Solution

From the lecture notes on optimal thresholding, we see that in general the optimal T can be found by solving second degree plynomial.

However, if the variances are equal, i.e. $s_1^2 = s_2^2$ then the optimal T will be:

$$T = \frac{m_1 + m_2}{2} + \frac{s^2}{m_1 - m_2} \ln\left(\frac{P_2}{P_1}\right)$$

Solution

On the average 40% of the pixels belong to the object,

i.e. P_2=0.4 and thus P_1=1-P_2=0.6

We get:

$$T = \frac{50+80}{2} + \frac{400}{50-80}\ln\left(\frac{0.4}{0.6}\right) \approx 70$$

$$\text{if } P_1 = P_2 \text{ then } T = \frac{m_1 + m_2}{2} = \frac{50+80}{2} = 65$$