Experiment 2: Image Transformations for Image Enhancement

Aim

To implement various image transformation techniques for image enhancement such as:

- Image Negative
- Contrast Stretching
- Bit Plane Slicing
- Gray Level Slicing

Software Required

- Python
- OpenCV
- NumPy
- Matplotlib

1. Image Negative

Theory

Image negative transformation enhances white or gray details in dark regions. For an 8-bit grayscale image, the transformation is given by:

$$s = 255 - r$$

where r is the input pixel value and s is the output pixel value.

2. Contrast Stretching

Theory

Contrast stretching improves image visibility by expanding the range of intensity values.

$$s = \frac{(r - r_{min})}{(r_{max} - r_{min})} \times 255$$

3. Bit Plane Slicing

Theory

Bit plane slicing decomposes an image into its binary components, highlighting the importance of each bit in image formation.

4. Gray Level Slicing

Theory

Gray level slicing highlights a specific range of gray levels in an image. It can be performed with or without suppressing the background.

Result

Thus, various image transformation techniques such as Image Negative, Contrast Stretching, Bit Plane Slicing, and Gray Level Slicing were successfully implemented and analyzed for image enhancement.