ISSN:0975-9646

Jabir Ali et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 2 (5) , 2011, 2293-2296

Real Time Facial Expression Detection Techniques using Pixels Values.

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Abstract- **As we know that the human communication has two aspects verbal and non-verbal. In verbal we have auditory communication but in non-verbal communication we directly depend on facial expression, body movements, and psychological reactions. These all are the basic units of non-verbal communication. An emotional state of a person can be detected by his facial expression only, so here in this paper we have a technique to detect the facial expression that is faster and much accurate in compare of previous techniques.**

Keywords: expressions, static image, viola & jones, iris, lips detection.

I. INTRODUCTION

As we know that faces are the most common objects that people observe everyday and play a key role in human communication. Therefore automatic facial image processing including face detection, facial feature extraction, face recognition, and facial expression understanding, etc., has attracted much attention in the past decades.

Automatic analysis of facial expression attracted the interest of many AI researchers since such systems will have numerous applications in behavioural science, medicine, security, and human-computer interaction. To develop and evaluate such applications, large collections of training and test data are needed. While motion records are necessary for studying temporal dynamics of facial expressions, static images are important for obtaining information on the configuration of facial expressions which is essential, for inferring the related meaning (e.g., Happy, Sad, Surprise, Think, Fear etc).

In this paper we have concentrate on speed and accuracy of the result. So my idea is that as we are comparing to a face from the data base images to detect the expression of that particular face, instead of if we compare to only that part of the image which is more effective to detect the facial expression.

II. PROPOSED SYSTEM

As we know that to detect the facial expression mostly we consider eyes parts and lips parts because in the detection of facial expression these two (eyes and lips) affect more.

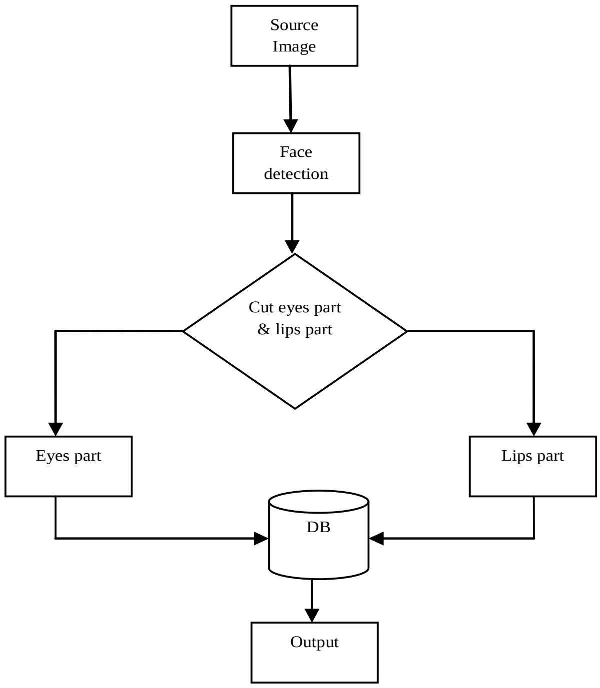


Fig.1 Proposed model for facial expression detection.

1. Face Detection

As above we draw a flow diagram of our propose system here in first step we have input an image and detect the face of that particular image. To face detection we have lot of techniques and we use skin colour technique with **viola and jones** technique for the face detection. As we know that the skin colour has a different colour in the whole body so on the basis of skin colour we detect the face. And viola and jones technique will be use for to improve the accuracy of our system. Given a single image, the goal of face detection is to identify all image region containing a face, regardless of its three dimensional position, orientation and lighting conditions, Additionally, robust face and on the face such as glasses, beards, hats, etc.

Face detection in facial expression recognition has to be performed accurately and independently of the facial expression. Several facial expression change the appearance of the face considerably like a wide opened mouth does and therefore the face would be detected with different results. Invariant detection of faces performing different facial expressions places additional requirements of the method of face detection.

2. Eyes detection

As one of the salient features of the human face, human eyes play an important role in face recognition and facial expression analysis. In fact, the eyes can be considered salient and relatively stable feature on the face in comparison with other facial features. Therefore, when we detect facial features, it is advantageous to detect eyes before the detection of other facial features. The position of other facial features can be estimated using the eye position [1]. In addition, the size, the location and the image-plane rotation of face in the image can be normalized by only the position of both eyes.

