ABSTRACT

Edge detection is process of identifying points in a digital image at which the image intensity changes sharply or has discontinuities. Multilevel thresholding is one of the most popular image segmentation techniques for edge detection. Segmentation needs threshold level to separate the object from the background to read the image properly and identify meaningful content of an image. In this era it has found more attention of researchers. In order to determine the thresholds, method uses the histogram of the image. Thresholding is a process, used to split the image pixels in to different group/cluster by comparing the intensity value of image pixels with reference threshold level. The threshold value split the image pixels in a way that pixels having lower intensity-value than fixed threshold level belongs to one cluster while pixels whose intensity-value is more than fixed threshold level belongs to another cluster. By the help of thresholding process it is easy to mark a pixel as edge where the pixels have sudden change in intensity value is higher than threshold level and vice versa then those pixels are extracted and linked to make closed region boundaries.

This work has recommended multilevel thresholding for edge detection using OTSU algorithm. First the multilevel thresholding OTSU method is applied on input image to find the threshold level, an image is divided into three or more cluster by taking more than three threshold levels instead of two as the standard OTSU method does. The optimal thresholds are found by maximum between-class variance between two cluster and minimum class variance within same cluster and try to minimize the number of cluster by iterative for all cluster present over there and find the optimum threshold value for image to make different between background and object.

In this work, an effort is made to study and analyses the performance of frequently used edge detection techniques. The well-liked parameters such as signal to noise ratio (SNR), universal image quality index (UIQI), peak-to-signal ratio (PSNR) and mean square error (MSE) are consider to analysis the performance of proposed method and Canny method. The parameter comparison of those techniques is carried-out with an experiment by using image processing toolbox of MATLAB 7.3 software. Basics of edge detection and fundamental of image processing are also discussed to build a platform to understand the image processing techniques.
The OTSU algorithm is calculated the high threshold value which is significant to the Canny algorithm, and then that threshold value is used in the Canny algorithm to detect the object’s edge. Summarised table for different parameters shows that high value of PSNR, UIQI, SNR and low value of MSE achieved by proposed method and edge detected by proposed method is sharp and true than Canny method. PSNR is improved from 11% to 32% as compare to Canny method. Experimental results of different images shows that the multilevel threshold based on OTSU method gives better results as compared with traditional Canny method and due to better performance of proposed method; it is widely used in different field of science and engineering.