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Implementation of Face Recognition Using SIFT Feature Extraction

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Abstract - **The main motive to design to recognize Automatic Face Recognition is the ability of person's and identity based on facial characteristics. One of the ways to do this is by comparing selected facial features from the test image and a facial database. Usually, the face image of a test subject is matched to the gallery data using a one-to-one or one-to-many scheme. The one-to-one and one-to-many matching are called verification and identification, the feature extraction on the other hand is usually applied to obtain the relevant facial features such as face regions, variations, angles or measures etc. from the data. This phase has other applications like facial feature tracking or emotion recognition. Selection of suitable features plays a crucial role in the performance of the face recognition algorithm This phase involves a comparison method, a classification algorithm and an accuracy measure.**

Keywords**: SIFT, DRLBP, Feature Descriptors, Feature Detectors**

I. INTRODUCTION

Among various feature detector, the scale invariant feature transform (SIFT) algorithm is one of the best approaches. The algorithm is mainly applicable for multistage images. The features extracted using SIFT algorithm are invariant to image scaling, rotation, transition and partially invariant to illumination and 3D camera view point. The SIFT algorithm is mainly divided into two modules. They are key point detection module and descriptor generation module. In order to increase the performance of the algorithm the method used in descriptor generator module is changed. In existing system the window rotation technique is used and it becomes the bottleneck for key point detection module. In the proposed method, the novel window is
Divided into sub regions in sixteen directions and histogram reordering technique are used in descriptor generation. The descriptor generation module leads the speed fifteen times faster than the recent solution. Feature extraction and matching is at the base of many computer vision problems, such as object recognition and stereo matching. Existing work introduces a scale invariant feature transform (SIFT) architecture for real-time extraction of image features. Among various feature detector, the scale invariant feature transform (SIFT) Algorithm is one of the best approaches. The algorithm is mainly applicable for multi scale images. Face recognition systems are mostly used as a mass security measure and user authentication and so forth; the faces can be easily recognized by humans, but automatic recognition of face by machine is a difficult and complex task. Furthermore, it is not possible that a human being always conveys the same expression of face. The expression of human face randomly changes with respect to his mood. Thus, it becomes more challenging task to compare face under different emotions with only neutral faces which are stored in the database. Many approaches have been proposed for face recognition. The SIFT has properties to match different images and objects [1]. The SIFT algorithm extracts the interesting key points from an image to produce a feature description. These extracted features are invariant to orientation, scaling, illumination changes, and affine transforms; therefore, they are very well suited for face description.

SIFT: The SIFT algorithm ensures that these descriptors are mostly invariant to in-plane rotation, illumination and position. So if a feature from one image is to be matched with the corresponding feature in another image, their descriptor needs to be matched to find the closest matching feature. For any object there are many features, interesting points on the object, that can be extracted to provide a "feature" description of the object. This description can then be used when attempting to locate the object in an image containing many other objects. There are many considerations when extracting these features and how to record them. SIFT image features provide a set of features of an object that are not affected by many of the complications experienced in other methods, such as object scaling and rotation. While allowing for an object to be recognized in a larger image SIFT image features also allow for objects in multiple images of the same location, taken from different positions within the environment, to be recognised. SIFT features are also very resilient to the effects of "noise" in the image.

The SIFT approach, for image feature generation, takes an image and transforms it into a "large collection of local feature vectors" (From "Object Recognition from Local Scale-Invariant Features", David G. Lowe). Each of these feature vectors is invariant to any scaling, rotation or translation of the image. This approach shares many features with neuron responses in primate vision. To aid the extraction of these features the SIFT algorithm applies a 4 stage filtering approach:

Scale-Space Extreme Detection: This stage of the filtering attempts to identify those locations and scales that are identifiable from different views of the same object. This can be efficiently achieved using a "scale space" function. Further it has been shown under reasonable assumptions it must be based on the Gaussian function. The scale space is defined by the function:

$$L(x, y, \sigma) = G(x, y, \sigma) * I(x, y)$$

Where * is the convolution operator, $G(x, y, \sigma)$ is a variable-scale Gaussian and $I(x, y)$ is the input image. Various techniques can then be used to detect stable key point locations in the scale-space. Difference of Gaussians is one such technique, locating scale-space extreme, $D(x, y, \sigma)$ by computing the difference between two images, one with scale k times the other. $D(x, y, \sigma)$ is then given by:

$$D(x, y, \sigma) = L(x, y, k\sigma) - L(x, y, \sigma)$$

To detect the local maxima and minima of $D(x, y, \sigma)$ each point is compared with its 8 neighbours at the same scale, and its 9 neighbours up and down one scale. If this value is the minimum or maximum of all these points then this point is an extreme.

