

Report on Matlab projects (SEC 101)

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1 Project 1: Random Walk Simulator

Problem Statement

This project aims to simulate a 2D random walk. The program generates 200 random movements in the X and Y directions, calculates the cumulative path, and visualizes the complete motion. This helps illustrate the concept of randomness and basic plotting in MATLAB.

MATLAB Code

```
% RANDOM WALK SIMULATOR
steps = 200;
moves = randi([-1 1], steps, 2); % random steps
path = cumsum(moves);           % cumulative motion

figure;
plot(path(:,1), path(:,2), 'LineWidth', 2);
title('2D Random Walk Simulator');
xlabel('X Position');
ylabel('Y Position');
axis equal;
```

Output

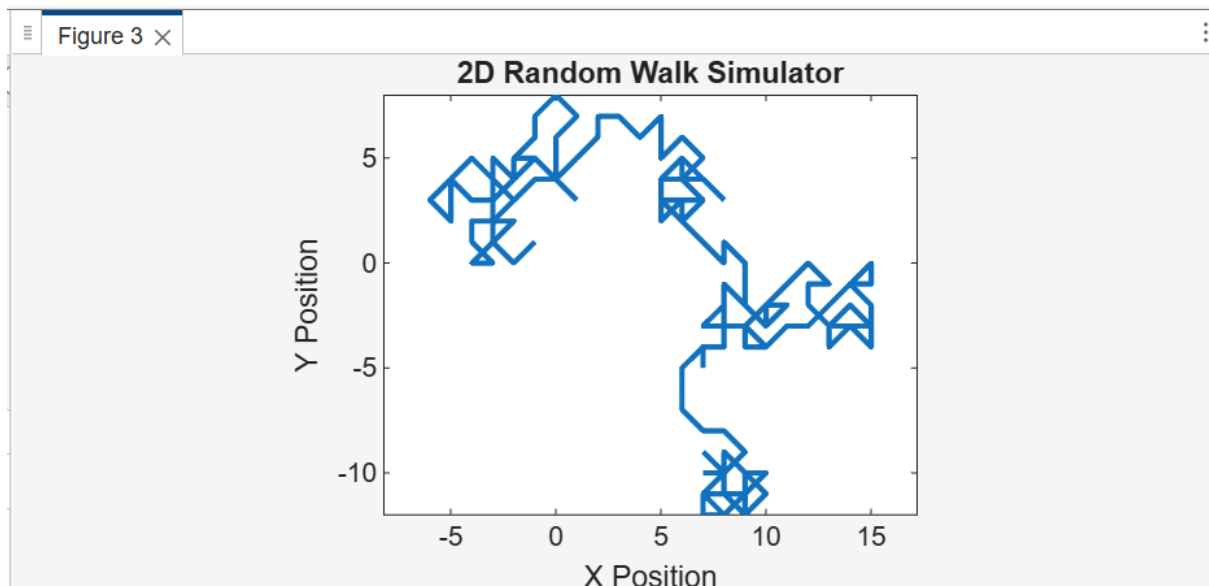


Figure 1: Random Walk Output

2 Project 2: Guess the Number Game

Problem Statement

The objective of this project is to create an interactive guessing game. MATLAB randomly selects a number between 1 and 50. The user repeatedly enters guesses and receives hints whether the guess is too high, too low, or correct. This project demonstrates loops, conditionals, user input, and interaction.

MATLAB Code

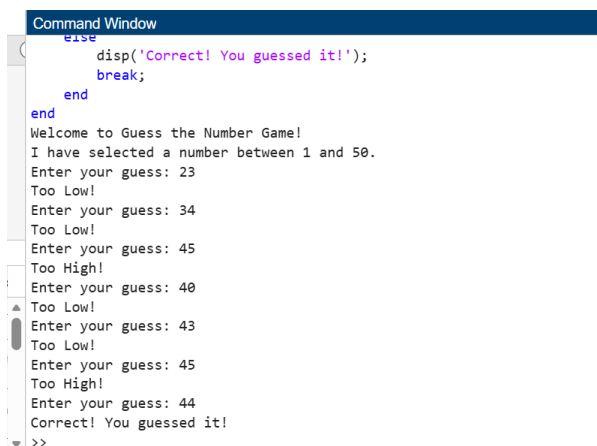
```
% GUESS THE NUMBER GAME
target = randi([1 50]); % picks a number
guess = -1;

disp('Welcome to Guess the Number Game!');
disp('I have selected a number between 1 and 50. ');

while guess ~= target
    guess = input('Enter your guess: ');

    if guess > target
        disp('Too High!');
    elseif guess < target
        disp('Too Low!');
    else
        disp('Correct! You guessed it!');
    end
end
```

