Al-Imam Mohammad ibn Saud Islamic University

College of Computer and Information Sciences

Computer Science Department

**Digital image processing  
  
Assignment #1**

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**INTRODUCTION**

Image enhancement techniques are essential for improving the quality and interpretability of visual data, especially in applications requiring clarity and detail. Spatial domain enhancements involve directly manipulating pixel values to improve image quality, such as adjusting contrast or reducing noise. Frequency domain enhancements, on the other hand, operate on the frequency components of an image, enabling targeted modifications like smoothing or sharpening by filtering specific frequency ranges.

For this assignment, I selected a dataset of commercial airplane images due to their clear structural features and diverse visual elements, such as smooth surfaces, distinct edges, and varying lighting conditions. These characteristics make them ideal for evaluating the effectiveness of enhancement techniques.

The techniques applied include histogram equalization to improve contrast, spatial filtering for smoothing and sharpening, and Fourier-based low-pass and high-pass filtering to manipulate frequency components for noise reduction and edge enhancement. These methods aim to comprehensively assess both spatial and frequency domain approaches.

**METHODOLOGY**