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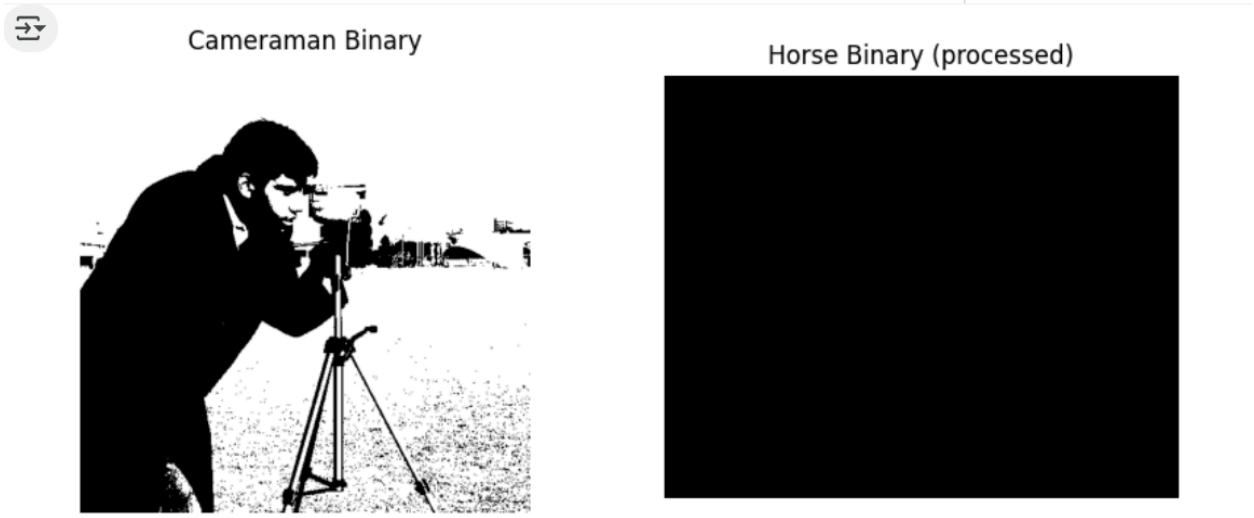
Assignment :01

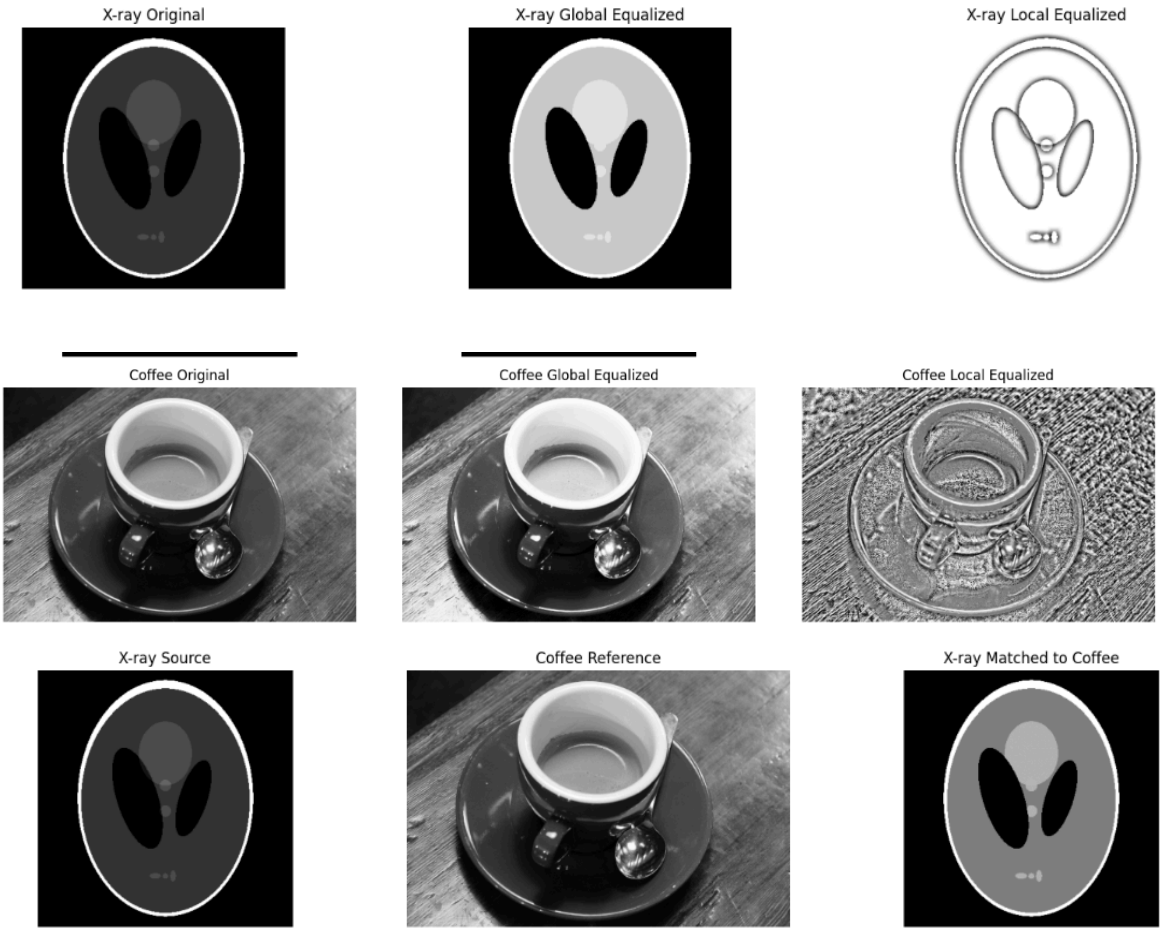
Q1:

