different ranges.

2. **Delta Modulation (DM):**
    - DM is a simplified encoding technique where only changes in signal amplitude are transmitted.
    - The fixed step size (delta) creates a staircase approximation of the signal.
    - A smaller delta increases fidelity but may introduce granular noise, while a larger delta may cause slope overload during rapid signal transitions.
    - The reconstructed signal lags slightly due to its dependence on previous values.

7. SUMMARY

This lab effectively combined mathematical signal visualization with a practical encoding method used in communication. By plotting sine and cosine functions and implementing Delta Modulation, we gained hands-on insight into signal behavior, transmission, and reconstruction. This foundation is critical for understanding more advanced modulation and coding techniques used in modern digital systems.