OpenCV4 图像处理与视频分析教程

轮廓匹配

- 图像几何矩与Hu矩
- 代码演示

图像几何矩与Hu矩

- 几何矩计算
- Hu矩计算与不变性

$$m_{p,q}=\sum_{x=0}^{M-1}\sum_{y=0}^{N-1}f(x,y)x^p y^q$$

$$\mu_{p,q}=\sum_{x=0}^{M-1}\sum_{y=0}^{N-1}f(x,y)(x-x_{avg})^p(y-y_{avg})^q$$

$$x_{avg}=\frac{m_{10}}{m_{00}}\quad\text{and}\quad y_{avg}=\frac{m_{01}}{m_{00}}\qquad \eta_{p,q}=\frac{\mu_{p,q}}{m_{00}^{\frac{p+q}{2}+1}}$$

$$\phi_1=\eta_{20}+\eta_{02}$$

$$\phi_2=(\eta_{20}-\eta_{02})^2+4\eta_{11}^2$$

$$\phi_3=(\eta_{30}-3\eta_{12})^2+(3\eta_{21}-\mu_{03})^2$$

$$\phi_4=(\eta_{30}+\eta_{12})^2+(\eta_{21}+\mu_{03})^2$$

$$\phi_5=(\eta_{30}-3\eta_{12})(\eta_{30}+\eta_{12})[(\eta_{30}+\eta_{12})^2-3(\eta_{21}+\eta_{03})^2]$$
$$+(3\eta_{21}-\eta_{03})(\eta_{21}+\eta_{03})[3(\eta_{30}+\eta_{12})^2-(\eta_{21}+\eta_{03})^2]$$

$$\phi_6=(\eta_{20}-\eta_{02})[(\eta_{30}+\eta_{12})^2-(\eta_{21}+\eta_{03})^2]$$
$$+4\eta_{11}(\eta_{30}+\eta_{12})(\eta_{21}+\eta_{03})$$

$$\phi_7=(3\eta_{21}-\eta_{03})(\eta_{30}+\eta_{12})[(\eta_{30}+\eta_{12})^2-3(\eta_{21}+\eta_{03})^2]$$
$$-(\eta_{30}-3\eta_{12})(\eta_{21}+\eta_{03})[3(\eta_{30}+\eta_{12})^2-(\eta_{21}+\eta_{03})^2]$$

基于Hu矩轮廓匹配

- 两个轮廓的参数计算公式

$$m_i^A = sign(h_i^A) \cdot \log h_i^A$$

$$m_i^B = sign(h_i^B) \cdot \log h_i^B$$

CONTOURS_MATCH_I1 Python: cv.CONTOURS_MATCH_I1	$I_1(A,B) = \sum_{i=1...7} \left\| \frac{1}{m_i^A} - \frac{1}{m_i^B} \right\|$
CONTOURS_MATCH_I2 Python: cv.CONTOURS_MATCH_I2	$I_2(A,B) = \sum_{i=1...7} \left\| m_i^A - m_i^B \right\|$
CONTOURS_MATCH_I3 Python: cv.CONTOURS_MATCH_I3	$I_3(A,B) = \max_{i=1...7} \frac{\left\| m_i^A - m_i^B \right\|}{\left\| m_i^A \right\|}$

代码演示

- 计算hu矩与轮廓匹配

Thank You!