Processing of Iris Video frames to Detect Blink and Blurred frames

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Abstract— In Video based Iris Recognition system, Iris images are obtained with non-Cooperative situation. In video based system, it is time consuming to process each video frame for iris segmentation because some video frames may not contain an eye at all. The raw video frames were not processed like the still images. To improve the efficiency of iris recognition system it is important to process the video frames. Processing of video sequence is more challenging. It requires a robust and accurate method to extract frames that have only iris images. For non-cooperative users there could be many noisy video frames with different quality of iris images. Noisy video frames include blinking eye and blurred frames. In our paper we mainly concentrate on detecting these blink and blurred frames and the results are shown. The results are more accurate than the existing ones.

Keywords- Iris images; blinking eye; blurred video frames**.**

I.INTRODUCTION

The Iris recognition system consists of several steps like image acquisition, image segmentation, normalisation and many more in identifying a person. In the Image acquisition step capturing of iris image is taking place. In video based system the user may not be co-operative to iris camera. For this reason there is always a chance of getting noisy frames. That is while capturing iris image immediate surroundings of eye region is also captured. The noisy video frames include blinking eye and blurred frames that do not include valid iris data. Primarily it is significant to select the iris image containing exclusively iris. Selecting the best and focused video frames includes checking video frames for interlacing, blink and blur.

A. Blinking

Blinking is a natural eye motion defined as the rapid closing and opening of the eyelid. Two antagonistic muscles are responsible for generating a blink. The sphincter muscle closes the eyelids and the levator palpebre superior muscle raises the upperlid.Eye blinks can be put into three categories.1).Spontaneous, which is caused by unconsciously triggered.2).Reflexive, which is caused by a sudden impulse.3).Voluntary, which is caused by intentionally triggered. These categories can be distinguished based on duration, amplitude and context.

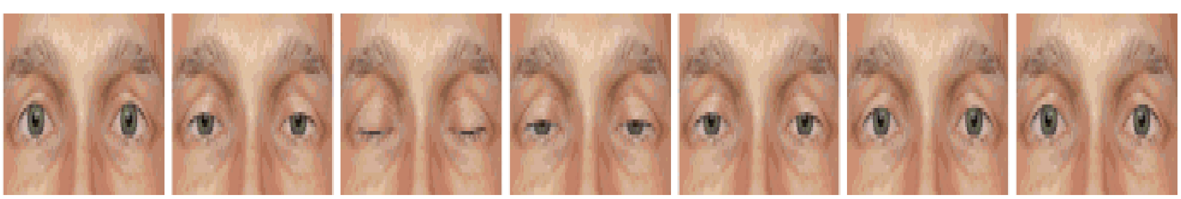

Figure 1.Various stages in eye blinks

B.Blurring

Freely taken digital video sequence may have some kind of blur. Usually we get two types of blurred frames, motion blur and out of focus blurred frames. Motion blur frames usually created when the time of exposure is long relatively to the movement of eye. Out focus frames are created when the iris is not in the depth of field of the lance.

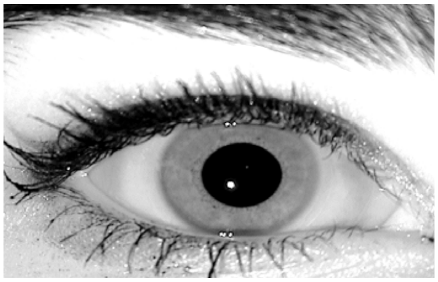

Figure 2(a).Original eye image

2(b). Motion Blurr image(45^0 10)

Figure 2©.Motion Blur image (45^0 25)

II. RELATION TO PRIOR WORK

Under user co-operative conditions as the user looks at the iris camera blinking and head movement is very small but in non-cooperative conditions blinking rate is high. There are different types of blink detection techniques are present , in that simplest method to detect blinks in the image sequence is to subtract the successive frame from each other and to create a difference image[1].The main drawback of this method is keeping head position constant. But in the video based system head movement is not avoidable, so this head moment will introduce false detection of frames. In real time to quantify the quality of a video stream Milos et al [2] proposed using an artificial neural network to predict resulting image quality rating scores. Random neural network is applied in Samir et al [3] article to automatically select the quality video frames. However these methods are designed for general video image processing. They cannot be applied on iris video directly since they do the processing on the entire video image instead of focusing on the iris of an eye image.

To measure iris image quality, several methods have been developed. Ma et al[4] used the frequency energy distribution to classify the images into two categories (good and bad) . Chen et al[5] used a Mexican hat wavelet to evaluate the iris quality. Kalka et al[6] developed comprehensive quality measure using Dempster-Shafer theory to combine several quality measures including defocus, motion blur, occlusion, specular reflection, lighting, off angle and pixel counts .These iris quality measures are based in single images.

III .1.DETECTION OF BLINKING FRAMES

In detecting the blink frame every frame is checked for finding ESD value (Eyelid’s state detecting) .This value is a measure to classify state of eyelid, open or close. The value can be computed by using an algorithm .The objective of the algorithm is to find the minimum threshold, which brings the binary image having at least one black pixel.\we then threshold the image value at least one white pixel appears. If there is no black pixel increase threshold value and follow the same sequence until getting the black pixel.

Figure 3 Binary converted image

Then apply the Sobel edge detection method to find the edge of the image.Once binary image is found dilate the image, remove the boarder and find the boarder of the dilated image.

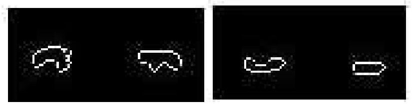

Figure 4 Dilated images

Divide the image in vertically in to two exact parts. Then take the first part of the image and find the maximum axis length and minimum axis length. If the first part is not found then go to the second part of the image and find the maximum axis length and minimum axis length of the image.