II. RELATED WORK OF SIFT

Feature Detectors Feature detection is a process to examine every pixel to see if there is a feature present at that pixel. For human action recognition, regions (patches) centered at the detected pixels can be cropped with calculated spatial and temporal scales and orientations. Algorithms used to generated features and patches can be referred to as feature detectors. Feature detectors usually select spatio-temporal locations, scales and orientations in video by maximizing specific saliency functions.

Feature Descriptors Feature descriptors are used to describe the detected regions in a representation that is ideally invariant to background clutter, appearance and occlusions, and possibly to rotation and scale Poppe (2010). The spatial and temporal size of a patch is usually determined by the scale of the interest point. For example, after feature detectors detected the features centered at (x, y, t) with the spatial size defined by σ and temporal size defined by τ, the corresponding 3D patch can be cropped, and the feature descriptor is used to summarize the information within that patch.

III. PROBLEM STATEMENT

The problem defined in this system is the time required to extract the invariant features from the images very extracted very slow. In order to reduce the time consumption for feature extraction method and to improve the efficiency of the SIFT algorithm the histogram method is used.

IV. SYSTEM ARCHITECTURE

The presented system has a architecture. It is composed of different modules connected by dependencies The input image and the recognition results.

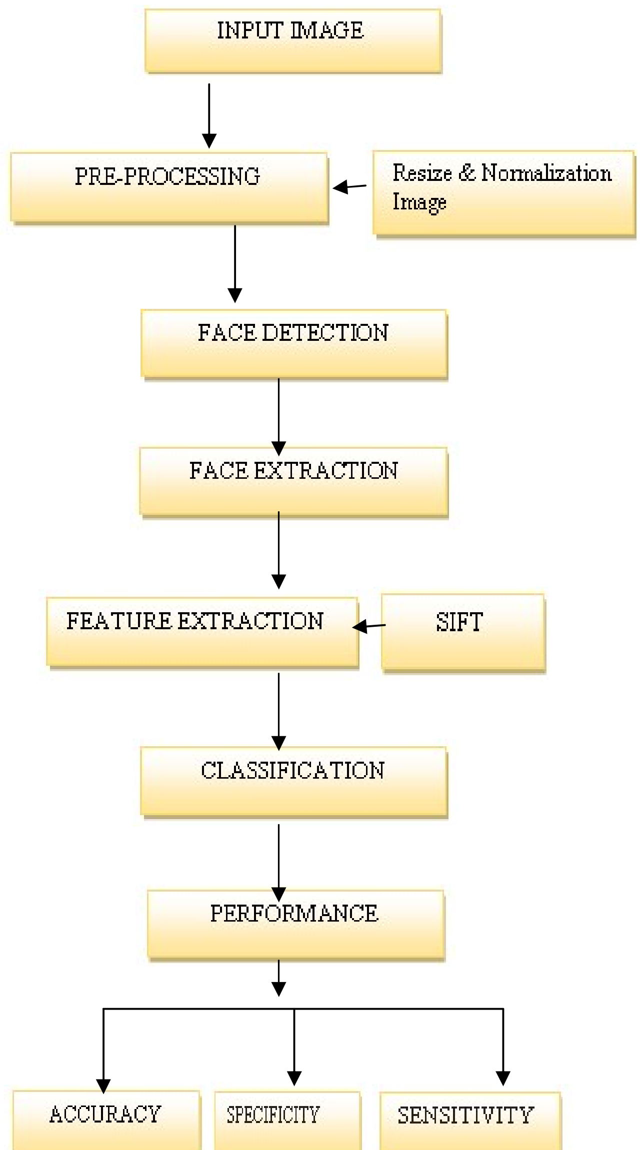

Fig.1. proposed flow chart.

