Real time security Access control system based on Face Recognition by using Hybrid Approach

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ABSTRACT

A security system in the current era has become a common feature where speed, time, high discrimination and accuracy. This article explains one of the effective ways to discover and distinguish a face, by relying on international descriptions of facial features. Among the most important of these methods used is the LBP (Local Binary pattern algorithm) and HOG (histogram of oriented gradients algorithm). When combined, these two algorithms give better results in terms of high and strong discrimination. This paper raises the issue of using a sensitive shape LBP algorithm which it is descriptor the shape and texture, in addition to using HOG to evaluate the slope direction value applied to images, the features of each algorithm are combined. The proposed method has been verified for its effectiveness on a security access control system using hardware devices webcam as input device and arduino microcontroller as output device. It proved to be effective with images from the real world as well as with a set of ORL databases. Finally, images are classified as either belonging to or not belonging to the database by using SVM classifier. The results indicate that the discrimination rate is 96.2%, which means a speed of discrimination, and that the method works well under different circumstances, as the method was applied to several databases and showed good results.

Keywords: *Face recognition, hybrid , LBP, HOG,SVM*

1. INTRODUCTION

Lately, with the entry new developed camera, phones, and smart home ,so the interest in digital image forensics has been grown exponentially .A Facebook , what Sapp have then further in to their extensive applications. The resampling detecting ,detection of copy-move, object removal and splicing , machine learning , JPEG artifacts differentiating and deep learning techniques it methods have been used to discern diverse manipulations in digital image[1]. Recently, many commercial systems have been used to identify faces[2]. confirms progress in marking the face recognition is worth noting the achievement of this field[3]. The question of face recognition have been remains the focus of researches on computer vision In spite of the achievements made. Relatively speaking, the current systems perform better in control environments, while they tend to suffer in different circumstances and different factors (head shape, lighting). As a result, increasing the robustness of existing systems in the face of various challenges is the aim of this present research. Finally, the research aims to create a system for identifying

faces that simulate the human ability to distinguish different faces. The strengths and weaknesses involved in using these technologies should be known for any future improvement in the system[4]. In this paper, the LPB algorithm was combined with the HOG algorithm in parallel, and it will then be classified using linear SVM to obtain better results and challenge different conditions compared to the previous methods.

2. PROPOSED METHODOLOGY

In this paper, a three-function system has been proposed. The first function is to choose an image either from the database or from a photo taken by a webcam and this image has been used to detected the face by using algorithm viola-jones. The second step is done in two stages, the first is to extract the features from the image by LBP, and the second stage is to extract the features from the image by HOG and then merging the features together. And the last stage is done using the SVM classifier to classify the images at the end. Figure 1 shows the general scheme of the system.

Also, Arduino uses part of a home security system to verify the person is known or not. Where a picture is taken as soon as he senses the presence of movement in front of the camera.