Manual thresholding and binary image connectivity were implemented using BFS and neighbor functions. Connectivity types—4-adjacency, 8-adjacency, and m-adjacency—were tested on the *Cameraman* and *Horse* images. All three types showed connectivity between selected points, with 4-adjacency being strict, 8-adjacency more permissive (potentially allowing false links), and m-adjacency balancing the two. This demonstrates how different adjacency definitions influence connected component analysis. The manual queue and thresholding implementations also provide insight into low-level image processing logic without relying on high-level libraries.



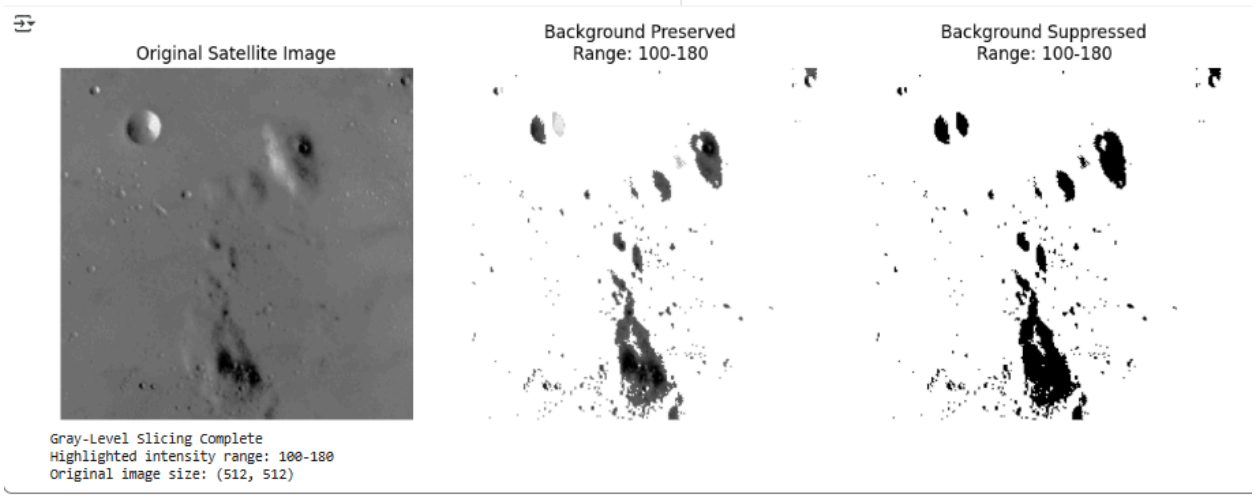
Q3:

Histogram-based techniques were implemented manually, including histogram computation, PDF, CDF, global histogram equalization, local histogram equalization (window-based), and histogram specification (matching). These were applied on *chest_xray.png* and *coffee.png* to enhance contrast and match histogram distributions. The exercises show how histogram manipulations can improve visual perception and detail in images. Manual calculation of CDF and mapping helps understand the foundation of histogram-based image enhancement.



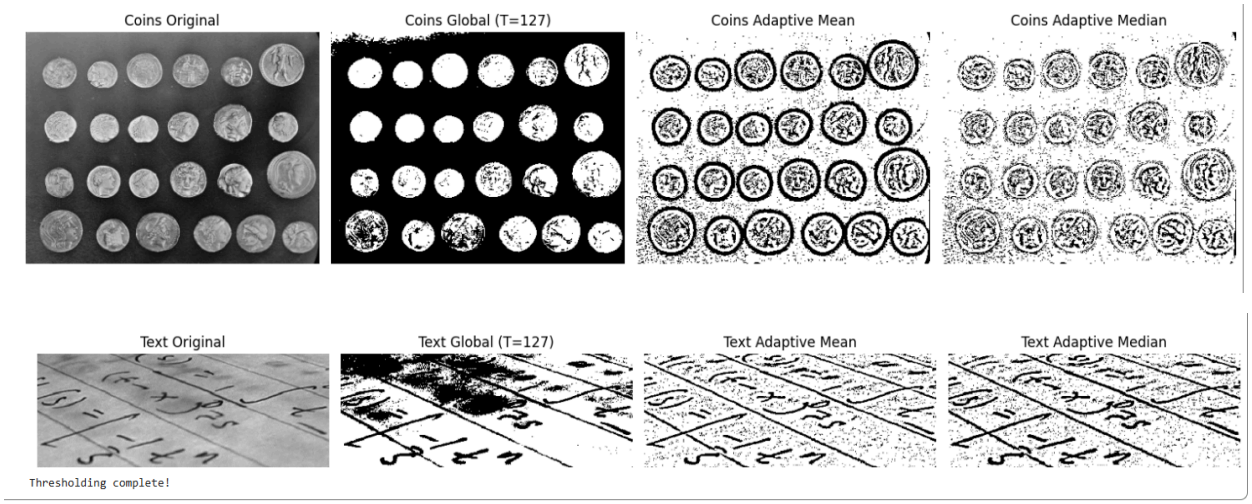
Q4:

Gray-level slicing was implemented in two ways: (1) preserving the background and (2) suppressing the background. Specific intensity ranges (100–180) were highlighted while either preserving or suppressing other pixel values. This technique allows selective enhancement of features of interest in an image. Applying it to *satellite.png* showed how feature extraction can emphasize specific land or object intensity ranges for analysis.



Q5:

Thresholding techniques were implemented manually: global thresholding, adaptive thresholding using local mean, and adaptive thresholding using local median. These methods were applied to *coins.png* and *text.png*, showing how local vs. global thresholds affect binary image segmentation. Adaptive methods improved segmentation in regions with non-uniform illumination. The comparison illustrates the importance of choosing appropriate thresholding methods for different image types.



Q2:

Point processing techniques were implemented manually: logarithmic transformation, gamma (power-law) transformation, and piecewise linear contrast stretching. *Coins.png* was processed with log transform and contrast stretching, while *Astronaut.png* was enhanced using gamma values 0.4, 1.5, and 2.5 to improve dark, bright, and overall contrast. The results illustrate how intensity transformations can enhance details in both dark and bright regions. Manual

implementations reinforced understanding of pixel-level operations and nonlinear transformations.