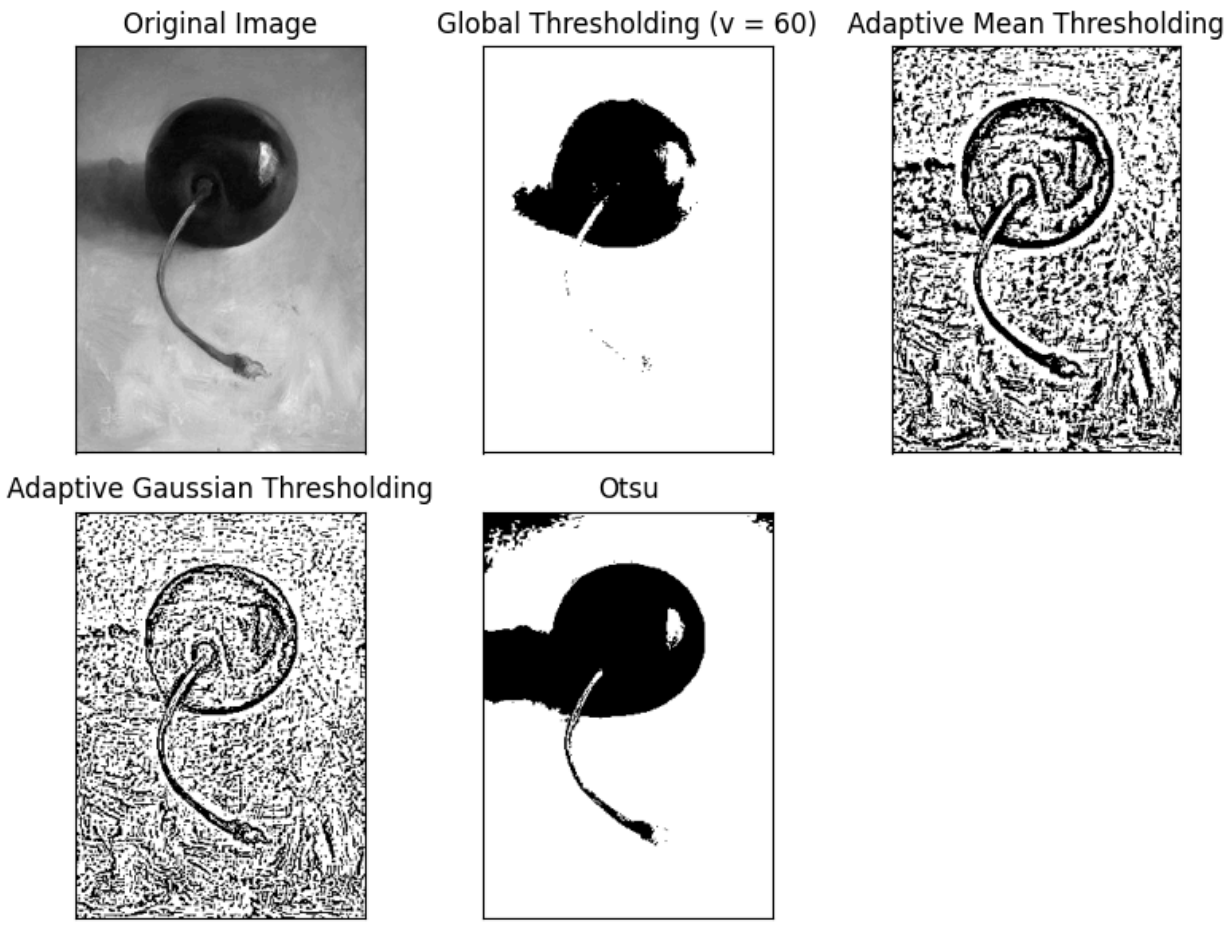
Image Processing for Computer Vision
Session 6