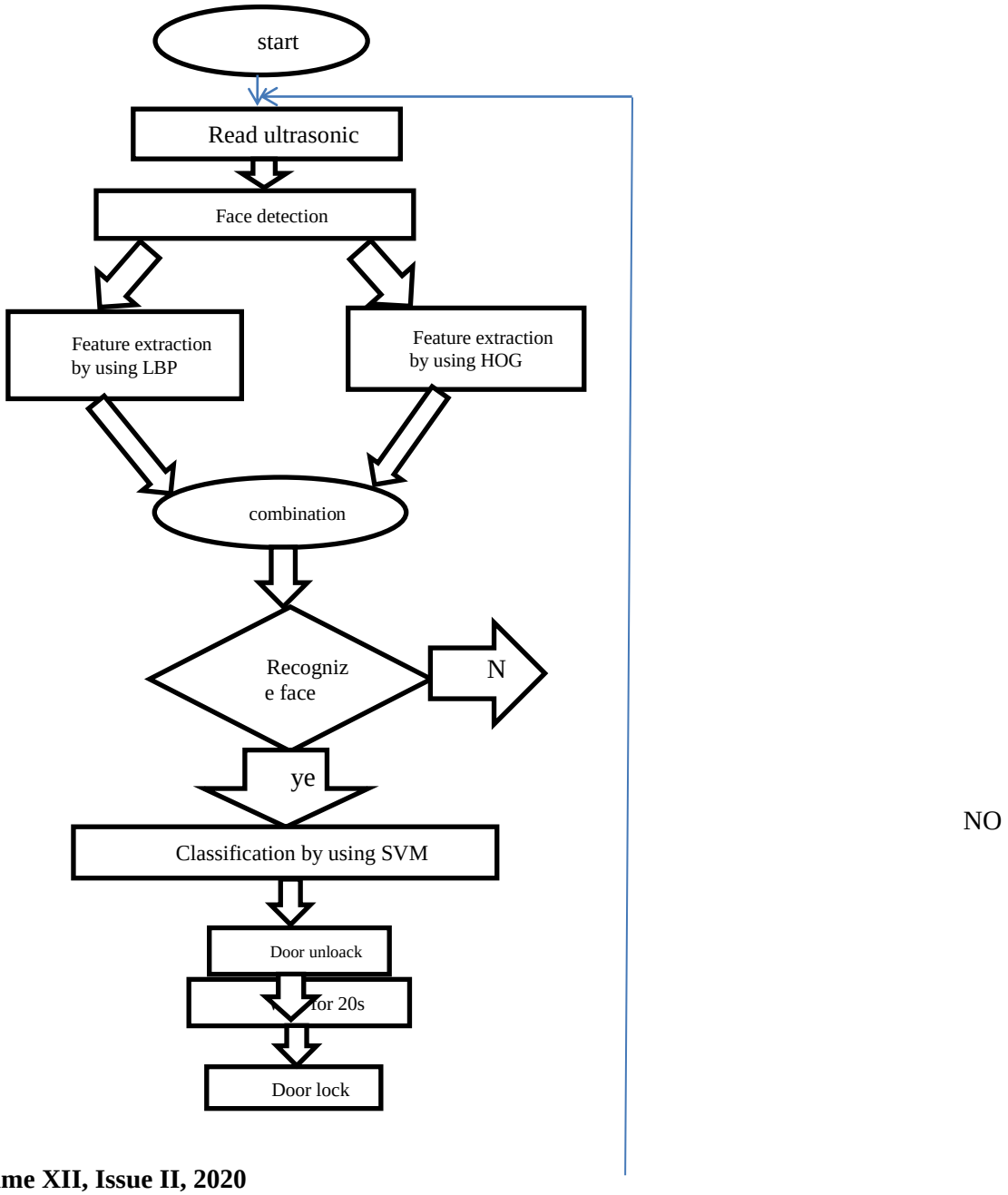

Figure (1) The proposed method of face recognition

2.1 LOCAL BINARY PATTERN

A texture measure operator is primarily is gray-scale invariant is Local Binary Pattern (LBP)[5] It was proposed in 1994 by the scientist and Ojala. LBP applications were widely used in various fields such as expression recognition, face recognition, but at first it was strong in classifying texture. when to use combining shape ,textures and all dynamic feature vector it can be efficient for good description LBP. The first step in the LBP algorithm turns the image into a gray pattern, after which 3 * 3 pixels are taken and the center value is taken as a sample and its value is compared to the rest of the neighborhoods if the threshold value is greater than the value of the adjacent turns to zero and if the threshold value is less or equal to the adjacent transform To 1 and thus the image will be converted from binary to decimal and work will be done according to the following equation :

$$LBP^{K,R}(x_c, y_c) = \sum_{i=0}^{K-1} s(g_i^{K,R} - g_c)2^{(i-1)} \quad (1)$$

Where ,g_c is the gray scale value of the current pixel and g_i is the scale value of the I th neighbor pixels .

The binary encoding function s(x) is defined :

$$s(x) = \begin{cases} 1, x \geq 0 \\ 0, x < 0 \end{cases}$$

2.2 HISTOGRAM OF ORIENTED GRADIENTS

The HOG algorithm was proposed by Dalal and Triggs [6], as an algorithm sensitive to object deformation. The basic idea of HOG is to assess the local density and distribution of the orientation that can visualize the shape of the local object and appearance, mainly used in the discovery of various objects in the fields, as well as in the detection of pedestrians, and works in the image in calculating the direction of slope in the local correction[5].

2.3 SUPPORT VECTER MACHINE

In 1963, the two scientists, Vladimir Wabnick and Alexei Sherfonenkez, and in 1995 the scientists Corinna Kurtz and Fabnek algorithm SVM was modified [7]. In the field of pattern recognition, there are many applications. When a separation is required between different categories, it works to give the value of a separation closer to reality, SVM trains on the basis that the pictures are authentic or not authentic. SVM makes a data separator, a separator called a hyperplane, and the distance between the data and the

hyperplane is the best separation distance between the trained data. The labeled samples of a training set given by:

$$D = (X_i, y_i) | x_i \in \{-1, 1\}_{i=1}^{p} \quad (2)$$

SVM tries to get samples with the lowest error

$$w.x - b = 0 \quad (3)$$

X represents the input vector, and SVM categorizes data by dividing the distance from the x vector to the hyperplane. Used for linear separation of data can be used in multiple separations.

