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# A Review on Face Recognition Using SIFT Feature Extraction

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***Abstract -*** **A facial recognition system is a computer application capable of identifying a person from a digital image or a video frame from a video source. One of the ways to do this is by relating particular facial features from the image and a face database. Recently Face recognition has received a lot of attention in biometrics, computer vision and network multimedia information access. Various methods are used for it. Comparison of various face recognition techniques has been done by several people. But so far no technique exists which has shown satisfactory results under all conditions. The system proposes new approach in extension with local binary pattern called DRLBP. By using these methods, the category recognition system will be developed for application to image retrieval. The category recognition is to classify an object into one of several predefined categories. The discriminative robust local binary pattern (DRLBP) is used for different object texture and edge contour feature extraction process. It is robust to illumination and contrast variations as it only considers the signs of the pixel differences. The proposed features retain the contrast information of image patterns. They contain both edge and texture information which is desirable for object recognition, the simulated results will be shown that used discriminative robust local binary pattern has better discriminatory power and recognition accuracy compared with prior approaches.**

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

## I. INTRODUCTION

Computer Vision and image processing has been one of the most exciting and important research fields in the earlier three decades. A complete review of all face recognitions systems is not a simple task. Hence, only a cluster of the most useful systems will be discussed in this paper. The reasons come from the need of automatic recognitions and surveillance systems, the interest in human visual system on face recognition, and the design of human-computer interface. Face recognition can be used for both verification and identification. In face recognition system it identifies faces present in the images and videos automatically. It is classified into two categories a. Face verification or Face authentication b. Face identification or Face recognition In face verification or authentication there is a one-to-one similar that relates a query face image against a template face image whose identity is being claimed. In face identification or recognition there is a one-to-many similar that relate a query face image against all the template face images in the database to determine the identity of the query face image. Another face recognition scenario involves a watch-list check, where a query face is matched to a list of suspects. The performance of face recognition systems has improved significantly since the first automatic face recognition system was developed [1]. The identification of a person by their facial images can be Done in a number of various ways such as by capturing an image of the face in the visible spectrum using an inexpensive camera or by using the infrared patterns of facial heat emission. Facial Recognition in visible light typically model key features from the central portion of the facial image using a wide assortment of cameras in visible light system extract features from the captured images that do not change over time while avoiding superficial features such as facial expression or hair. Several methods to model facial images in the visible spectrum are Principal Component Analysis (PCA) [2], local feature analysis, Neural Network [3], multire solution study etc. The challenges of facial recognition in the visible spectrum contain decreasing the impact of variable lightning and detecting a mask or photograph. Some facial recognition systems may require a stationary or posed user in order to capture image through many systems, though many systems use a real time process to detect a person's head and locate the face automatically. Major benefits of facial recognition are that it is non intrusive, hand free, continuous and accepted by most users. The access to restricted systems has mostly been controlled by knowledge-based (pin, password) or token-based (ID cards) security. However, these traditional identity management techniques can easily fail when a password is stolen or the card is lost. The technologies of biometric recognition are highly desired to address these problems. Biometrics use the physiological or behavioral

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characteristics to recognize the identity of an individual. These characteristics are something you possess rather than something you know thus offering a natural, reliable and user-friendly solution to identity management [33, 45]. Face recognition is one of the most widely used biometric systems due to its non-intrusive, natural and easy to use characteristics. Many advanced technologies and commercial systems for face recognition have been developed. These have been summarized in Face Recognition Systems A face recognition system can be either a verification system or an identification system depending on different applications. In the verification system, there is a pre-enrolled template set. Given a query image, the goal is to decide whether the query image comes from the same individual represented by the claimed target template. It performs a one to one comparison to determine whether the person presenting herself/himself to the system is the person she/he claims to be For the face recognition task, we use the SIFT based Kepenekci method which combines the efficient SIFT algorithm with the adapted Kepenekci matching. This algorithm was chosen, because as proven previously, it significantly outperforms the other approaches particularly for lower quality real data. Note that the above mentioned modifications do not influence the applicability of the original Kepenekci method. Moreover, this approach is not limited by the image resolution.

**Scale Invariant Feature Transform** The Scale Invariant Feature Transform algorithm basically has four steps: extreme detection, removal of key-points with low contrast, orientation assignment and descriptor calculation [1].

**Extreme Detection** The Difference of Gaussian (DoG) filter is applied to the input image. The image is gradually down-sampled and the filtering is performed at several scales. Figure 4 demonstrates the process of the creation of DoG filters at different scales [7]. Filtering at several scales ensures scale invariance. Each pixel is then compared with its neighbors. Neighbors on its level as well as on the two neighboring (lower and higher) levels are examined. If the pixel is the maximum or minimum of all the neighboring pixels, it is considered to be a potential key-point.

