



讲师：贾志刚

# OpenCV4 图像处理与视频分析教程



# 全局阈值

- 全局阈值概述
- OTSU阈值
- 三角阈值
- 代码演示

# 全局阈值概述

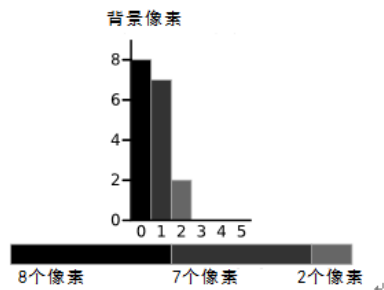
- 图像二值化分割，最重要的就是计算阈值
- 阈值计算算法很多，基本分为两类，全局阈值与自适应阈值
- OTSU
- Triangle

# 全局分割方法

- 均值法
- OTSU
- 三角法(Triangle)

$$m = \frac{\sum_{i=0}^h \sum_{j=0}^w p(i, j)}{w * h} \quad p(i, j) = \begin{cases} \geq m & 255 \\ < m & 0 \end{cases}$$

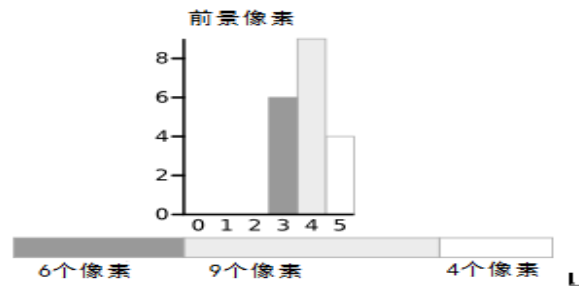
# OTSU 解释



$$\text{比重 } W_b = \frac{8+7+2}{36} = 0.4722$$

$$\text{平均值 } \mu_b = \frac{(0 \times 8) + (1 \times 7) + (2 \times 2)}{17} = 0.6471$$

$$\begin{aligned} \sigma_b^2 &= \frac{((0-0.6471)^2 \times 8) + ((1-0.6471)^2 \times 7) + ((2-0.6471)^2 \times 2)}{17} \\ \text{方差} &= \frac{(0.4187 \times 8) + (0.1246 \times 7) + (1.8304 \times 2)}{17} = 0.4637 \end{aligned}$$



$$\text{比重 } W_f = \frac{6+9+4}{36} = 0.5278$$

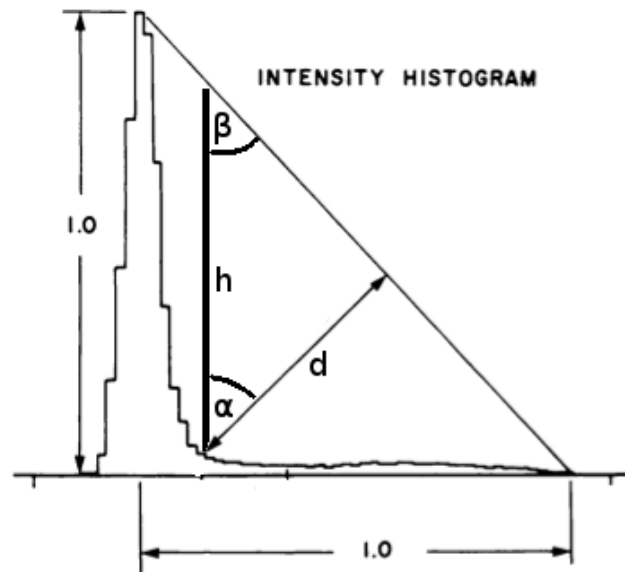
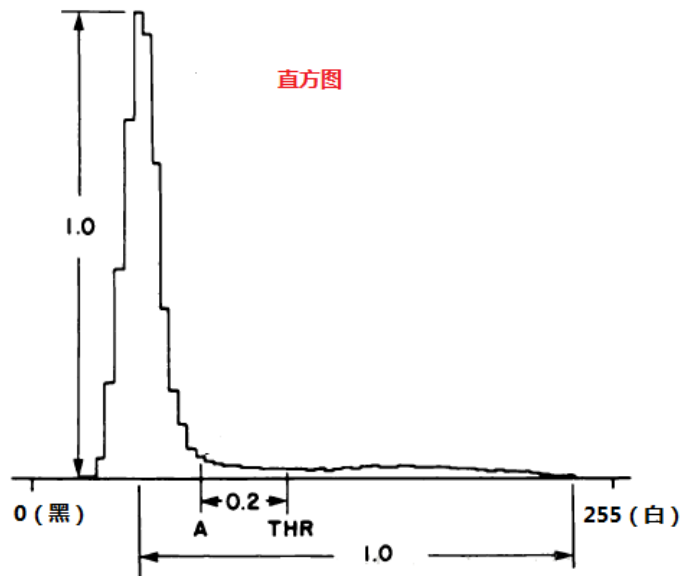
$$\text{平均值 } \mu_f = \frac{(3 \times 6) + (4 \times 9) + (5 \times 4)}{19} = 3.8947$$

$$\begin{aligned} \sigma_f^2 &= \frac{((3-3.8947)^2 \times 6) + ((4-3.8947)^2 \times 9) + ((5-3.8947)^2 \times 4)}{19} \\ \text{方差} &= \frac{(4.8033 \times 6) + (0.0997 \times 9) + (4.8864 \times 4)}{19} = 0.5152 \end{aligned}$$

然后使用上述计算结果，计算类内方差：

$$\sigma_w^2 = W_b \sigma_b^2 + W_f \sigma_f^2 = 0.4722 \times 0.4637 + 0.5278 \times 0.5152 = 0.4909$$

# 三角法



$$h^2 = d^2 + d^2 \Leftrightarrow d = \sqrt{\frac{h^2}{2}}$$

$$d = \sin(0.7854) * h$$

## API 层面知识点与演示

- THRESH\_OTSU → `ret, binary = cv.threshold(gray, 0, 255, cv.THRESH_BINARY | cv.THRESH_OTSU)`
- THRESH\_TRIANGLE → `ret, binary = cv.threshold(gray, 0, 255, cv.THRESH_BINARY | cv.THRESH_TRIANGLE)`



# Thank You !