Moments of Area

- Another method for deriving descriptive information from blobs
- We use the following equation to compute the area of blobs:
- $$M_{\alpha\beta} = \sum_{\text{all image pixels}} x^{\alpha} \cdot y^{\beta} \cdot f(x,y)$$
- $f(x,y)$ is a binary function,
  $f(x,y) = 0$ if the pixel at (x,y) is <u>outside the blob</u>
  $f(x,y) = 1$ if the pixel at (x,y) is <u>inside the blob</u>
- When $\alpha = 0$ and $\beta = 0$ and $f(x,y) = 1$ then <u>one</u> (pixel) will be added to the total blob-area $M_{\alpha\beta}$ (because $x^0 \cdot y^0 \cdot 1 = 1 \cdot 1 \cdot 1 = 1$)
- So for the normal case when we're just interested in the blob's area, we set α and β to 0.
- But we can also compute other properties with the formula above, e.g. when $\alpha = 1$ and $\beta = 0$ we get the sum of x-values of the blob's pixels.
- We can even compute the coordinates of the blob's center of gravity.
  $$(C_x, C_y) = \left(\frac{M_{\alpha=1,\beta=0}}{M_{\alpha=0,\beta=0}}, \frac{M_{\alpha=0,\beta=1}}{M_{\alpha=0,\beta=0}} \right)$$
- Tuned version of the equation that allows moving around the blob without causing the central moments to change:

Central moments of area $\rightarrow$ $$M_{\alpha\beta} = \sum_{\text{all image pixels}} (x-\overline{x})^{\alpha} \cdot (y-\overline{y})^{\beta} \cdot f(x,y)$$ where $(\overline{x},\overline{y})$ is the centre of gravity.