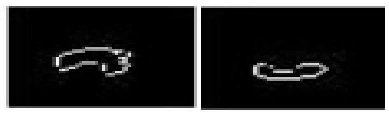

Figure 5 .Major axis and minor axis length

Once we got the major and minor axis length find the average of these two axes's and set the threshold to check whether eye is closed or opened. If we got the result as closed then those frames are considered as blink frames.

III .2. DETECTION OF BLUR FRAMES

In order to identify blur frames first we assume some dominant blur priors for estimating Point spread functions (PSF) of blurred frames in Bayesian MAP estimation. The blurred frames with estimated PSF's can be stored in VQ-Based multiple code books. These code books can thus be used for identifying blurred video frames via VQ encoding distortion measure. The vector quantizer code books supply incorporate prior incrementally to the Bayesian learning process. The probabilistic model predicts and adds new code books dynamically for identifying more blurred frames in a video sequence.

Blur prior can be first learned from training video frames based on Bayesian learning frame work [7][8][9].And to preserve more fidelity of the restored image and get the blur parameters in an alternating minimization procedure based on Bayesian maximum a posterior (MAP) estimation and we are using double cost functions[10]. The probabilistic methods are used for learning and generating posterior knowledge. The learned blur knowledge can then be stored and added incrementally in vector Quantization based code books for identifying more blurred frames. The frames which are having minimum VQ encoding distortion are blurring identified.

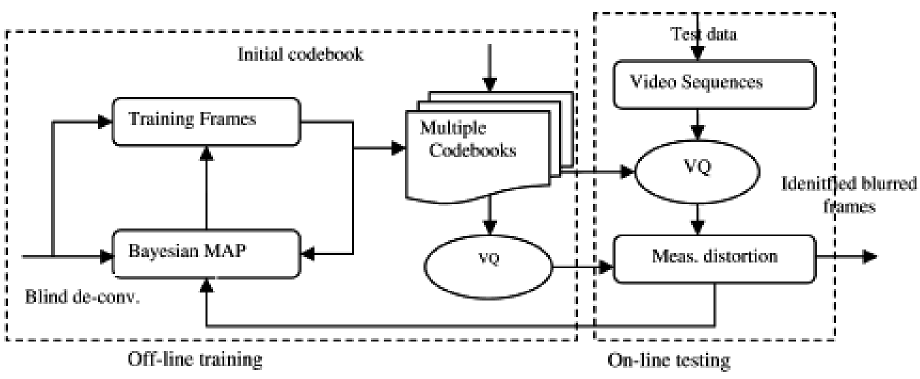

FIGURE 6. Blur identification in large video data

III.3. VQ-BASED CODE BOOK DESIGN

To identify the blurred frames in video sequence, we need to find an efficient method which cannot only store the trained knowledge but also use such knowledge dynamically for further development. The Vector code book design satisfies such demand. Vector quantization is primarily a data comparison technique that has been widely applied to image and speech encoding. The K-dimensional, N-level vector quantizer is defined as a mapping from a K- dimensional Euclidean space K into certain finite set C=C1,C2,-----C_N. The subset 'C' is called a code book and its elements C_i are called code words. The VQ encoding is to search and assign one code word to the input set vector with minimum distortion. Given an image with N_w* N_n =M block, each block has K pixels. For each code word $C_t = Ct_1, Ct_2, Ct_3$,-----Ct_N and the testing vector $X=(x_1, x_2$, -----$x_M)$. The squared Euclidean distortion can be expressed as

$$D(X,C_t) = \text{Sum}\left(\| x_i - C_{ti}\right)^2, i=1,2,\text{---}K$$

From this equation, we know that encoding each input vector requires N distortion computations and N-1 comparisons. Therefore the computational complexity of encoding each input vector includes KN multiplication (2K-1) N additions and N-1 comparisons. The searching algorithm here we used is Equant –average nearest neighbor search (ENNS). This algorithm uses the mean value of an input vector to reject impossible code words.

It also reduces the computational time compared with other fast search algorithms with only 'N' additional memory. In our algorithm the band passed pixel value in the code book is treated as the label. VQ is subsequently applied to all vectors with the same label based on the LBG [11] algorithm. The VQ can be generated in hierarchical way.

To apply VQ method for blur identification, blurred images are vector quantized in terms of the enhancement of blur represent. For this we use local non-flat region features to train the code book so that a lot of redundancy in homogeneous image regions can be avoided.

IV. EXPERIMENTAL RESULTS

1. Blinking:

For the testing purpose vides are converted into sequence of frames .Result of blink detection is shown in the following table.

S.No	Number of frames	Correct blink detected
1	1981	1948
2	900	865
3	1502	1368
4	2897	2886
5	257	246
6	3012	2993
7	498	483
8	1529	1500
9	300	289
10	56	56

Table.1

Percentage of correct blink detection is 97.65

2. Blurring:

We considered one group of images with motion blur. The group contains three images. The three images are tested in three different signal-to- noise ratio (SNR). The minimum VQ encoding distortion (MSE) of the testing image is identical with the trained code book.

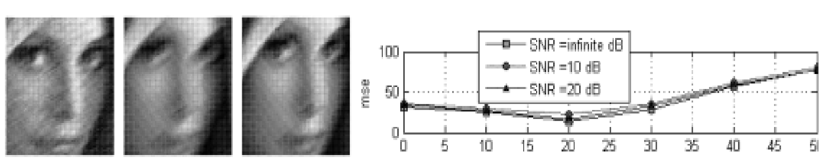

FIGURE. 7 .Identification of motion blur

V.CONCLSION

We considered different number of video frames and apply the algorithm to find the ESD value and from that we detected blink frames. And also considered one group of images with motion blur and these are tested with different SNR values.

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