BIRZEIT UNIVERSITY
Electrical & Computer Engineering Department
Communication Systems
Project

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Project Title: Design and Simulate ASK, FSK, PSK, and QPSK Modulation Systems in Simulink

Objective: The objective of this project is to gain hands-on experience in designing and simulating digital modulation techniques, including Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Quadrature Phase Shift Keying (QPSK) using MATLAB Simulink.

Instructions:

1. Introduction

- Provide a brief introduction to digital modulation techniques, including ASK, FSK, PSK, and QPSK.
- Explain the importance of modulation in digital communication systems.

2. Simulink Model Setup

- Create a new Simulink model.
- Set up the simulation parameters (e.g., sample time, simulation duration).

3. ASK Modulation

- Add an ASK modulation block to the Simulink model.
- Configure the ASK modulation parameters (e.g., carrier frequency, modulation index).
- Connect the ASK modulator to a random data source.

4. FSK Modulation

- Add an FSK modulation block to the Simulink model.
- Configure the FSK modulation parameters (e.g., carrier frequencies for 0 and 1).
- Connect the FSK modulator to the same random data source as ASK.

5. PSK Modulation

- Add a PSK modulation block to the Simulink model.
- Configure the PSK modulation parameters (e.g., phase offsets for 0 and 1).
- Connect the PSK modulator to the same random data source as ASK and FSK.

6. QPSK Modulation

- Add a QPSK modulation block to the Simulink model.
- Connect the QPSK modulator to the same random data source as ASK, FSK, and PSK.

7. Channel Modeling

- Add a channel block to simulate the communication channel.
- Optionally, introduce noise or other impairments in the channel.

8. Demodulation

- Add corresponding ASK, FSK, PSK, and QPSK demodulation blocks to the Simulink model.
- Connect the demodulators to the output of the channel block.

9. Data Recovery

- Add data decision blocks for each modulation scheme to recover the digital data from the demodulated signal.
- Connect the data decision blocks to the outputs of the respective demodulators.

10. Simulation and Analysis

- Configure simulation parameters (e.g., signal-to-noise ratio, modulation index).
- Run the simulation and observe the results.
- Calculate and analyze the Bit Error Rate (BER) for each modulation scheme.
- Compare the performance of ASK, FSK, PSK, and QPSK under different channel conditions.

11. Conclusion and Report

- Summarize the findings and observations from the simulation.
- Provide conclusions regarding the performance of ASK, FSK, PSK, and QPSK modulation techniques.
- Include plots, graphs, and explanations in your report.

12. Presentation

- Present your findings and results to the class.