Output



```
Command Window
>>
disp('Correct! You guessed it!');
break;
end
end
Welcome to Guess the Number Game!
I have selected a number between 1 and 50.
Enter your guess: 23
Too Low!
Enter your guess: 34
Too Low!
Enter your guess: 45
Too High!
Enter your guess: 40
Too Low!
Enter your guess: 43
Too Low!
Enter your guess: 45
Too High!
Enter your guess: 44
Correct! You guessed it!
>>
```

Figure 2: User guesses on console

3 Project 3: Voice Changer

Problem Statement

This project demonstrates basic signal processing concepts using MATLAB's built-in audio file `handel.mat`. The program plays the audio once, then allows the user to select from different playback modes including **fast**, **slow**, and **echo effects**. Based on user choice, the sampling rate is modified or an echo filter is applied. This helps understand signal processing.

MATLAB Code

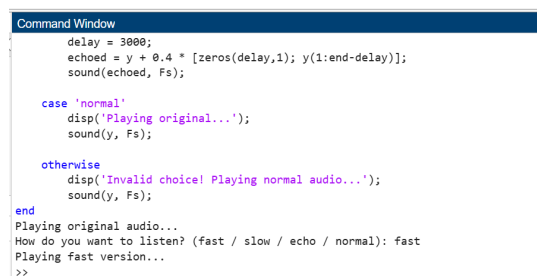
```
% INTERACTIVE VOICE CHANGER
load handel.mat % loads 'y' and 'Fs'

disp('Playing original audio...');
sound(y, Fs);
pause(4);

choice = lower(input('How do you want to listen? (fast / slow / \
echo / normal): ', 's'));

switch choice
    case 'fast'
        sound(y, Fs * 1.5);
    case 'slow'
        sound(y, Fs * 0.7);
    case 'echo'
        delay = 3000;
        echoed = y + 0.4 * [zeros(delay,1); y(1:end-delay)];
        sound(echoed, Fs);
    otherwise
        sound(y, Fs);
end
```

Output



```
Command Window
delay = 3000;
echoed = y + 0.4 * [zeros(delay,1); y(1:end-delay)];
sound(echoed, Fs);

case 'normal'
disp('Playing original...');
sound(y, Fs);

otherwise
disp('Invalid choice! Playing normal audio...');
sound(y, Fs);
end
Playing original audio...
How do you want to listen? (fast / slow / echo / normal): fast
Playing fast version...
>>
```

Figure 3: Modified sound playing

4 Project 4: Two Images Merger

Problem Statement

This project focuses on image blending using MATLAB's image processing tools. Two built-in sample images (`peppers.png` and `saturn.png`) are loaded, resized to identical dimensions, converted to double precision, and blended using pixel-wise averaging. The final output combines features of both images, demonstrating how images are stored as matrices and manipulated numerically.

MATLAB Code

```
% TWO IMAGES MERGER

img1 = imread('peppers.png');    % Image 1
img2 = imread('saturn.png');     % Image 2

img2 = imresize(img2, [size(img1,1), size(img1,2)]);

A = im2double(img1);
B = im2double(img2);
merged = (A + B) / 2;

figure;

subplot(1,3,1); imshow(img1); title('Image_1');
subplot(1,3,2); imshow(img2); title('Image_2');
subplot(1,3,3); imshow(merged); title('Merged_Output');
```

Output

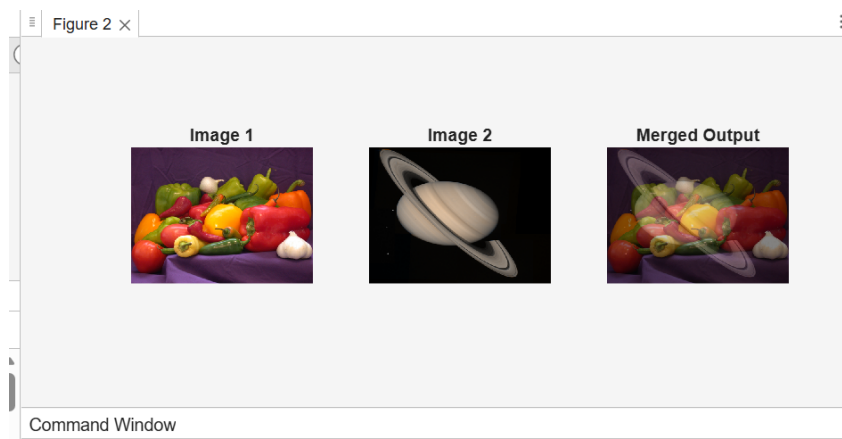


Figure 4: Merged Image Output

5 Conclusion

This report demonstrates four MATLAB applications covering plotting, logic building, digital audio manipulation, and image blending. Each project uses fundamental programming concepts and MATLAB topics specified in the course syllabus.