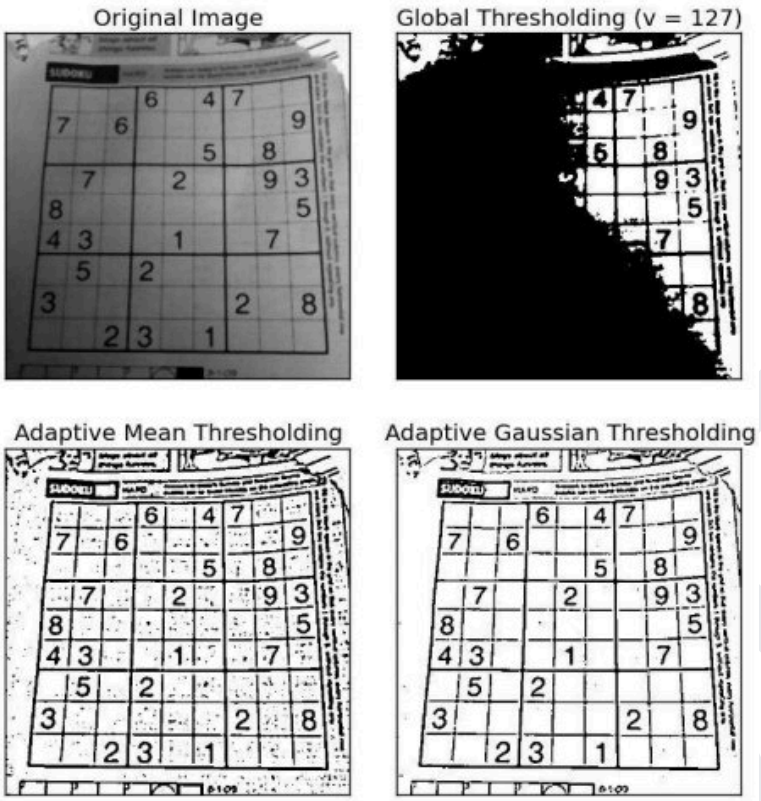
Adaptive and Otsu’s Thresholding



Topics

- Adaptive Thresholding
- Otsu’s Thresholding

Adaptive Thresholding:



OpenCV

- determines the threshold for a pixel based on a small region around it.
- different thresholds for different regions of the same image
- gives better results for images with varying illumination.

Syntax:

cv.adaptiveThreshold(input_img, maxValue, adaptiveMethod, thresholdType, blockSize, C)

- The **adaptiveMethod** decides how the threshold value is calculated
- **blockSize** determines the size of the neighbourhood area
- **C** is a constant that is subtracted from the mean or weighted sum of the neighbourhood pixels.

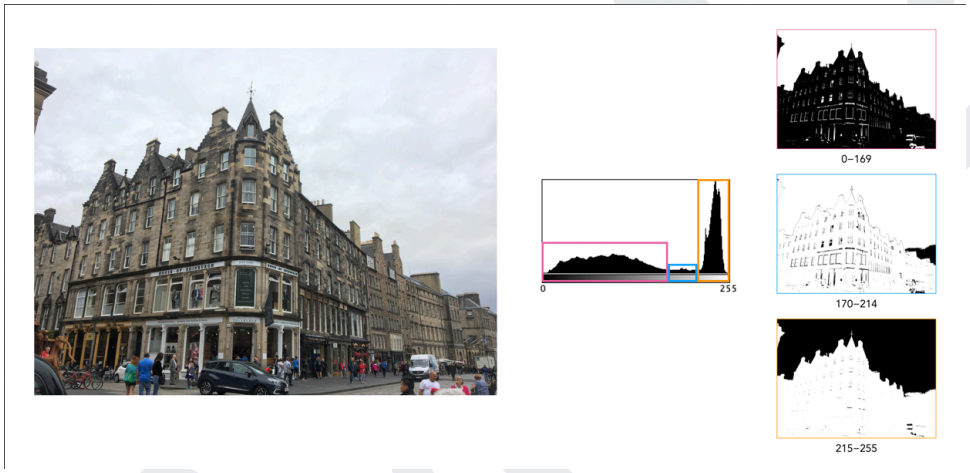
cv.ADAPTIVE_THRESH_MEAN_C: The threshold value is the mean of the neighbourhood area minus the constant **C**.

cv.ADAPTIVE_THRESH_GAUSSIAN_C: The threshold value is a gaussian-weighted sum of the neighbourhood values minus the constant **C**.

$$G(x, y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2 + y^2}{2\sigma^2}}$$

- (x, y) are the coordinates of a pixel relative to the center of the neighborhood.
- sigma is the standard deviation, which controls the spread of the Gaussian function.

Otsu's Binarization:



pixelcraft

The right peak is associated with the overcast sky (and white van). The left shallow mound comprising both midtones and shadows makes up most of the remaining image content.

- Otsu's method avoids having to choose a value and determines it **automatically**.
- Otsu's method determines an optimal global threshold value from the image histogram.
- The **result of the process is a binary image**, where each pixel is assigned one of two possible values.
- Otsu's method was introduced by Nobuyuki Otsu in 1979

Syntax: Almost same as the global thresholding

cv2.threshold(input_img, arbitary_threshold, max_val, thresh_method + cv2.THRESH_OTSU)

- cv.THRESH_OTSU is passed as an extra flag
- The threshold value can be chosen arbitrarily.

The **algorithm then finds the optimal threshold value** which is returned as the first output.