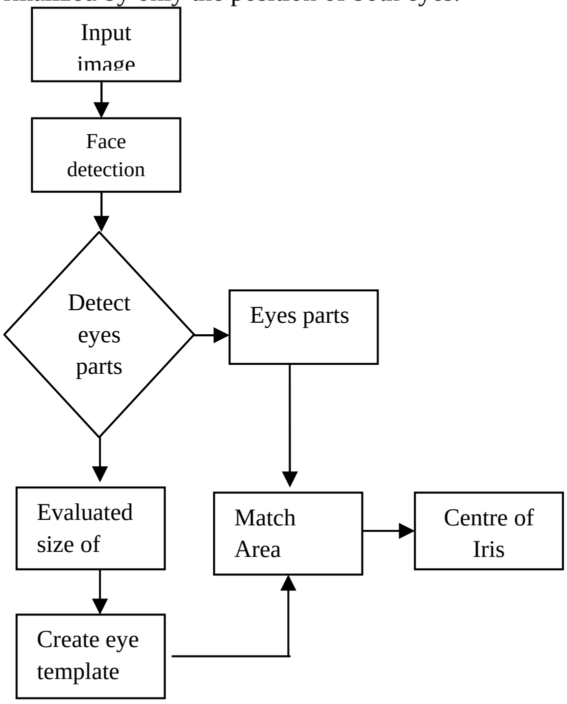


Fig 2 Basic model for eyes detection.

3. Localization of iris centres

Suppose that we have a template g[i, j] and we wish to detect its instances in an image f[i, j]. An obvious thing to do is to place the template at a location in an image and to detect its presence at that point by comparing intensity values in the template with the corresponding values in the image. Since it is rare that intensity values will match exactly, we require a measure of dissimilarity between the intensity values of the template and the corresponding values of the image.

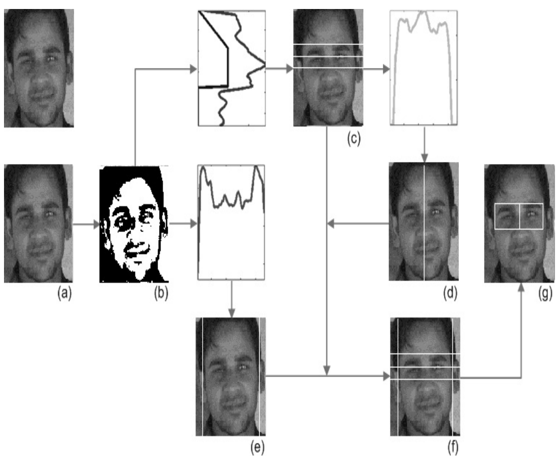
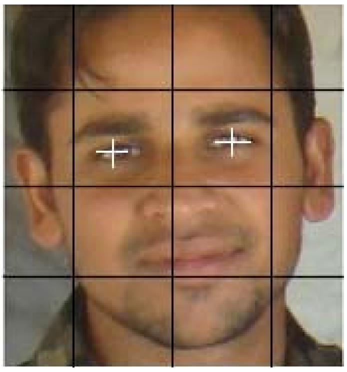


Fig. 3 Detection of eyes regions



Several measures may be defined:

$$\max_{[i,j]\epsilon R} |f - g|,$$

$$\sum_{[i,j]\epsilon R} |f-g|$$

$$\sum_{[i,j]\epsilon R} (f-g)2$$

Where R is the region of the template.

The sum of the squared errors is the most popular measure. In the case of template matching, this measure can be computed indirectly and computational cost can be reduced.

Now we get exact location of iris. Suppose left iris coordinates are (x, y) and for right iris are (x`, y`). Now we have to find out the area of eyes which we need for the comparison in our database for the facial expression detection.

Take a 100 x 100 pixels face image.

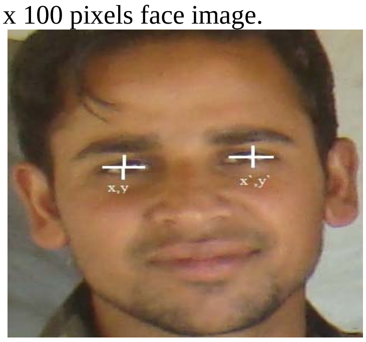


Figure 4: detected iris coordinates.

Now we just found the coordinates of iris but we need the eyes part. For the detection of eyes part we use this formula. To detect the eyes part we will take distance'd' from the coordinates.

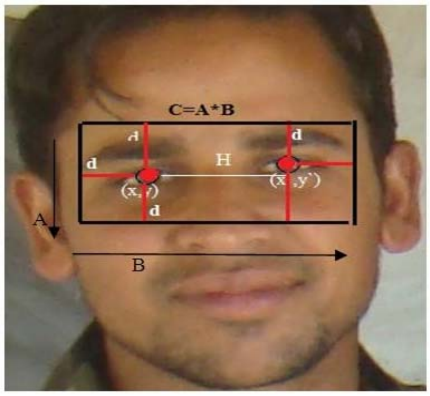


Fig.5 Detect the eyes part.

H= $\sqrt{(x` - x)2 + (y` - y)2}$]

A= [$\{(x, -d) + (x`,\ d)\} + \sqrt{(x` - x)2 + (y` - y)2}$]

B= (y, d) + (y, -d) **or** (y`, d ) + ( y`, -d)

Now the area

C= (A.B)

C=(y, d) + (y, -d) **or** (y`, d ) + ( y`, -d) *** [**$\{(x, -d) + (x`,\ d)\} + \sqrt{(x` - x)2 + (y` - y)2}$]

So the Area C will be cut it from here and it will be stored in database.

