

Experiment No.7

Code:-

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% Parameters

SNR_dB = 0:5:30; % SNR values in dB (0, 5, 10, ..., 30)

SNR = 10.^(SNR_dB/10); % Convert SNR from dB to linear scale

num_SNR = length(SNR); % Number of SNR points

% MIMO system sizes (2x2, 4x4, 8x8)

MIMO_systems = [2, 4, 8];

num_systems = length(MIMO_systems);

% Pre-allocate capacity matrix

Capacity = zeros(num_systems, num_SNR);

% Loop over different MIMO systems

for sys = 1:num_systems

    Nt = MIMO_systems(sys); % Number of transmit antennas

    Nr = Nt; % Assume same number of receive antennas (Nt x Nt)

    H = (1/sqrt(2)) * (randn(Nr, Nt) + 1j*randn(Nr, Nt)); % Random MIMO channel matrix

    for i = 1:num_SNR

        % Capacity calculation using the MIMO capacity formula

        C = log2(det(eye(Nr) + (SNR(i)/Nt) * (H * H')));

        Capacity(sys, i) = C;

    end

end

end
```

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% Plotting

figure;

hold on;

for sys = 1:num_systems

    plot(SNR_dB, Capacity(sys, :), '-o', 'DisplayName', sprintf('%dx%d MIMO',
        MIMO_systems(sys), MIMO_systems(sys)));

end

xlabel('SNR (dB)');

ylabel('Channel Capacity (bits/sec/Hz)');

title('MIMO Channel Capacity vs SNR');

legend('show');

grid on;

hold off;

```

Output:-



