The method of minimization divides the image into the groups based on the threshold while each group would have its own mean and variance. According to this variance, we can measure the homogeneity within each group. In an iteration, the threshold which is minimizing the variance and subsequently, maximizing the homogeneity is selected. In order to perform this thresholding method, we can say that by calculating the prior probabilities of the object and background according to the T value in the iteration, which is scanning the whole intensities or the histogram values, we can get the mean and variance for both object and background and finally find the within group variance.

$$P(i) = h(i)/N$$

$$P_o(T) = \sum_{i=0}^{T} P(i)$$

$$P_b(T) = \sum_{i=T+1}^{255} P(i)$$

$$\mu_o(T) = \sum_{i=0}^{T} iP(i)/P_o(T)$$

$$\mu_b(T) = \sum_{i=T+1}^{255} iP(i)/P_b(T)$$

$$\sigma_o^2(T) = \sum_{i=0}^{T} [i - \mu_o(T)]^2 \, P(i) \, /P_o(T)$$

$$\sigma_b^2(T) = \sum_{i=T+1}^{255} [i - \mu_b(T)]^2 \, P(i) \, /P_b(T)$$

$$\sigma_w^2(T) = \sigma_o^2(T)P_o(T) + \sigma_b^2(T)P_b(T)$$

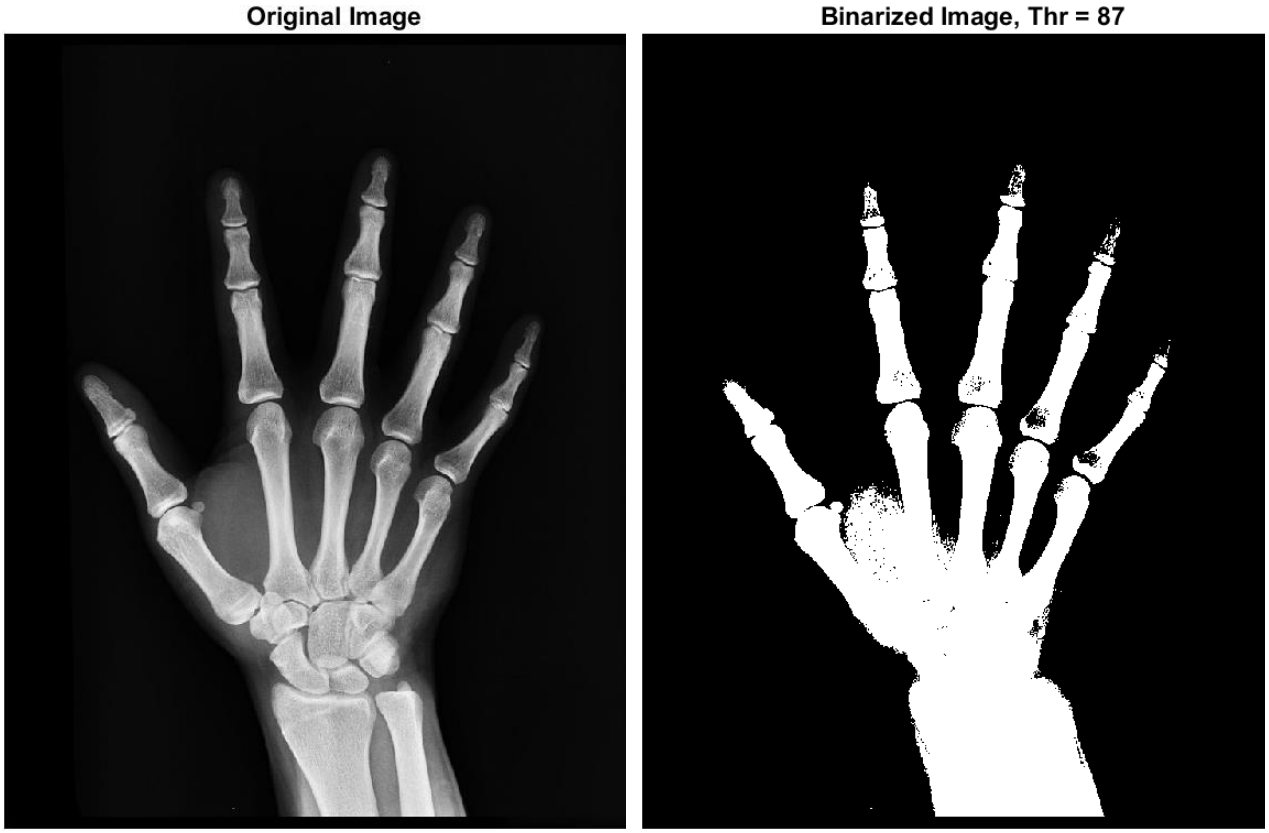
All probabilities, mean and variance values are computed according to the noted expressions while the threshold is changing between all intensities from 1 to 255.

The within variance for each threshold is stored in ‘Var_w’. the threshold is positioned in a place that the within variance is minimum. Accordingly, ‘min_var’ computes the smallest variance and finds the locations in ‘Var_w’ where this ‘min_var’ is positioned.

The first place that we have found this small variance is considered as threshold.

The implementation of the method in MATLAB provides us with a perfect binary image when the image is noise free, like fig.8. However, in a case such as fig.9 and by considering the skin area as the noise that interferes with bone segmentation, we can say that there will be a high level of misclassification in image segmentation. For this reason, we are going to find better methods of thresholding.

Fig. 1. Image Thresholding by minimization method for a noise free image



(a) (b)