BACKGROUND ESTIMATION

It is proposed to estimate an initial background image using a large number of pictures and the median filter operating in the temporal axis. The assumption is that the pixel stays in the background for more than half of the frames used for the estimation.



Where B is the Background Image, I is the Frame Image and n is the number of frames to be used for the approximation of the background.

BACKGROUND UPDATING

To avoid false object detection (false negatives) that might be caused by slight but steady background lightning changes, a knowledge-based background updating algorithm is proposed. The background image that has been given or estimated with the background estimation algorithm has to be updated in regular time intervals. Using the knowledge of the detected objects in a scene, it is possible to define a selective update, which computes a new background value only if a point is not marked as an object pixel.

The new background is the weighted average between the current background objects and the old background.



Where Bj is the jth updated background image (j = I mod K), Ii is the current image, and a (0<=a<=1) is a scalar representing the importance of the current data and the learning rate of the model. K controls the update frequency of the background to avoid the updating for every frame.

PROBLEM WITH EUCLIDEAN DISTANCE APPROACH

The Euclidean Distance approach calculates distance of the centre of the hand to the convex points. Convex points are actually the fingertips of our hand. Hand gesture is recognized by using the Image Euclidean distance measure by comparing the current Dynamic Signature of the particular gesture with the gesture Alphabet set. There is a new Euclidean distance for images, which is called image Euclidean distance (IMED). Unlike the traditional Euclidean distance, IMED takes into account the spatial relationships of pixels. Therefore, it is robust to small perturbation of images. It is argued that IMED is the only intuitively reasonable Euclidean distance for images. IMED is then applied to image recognition. The key advantage of this distance measure is that it can be embedded in most image classification techniques such as SVM, LDA, and PCA. The embedding is rather efficient by involving a transformation referred to as standardizing transform (ST). The study shows that ST is a transform domain smoothingthe image Euclidean distance (IMED) considers the spatial relationship between the pixels of different images and can easily be embedded in existing image recognition algorithms that are based on Euclidean distance. IMED uses the prior knowledge that pixels located near one another have little variance in gray scale values, and defines a metric matrix according to the spatial distance between pixels. In this paper, the author proposes an adaptive image Euclidean distance (AIMED), which considers not only prior spatial knowledge, but also prior gray level knowledge from images. The most important advantage of the proposed AIMED over IMED is that AIMED makes the metric matrix adaptive to the content of the concerned images. Two ways of using gray level information are proposed. One is based on gray level distances, and the other is based on cosine dissimilarity of gray levels. Experiments on two facial databases and a handwritten digital database show that AIMED achieves the highest classification accuracy when it is embedded in nearest neighbour classifiers, principal component analysis, and support vector machines.

The limitation of this approach is that it considers objects other than the hand in the scene.

OVERCOMING LIMITATION OF EUCLIDEAN DISTANCE APPROACH

To overcome and eliminate this limitation we have taken into consideration the angles between the fingers of our hand to be able to detect only the hand in the foreground. Since normally, the angles between the fingers cannot exceed ninety degree, this characteristic can be used to detect the hand from other other objects.