



Image segmentation by threshold technique

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Image segmentation by threshold technique involves setting a pixel value threshold to classify pixels as foreground or background, simplifying segmentation based on intensity values.

Select an initial estimate for T . Segment the image using T . This will produce two groups of pixels: G_1 consisting of all pixels with gray level values $>T$ and G_2 consisting of pixels with values $\leq T$. Compute the average gray level values μ_1 and μ_2 for the pixels in regions G_1 and G_2 .

Compute a new threshold value:

$$T = \frac{1}{2}(\mu_1 + \mu_2).$$

Repeat steps 2 through 4 until the difference in T in successive iterations is smaller than a predefined parameter T_e .

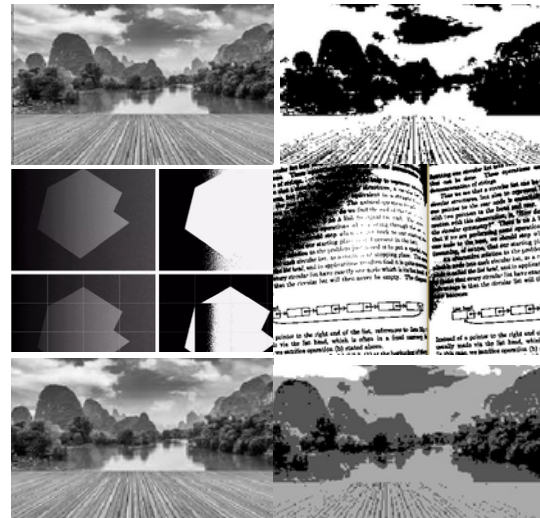
1. Global Thresholding: Applies a single threshold value to the entire image, categorizing pixels as foreground or background based on their intensity..

$$g(x, y) = \begin{cases} 1 & \text{if } f(x, y) > T \\ 0 & \text{if } f(x, y) \leq T \end{cases}$$

2. Variable Thresholding: Utilizes adaptive or locally determined thresholds based on the intensity distribution in small image regions.

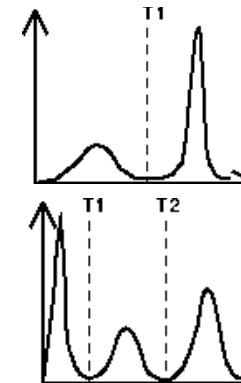
$$g(x, y) = \begin{cases} a & \text{if } T_1 < f(x, y) \leq T_2 \\ b & \text{if } f(x, y) > T_2 \\ c & \text{if } f(x, y) \leq T_1 \end{cases}$$

3. Multiple Thresholding: Involves using multiple threshold values to classify pixels into multiple classes or regions.



Applications:

Object Detection and Recognition, Segmentation of Medical Images, Document Image Analysis, Biometric Identification, Quality Control in Manufacturing, Satellite and Remote Sensing, Forensic Analysis, Traffic Monitoring and Management



Drawbacks:

Sensitivity to Noise, Lack of Adaptability to Varying Illumination, Difficulty in Choosing Optimal Threshold, Inability to Handle Complex Backgrounds, Insufficient for Images with Gradual Intensity Transitions, Poor Performance on Images with Overlapping Intensity Distributions, Manual Selection of Thresholds Required.