**Low Contrast Key-Point Removal** the detected key-points are further examined to choose the "best" candidates. For the resulting set of key-points their stability is determined. Locations with low contrast and unstable locations along edges are discarded

**Orientation Assignment** The orientation of each key-point is computed. The computation is based upon gradient orientations in the neighborhood of the pixel. The values are weighted by the magnitudes of the gradient.

Descriptor Calculation The final step consists in the creation of descriptors. The computation involves the 16 × 16 neighborhood of the pixel. Gradient magnitudes and orientations are computed in each point of the neighborhood. Their values are weighted by a Gaussian. For each sub-region of size 4 × 4 (16 regions), orientation histograms are created. Finally, a vector containing 128 (16 × 8) values is created. . SIFT based Kepenekci Method the original Kepenekci method achieves very good accuracy. We modified this approach by replacing the features obtained using Gabor wavelet filters with the SIFT features. The original Kepenekci matching was simplified by removing the "similarity" threshold which excludes some feature vectors from the matching procedure. We

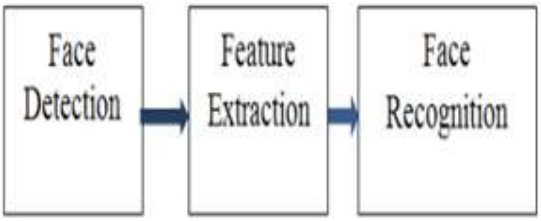

Fig.1 SIFT Block Diagram.

Face detection is defined as the process of extracting faces from scenes so as to enable the system to identify a certain image region as a face positively. It has many applications like face tracking, pose estimation or compression. 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 [82]. Finally, the system does recognize the face. This phase involves a comparison method, a classification algorithm and an accuracy measure.

## II. LITERATURE REVIEW

Many previous image processing methods discard low frequency components of images to extract illumination invariant for face recognition. However, this method may cause distortion of processed images and perform poorly under normal lighting. Although 3D face imaging is increasingly popular, many 3D facial imaging systems have significant noise components which need to be reduced by post-processing if meaningful recognition results are desired. Biometric image recognition is the process of studying the closest match region in between the examining images. The study of the recognition is done about the spatial pixels (picture element) among the image. Recognition of two different biometric features, fingerprint and face images are attempted. One of the major challenges encountered by current Face

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Recognition (FR) techniques lies in the difficulties of handling varying poses and illuminations. In this paper we propose three novel techniques, viz. Face Recognition (FR) under varying lighting conditions and pose is very challenging. This paper proposes a novel approach for enhancing the performance of a FR system, employing a unique combination of Active Illumination Equalization (AIE), Image Sharpening (IS) The appearance of the face varies drastically when background, pose and illumination change. Variations in these conditions make Face Recognition (FR)

M. Sushama et.al The detection of human face from images plays a vital role in Computer vision, cognitive science and Forensic Science. The various computational and mathematical models, for classifying face including Scale Invariant Feature Transform (SIFT) and Dominant Rotated Local Binary Pattern (DRLBP) have been proposed to yield better performance. This paper proposes a novel method of classifying the human face using Artificial Neural Network. This is done by pre-processing the face image at first and then extracting the face features using SIFT. Then the detection of human faces is done using Back Propagation Network (BPN). The process of combining

Nthabiseng et.al The choice of a face database should solemnly depend on the problem to be solved. In this research work, we use the Face Recognition Technology (FERET) database to address the challenge of face pose variations. The Scale Invariant Feature Transform (SIFT) is used to represent these face images in the database. SIFT has been proven to be a robust and a powerful method for general object detection in the past years. This method is now popular in the field of face recognition for purposes of extracting key points which are scale and orientation invariant from the face image. This work demonstrates that through extracting SIFT features from different face image patches and at different sigma  values, a face pose can be classified towards better pose invariant face recognition.

Lilly Jebarani et.al In re cent days, a number of face recognition and authentication mechanisms are developed in the computer vision applications. The human faces may be obstructed by other object that makes the acquisition of fully holistic image processing as a complex task. To overcome this problem, a new partial face recognition system is introduced in this paper. This work includes the pre-processing, face detection, feature extraction and classification tasks. At first, the given face image is pre-processed by using the Gaussian filtering technique, which efficiently removes the noise and smoothens the image. Then, the Viola Jones algorithm is implemented to detect the face from the filtered image. Here, the Scale Invariant Feature Transformation (SIFT) technique is employed to extract the features for better classification. After that, the Robust Point Set Matching (RPSM) technique is used to align the probe partial face to gallery facial images even with the presence of occlusion, random partial crop and exaggerated facial expression. Finally, the Probabilistic Neural Network (PNN) classification technique is developed to classify the given face image. The experimental results evaluate the performance of the proposed face recognition system in terms of sensitivity, specificity, accuracy, precision and recall.