3. EXPERIMENTAL RESULT

In order to evaluate our proposed work, two types of databases were used. One of these rules is an ORL database that contains 4000 images. The other rule is a group of randomly generated images of approximately 200 images. A group of this database was also randomly selected to evaluate this rule and Table (1),(2),(3),(4). The following illustrates this.And show figure(2),(3) and figure (4) have sample of design system to recognize person using sample of Arduino and servio motor:

Table(1) shows sample of dataset of ORL

55	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm	9pgm	10.pgm
S7	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm	9pgm	10.pgm
S13	1.pgm	2.pgm	3.pgm	4.pgm	8.pgm	9.pgm	10.pgm
S16	1.pgm	2.pgm	3.pgm	4.pgm	8.pgm	9.pgm	10.pgm
S21	1.pgm	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	10.pgm
S36	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm
S40	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm

Table (2) recognition rate real word

Method	**S5**	**S7**	**S13**	**S16**	**S21**	**S6**	**S0**	**accuracy**
LBP	**7**	**8**	**7**	**7**	**7**	**8**	**7**	**72%**

HOG	**8**	**10**	**9**	**10**	**9**	**8**	**8**	**88%**
Hybrid(LBP+HOG)	**7**	**10**	**10**	**10**	**10**	**8**	**8**	**90%**
Proposed system	**8**	**10**	**10**	**10**	**10**	**10**	**9**	**96.2%**

Table (3) shows sample of image from real word

S8	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm	9.pgm	10.pgm
S10	1.pgm	2.pgm	3.pgm	4.pgm	8.pgm	9.pgm	10.pgm
S20	1.pgm	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	10.pgm
S26	1.pgm	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	10.pgm
S35	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm
S37	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm
S39	2.pgm	3.pgm	4.pgm	5.pgm	6.pgm	7.pgm	8.pgm

Table (4) recognition rate real word

Method	S8	S10	S20	S26	S35	S37	S39	
LBP	8	9	7	8	8	7	8	78.5
HOG	8	9	8	9	8	10	8	85.7
HYBRID	9	9	8	9	8	10	8	87.1
Proposed	**8**	**8**	**8**	**9**	**10**	**10**	**10**	**96.2**

The image was first converted to a gray scale, then the dimensions of the image were changed 92 * 92. To obtain a high resolution ratio, the image was converted to ellipes to get rid of the background and to get a high match. In this system used Matlab 2018b.

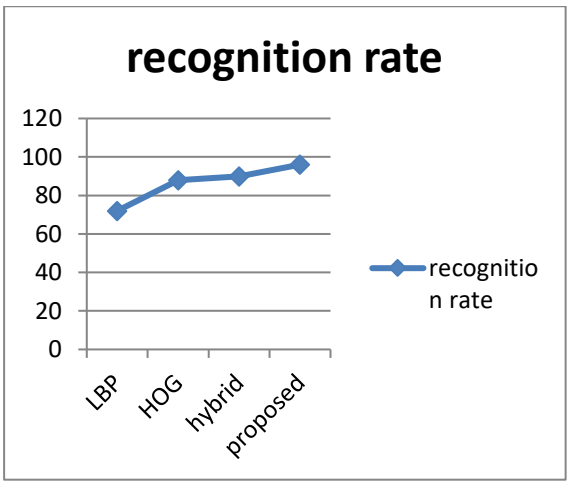

Figure (2) result of recognition ORL

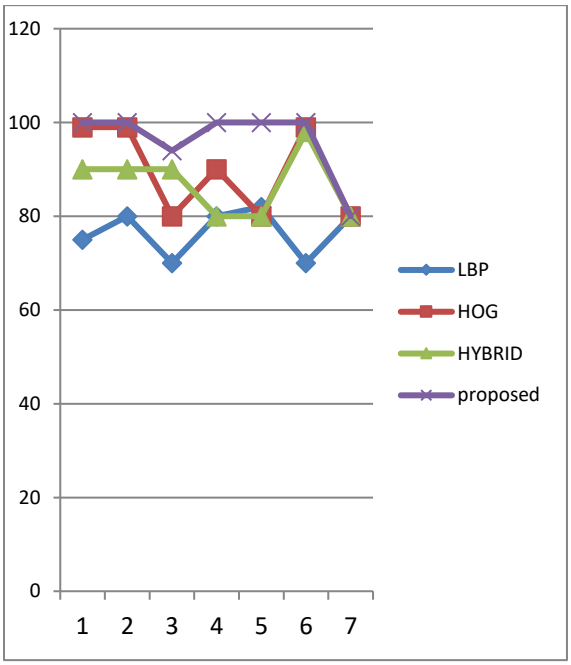

Figure (3) result of recognition real face from world

Figure (4) shows sample of design system with Arduino

4. CONCLUSION

A system was proposed to distinguish the images in the database from the ones that do not exist where when LBP_HOG algorithms were combined, a high discrimination rate was obtained compared to each separate algorithm was used, where a discrimination rate of 96.2 when categorizing the images using the SVM classifier was given. And the LBP-HOG algorithms are very sensitive to the shapes. The purpose of distinguishing whether or not the image is present in the database is to increase the security of the proposed system, as this system allows for the development of home systems in order to increase confidence in the proposed algorithms that lead to high discrimination results. This method is also quick to distinguish, that is, it gives speed in the time taken to distinguish. Our goal in the future is to increase the accuracy of the algorithm for use in medical images as well as in video applications.

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