EXPERIMENT—6
Discrete_Wavelet_Transform_Watermarking

by- Divya Patle(BT22ECE025)

```
clc; clear; close all;

% Load Original Image
img = imread('lena.png');  % Change this to your image file
if size(img,3)==3
    img = rgb2gray(img);
end

% Load Watermark Image (Must be smaller than original)
watermark = imread('watermark.png');  % Your custom watermark
if size(watermark,3)==3
    watermark = rgb2gray(watermark);
end
watermark = imresize(watermark, size(img)/2); % Resize to fit DWT subbands

% Apply DWT to Original Image
[LL, LH, HL, HH] = dwt2(double(img), 'haar');

% Embed Watermark in High-Frequency Subband (HH)
alpha = 0.1; % Strength of watermark
HH_watermarked = HH + alpha * double(watermark);

% Reconstruct Watermarked Image
img_watermarked = idwt2(LL, LH, HL, HH_watermarked, 'haar');
img_watermarked = uint8(img_watermarked);

% Save and Display Watermarked Image
imwrite(img_watermarked, 'watermarked_image.png');
figure;
subplot(1,3,1); imshow(img); title('Original Image');
subplot(1,3,2); imshow(img_watermarked); title('Watermarked Image');
subplot(1,3,3); imshow(watermark, []); title('Watermark');
```

```
% ------------------- Watermark Removal -------------------

% Apply DWT to Watermarked Image
[LL2, LH2, HL2, HH2] = dwt2(double(img_watermarked), 'haar');

% Remove Watermark by Nullifying HH
HH2_cleaned = HH2 - alpha * double(watermark);

% Reconstruct Image
img_cleaned = idwt2(LL2, LH2, HL2, HH2_cleaned, 'haar');
img_cleaned = uint8(img_cleaned);

% Save and Display Results
imwrite(img_cleaned, 'watermark_removed.png');
figure;
subplot(1,3,1); imshow(img_watermarked); title('Watermarked Image');
subplot(1,3,2); imshow(HH2_cleaned, []); title('HH after Removal');
subplot(1,3,3); imshow(img_cleaned); title('Watermark Removed');
```

With watermark

watermark_removed