- The storage of the face representation is shown by the Face Gallery. Images taken from data set gallery the first module deals with Resize & Normalization followed by pre-processing this pre-processing module converts a color image into its grey-scale representation, then it performs face detection.
- The detected face is further extracted from the image in the next step.
- This module also detects the face of object in the detected face region and transforms and resizes the face. The feature extraction module is used to create the face representation. It detects the SIFT key-points and creates a set of SIFT descriptors for a representation of the face image.
- The next module is used to select the most representative face vectors in order to create a precise face model The algorithm implemented within this module
- Then face recognition. A recognized face is compared to the face models stored in the Face Gallery and the most similar model is chosen as the recognized one.
- The last confidence measure module is dedicated to identifying whether the recognition result is correct or not followed by classifier.

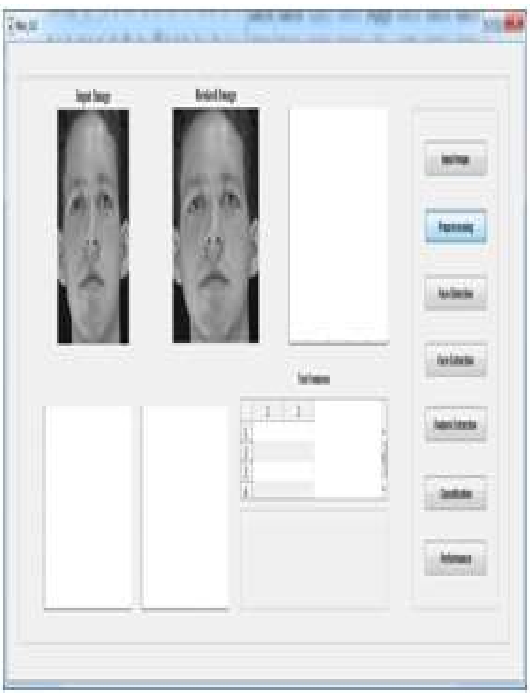

Fig.2. GUI Window.

The storage of the face representation is shown by the Face Gallery. Images taken from data set gallery the first module deals with Resize & Normalization followed by preprocessing this preprocessing module converts a color image into its grey-scale representation, then it performs face detection.

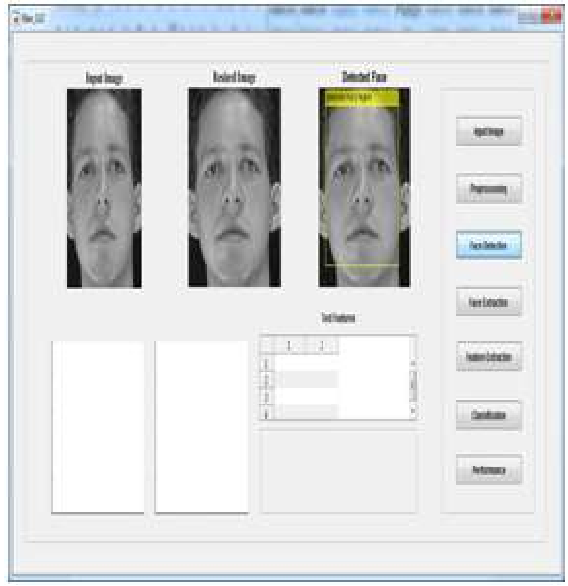

Fig.3. GUI Window Detected Face.

Then face recognition. A recognized face is compared to the face models stored in the Face Gallery and the most similar model is chosen as the recognized one

Fig.4. GUI Window Extracted Region.

This module also detects the face of object in the detected face region and transforms and resizes the face. The feature extraction module is used to create the face representation. It detects the SIFT key-points and creates a set of SIFT descriptors for a representation of the face image

