BERR 4723 DIGITAL IMAGE PROCESSING

Group 16 – KANG CHIAW NA, WAN SYAHIRAH AKMAL, SITI SHAFAWATIH, AMIR AFZAL

PROJECT TOPIC SELECTION:

Object Removal System: Remove Unwanted Objects from Images Using Digital Image Processing

PROBLEM STATEMENT:

In photography and digital media, unwanted objects often appear in images, such as a passerby in a scenic photo, a stray mark on a scanned document, or an old watermark. These elements can distract from the subject of the image, reduce its aesthetic value, or impede its professional use. Current solutions, such as manual editing tools in software like Photoshop, require significant expertise and time, making them inaccessible to non-professional users.

There is a need for a straightforward and efficient system that allows users to remove unwanted objects from images with minimal effort, while preserving the quality and continuity of the surrounding content. The system will integrate multiple image processing techniques, including enhancement, segmentation, geometric transformations, and restoration, to offer a semi-automated solution that is accessible to everyday users.

This project aims to develop such a system, allowing users to input an image, select the unwanted object manually, and receive a processed output where the object is seamlessly removed. This tool would be useful in scenarios ranging from personal photo editing to professional content preparation, offering a practical and time-saving solution to a common problem.

TECHNIQUES:

1. Image Enhancement

To improve the quality and visibility of the image by adjusting contrast, brightness, or other features. This step is critical as a pre-processing stage to ensure other techniques work effectively. Before removing an object, improving image brightness helps ensure that the boundaries of the object are clearly defined.

Example: Apply histogram equalization to improve image brightness. Enhancing edges and textures to make segmentation more precise.

1. Image Segmentation

To divide an image into meaningful regions, such as separating the object to be removed from the background. Isolating the object ensures only the unwanted region is processed while preserving the rest of the image.

Example: Using thresholding to create a binary mask of the object to be removed, marking it as a region for editing. Edge detection to outline the object for accurate removal.

1. Geometric Transformations

To modify the image geometry by shifting, scaling, or rotating regions of the image. This is useful for filling gaps left by removed objects. After removing an object, shifting adjacent regions to cover the removed space helps maintain a natural look.

Example: Shifting nearby pixels to fill the gap after removing an object. Aligning or resizing portions of the image to restore continuity.

1. Image Restoration

To refine and enhance the image by smoothing out imperfections caused by object removal. This step ensures that the edited area blends seamlessly with the rest of the image. This technique polishes the filled region, ensuring it looks as natural as the original image.

Example: Applying a Gaussian blur or median filtering to smooth the transition between the edited region and the rest of the image.