T. Kamalaharidharini et.al In recent days, there has been increasing need for recognition of unconstrained face images, such as those collected from the web or captured by mobile devices and video surveillance cameras. In such real world scenarios, human faces could be easily occluded by other objects that make the face recognition task as a complex one. Satisfactory performance has been achieved earlier but often only in the controlled environments. But it is very tedious to obtain holistic face images for unconstrained face recognition. Thus, in order to avoid the degradation of face images and the huge variations due to illumination, pose, occlusion and expression, a new Robust Face Recognition approach is proposed. In this approach, the partial face recognition using Scale Invariant Feature Transform (SIFT) technique is combined with Multi-directional Multi-level Dual Cross Patterns (DCP) technique that makes the recognition task as a robust one when compared to other face recognition approaches. Then, the Robust Point Set Matching (RPSM) is used to match the corresponding stable keypoints from both the gallery image and probe face image. Finally, PNN and K-NN classification are used to classify the face images even with the presence of occlusion, random partial crop, illumination, pose and exaggerated facial expression. The proposed robust face recognition system is evaluated based on the performance parameters such as sensitivity, specificity, accuracy, precision and recall.

S. R. Khot et.al An image matching algorithm is present in this paper. A set of interest points known as SIFT features are computed for a pair of images. Every key point has a descriptor based on histogram of magnitude and direction of gradients. These descriptors are the primary input for the image correspondence algorithm. Initial probabilities are assigned for categories considering a feature point assignment to one of the category as a classification problem. For selecting the neighbours for the left key point, a fixed number of pixels around the key point, considered as a window, are selected. The neighbors of the right key point are based on inspection of pair of images and the disparity range. The probabilistic estimates are iteratively improved by a relaxation labeling technique. The neighbor key points which will contribute to improve the probability is based on consistency property.

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## III. SIFT ALGORITHM

SIFT algorithm can be divided into two major modules They are key point detection Module and descriptor generation module. The SIFT algorithm is mainly divided as four main steps:

- Scale Space Extrema Detection
- Key point Localization
- Orientation Assignment
- Key point Descriptor
- Scale-Space Extrema Detection

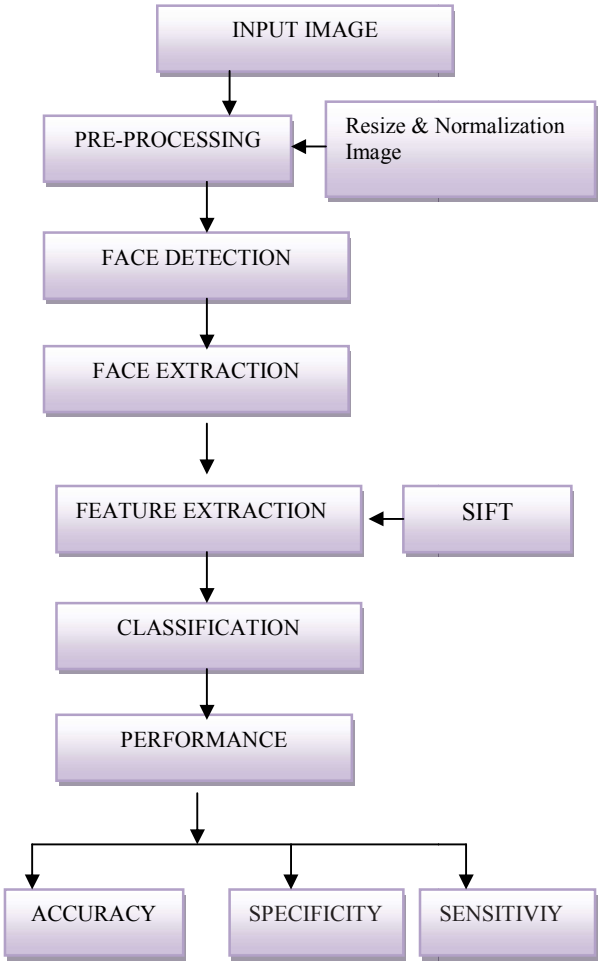


Fig.2. Proposed flow chart.

This is the first stage where the interest points, that is key points in the SIFT framework, are detected. In this stage, the Gaussian filter is applied at different and then the difference of successive Gaussian blurred images taken. Then the key points that are maximum or minimum occur at multiple scales. Specifically, a DoG of the image is represented as

D( x,y,□)=D(x,y,ki□)-D(x,y,kj□) (1)

Where L(x,y,k □) is the convolution of the image and the image is represented as I(x,y) and its Gaussian blur is G(x,y, k □) at scale, i.e;

L(x,y, k □)=G(x,y, k □)*I(x,y) (2)

Hence a Dog image between scales ki□ and kes j□ is the difference of the Gaussian blurred images at scales ki□ and kj .the Gaussian blur is applied at different scales and the convolved images are grouped by octave. Fixed number of convolved images is obtained and DOG is calculated from that images.

Key point Localization The key points are chosen with high contrast point. The Taylor expansion of DOG scale-space function and the candidate key point is taken as the origin. Representation and modules M4 and M5 are used only for recognition. The last remark is that every module should be used separately in order to create another face processing system.

## IV. 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. 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 will be carried out by matlab simulation

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