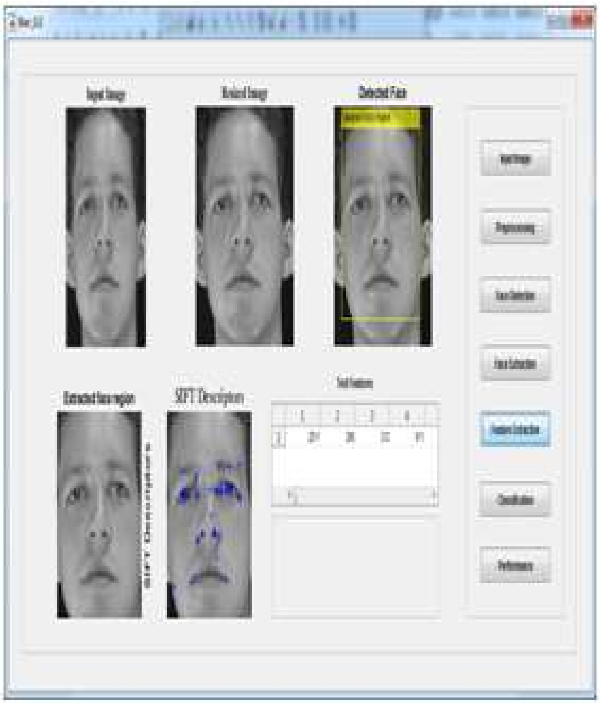

Fig.5. GUI Result Window.

module is used to select the most representative face vectors in order to create a precise face model The algorithm implemented within this module

Table 1. Parameters values.

	Parameters	
S. No.	Existing System [M. Sushama]	Proposed System
1	Accuracy	98.7287
2	Sensitivity	98.7287
3	Specificity	99.538

The last confidence measure module is dedicated to identifying whether the recognition result is correct or not followed by classifier.

CLASSIFICATION The goal of a classifier is to compare the features of a test face image with those of the template and give the final decision in terms of some similarity measures. For face identification, the most widely used classifier is the Nearest Neighbor (NN) classifier. An important issue for designing the NN classifier is how to measure the similarity. A direct way is to measure how similar the two compared images are. Another possible way is to compute the distance between the two image features.

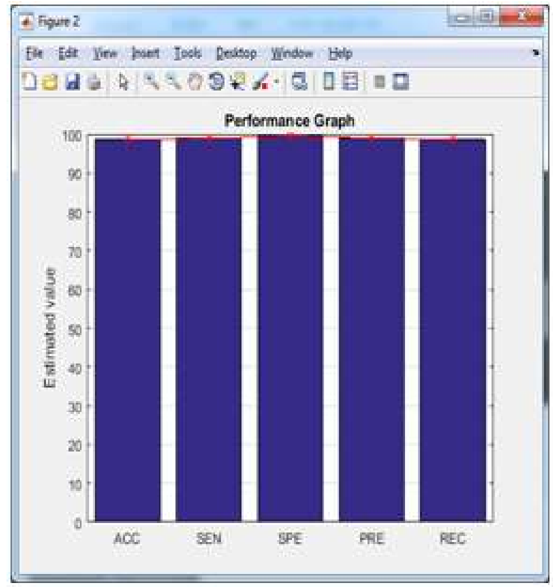

Fig.7. Performance Graph.

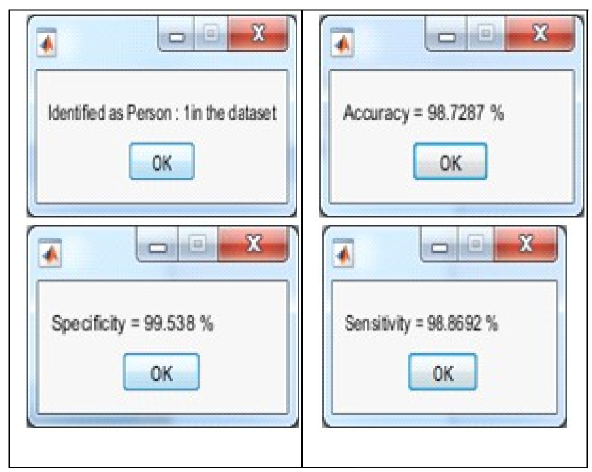

Fig.8. Parameters.

V. CONCLUSION

In this paper we came into an approach for Face recognition using DRLBP &SIFT Feature Extraction. This can be used by ATM Securities and many more Home appropriate military services. This idea has come through the criminal detection that could help policemen to identify the face of the criminal. Paper on face recognition. This paper is used to find number of true faces and number of false faces are identified. Hence, their accuracy for finding the images is 99% We proposed a framework on can be face recognition using dominant rotate local binary pattern and scale invariant feature extraction to detect whether the person is an authenticate or an unauthenticated. Hence by using the parameters like sensitivity, specificity and accuracy has high performance Accuracy-

99.538%Sensitivity-98.7287%, Specificity-98.7287% carried out by matlab simulation The novelty of the method is reduced database size, as it requires only neutral images to store instead of all the expressions of the same face image

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