4. Lips detection

As we know that if we found centre of two eyes and between those eyes we take a point that point will move downwards and found where the pixel value change sharply (lips colour will b differ so the pixels values of lips will be changed sharply) at that location or at that place

Take a 100 x 100 pixels face image.

Now we have detect point D_i (Diagonal intersection point)

(x,y),(y`, d) = $\sqrt{\{(x, y) + (x`, y`)\}^2 + (y`, d)^2}$

Or

(x,y),(y`, d)= $\sqrt{H^2 + (y`, d)^2}$

So

$$D_i = \frac{\sqrt{H^2+(y`,d)^2}}{2}$$

Now the point Di will move to downwards and stop at there the pixels values change sharply. As in given figure we got the point Di.

Now we will move to area Di and when both the points will meet to each other we stopped to moving and cut that area (lips area). And store this lips part in the database.

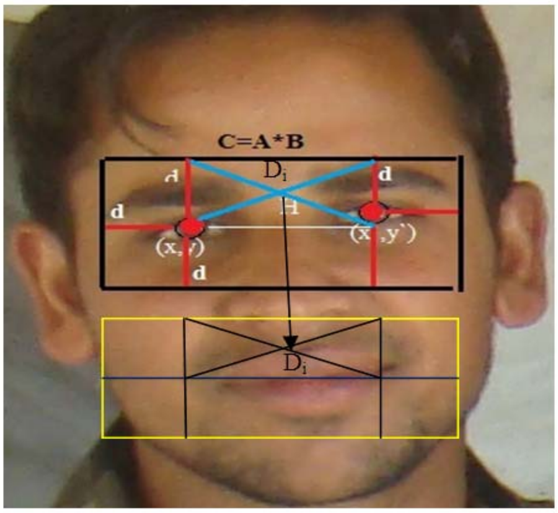
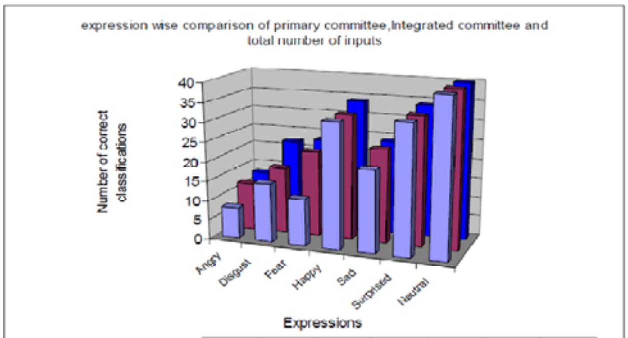


Fig.6 Detect the eyes and lips part.

RESULTS

In the current study, the goal was to test whether the addition of new parameters to the existing system improves the performance accuracy.

The comparative expression classification performance by the integrated committee neural network system is shown in figure 7. It gives a plot of expression wise performance of the primary and integrated committee neural network system. The angry, disgust and fear expressions showed low classification accuracy while neutral, happy, and sad and surprised showed high classification accuracy in the primary neural networks. The performance was improved after integration of the primary and secondary committee systems. The integrated committee neural network system showed more than 90 % correct classifications except for disgust which showed only 78% correct classifications.



	Angry	Disgust	Fear	Happy	Sad	Surprised	Neutral
Correct classifications by primary committee	8	15	12	32	21	33	40
Correct classifications by integrated committee	12	17	22	32	24	33	40
Actual number of inputs	13	22	23	34	24	34	40

Fig.7 Plot of correct expression classifications for primary and secondary committee classification systems compared to total expressions.

An expression wise accuracy performance of the integrated committee neural network classification system is shown in figure 31. The angry, disgust and fear expressions showed low classification accuracy in the range of 50 % to 70 %, while neutral, happy, sad and surprised showed high classification accuracy of more than 85 % for the primary neural network classification system. For the integrated system, all expressions except disgust showed more than 90 % accuracy.

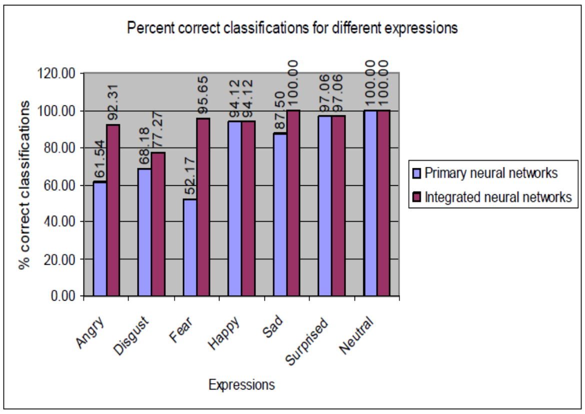


Figure 8: Plot of percentage correct classifications v/s expressions.

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