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A Review of Face Recognition Using SIFT Feature Extraction

Prof. Shubha Dubey, Ravina Meena
Department of Computer Science & Engineering,
Sagar Institute of Research & Technology College,Indore,MP,India
www.sageuniversity.in

***Abstract*- Face detection may be defined as the process of determining whether face is present or not in a given image, if present, then the location of the face is notified. Face can be detected in colour or single intensity, single image or video sequence (single image/frame taken at a time).Another term closely related to face detection is face localization. It may be defined as determining position of single face in a given image. The difference is that in face localization it is assumed that only one face is present in the input image. But in the face detection presence of face either one or many is not known prior. Facial feature detection is to detect the presence and location of facial features like eyes, eyebrow, nose, nostrils, mouth, lips and ears. Automatic Face Recognition aims to use pattern recognition technology to identify people in photos or videos. Automatic face recognition has been widely used in applications from social media to advanced authentication systems. Face recognition technology is very mature. In an unlimited real environment, automatic recognition of faces from digital cameras is still very challenging because it involves important changes in acquisition conditions, facial expressions and attitude changes. Therefore, the key challenges in this area as well as developed solutions and applications based on imaging and machine learning technologies are introducing the topic of automatic computer face recognition.**

***Keywords*- Face Recognition SIFT, DRLBP.**

I. INTRODUCTION

Face Recognition is the ability to establish a person's 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, respectively. face recognition is a relatively new concept of the 60's. The first semi-automated system for face recognition [1] was designed to locate features such as eyes, ears, nose, and mouth on the photographs by comparing the distances and ratios with some reference data.

In the 1970s, Goldstein et.al. [14] Used 21 specific subjective markers such as hair colour and lip thickness to automate the recognition. In these early solutions, the measurements and locations were manually computed.

In 1988, Kirby and Sirovich [35] had applied principle component analysis (PCA) to the face recognition problem. This was considered to be a milestone in terms of obtaining reduced samples for coding a suitably aligned and normalized face image accurately. In 1991, Turk and Pentland [130] have shown that the residual error could be used to detect face images in using the eigenfaces techniques. This has enabled reliable real-time automated face recognition systems.

Although the approach was somewhat constrained by factors like illumination and pose variations, it nonetheless created significant interest in further development of automated face recognition techniques Configuration of a general face recognition structure Face Detection:

The main function of this step is to determine

- Whether human faces appear in a given image, and
- Where these faces are located at.

The expected outputs of this step are patches containing each face in the input image. In order to make further face recognition system more robust and easy to design, face alignment are performed to justify the scales and orientations of these patches. Besides serving as the pre-processing for face recognition, face detection could be used for region-of-interest detection, retargeting, video and image classification, etc.

Feature Extraction: After the face detection step, human-face patches are extracted from images. Directly using these patches for face recognition have some disadvantages, first, each patch usually contains over 1000 pixels, which are too large to build a robust recognition system1.

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Second, face patches may be taken from different camera alignments, with different face expressions, illuminations, and may suffer from occlusion and clutter. To overcome these drawbacks, feature extractions are performed to do information packing, dimension reduction, salience extraction, and noise cleaning.

After this step, a face patch is usually transformed into a vector with fixed dimension or a set of fiducially points and their corresponding locations. We will talk more detailed about. In some literatures, feature extraction is either included in face detection or face recognition. Face Recognition: After formulizing the representation of each face, the last step is to recognize the 1 we'll introduce the concept of "curse of dimensionality identities of these faces.

In order to achieve automatic recognition, a face database is required to build. For each person, several images are taken and their features are extracted and stored in the database. Then when an input face image comes in, we perform face detection and feature extraction, and compare its feature to each face class stored in the database.

There have been many researches and algorithms proposed to deal with this classification problem, and we'll discuss them in later sections. There are two general applications of face recognition, one is called identification and another one is called verification. Face identification means given a face image, we want the system to tell who he / she is or the most probable identification; while in face verification, given a face image and a guess of the identification, we want the system to tell true or false about the guess. an example of how these three steps work on an input image.

Biometric Recognition Biometrics are automated methods of recognizing a person based on a physiological or behavioural characteristic. Among the features measured are: face, fingerprints, hand geometry, handwriting, iris, retinal, vein, and voice. Biometric technologies are becoming the foundation of an extensive array of highly secure identification and personal verification solutions. As the level of security breaches and transaction fraud increases, the need for highly secure identification and personal verification technologies is becoming apparent.

Biometric- based [1] solutions are able to provide for confidential financial transactions and personal data privacy. Enterprise-wide network security infrastructures, government IDs, secure electronic banking, investing and other financial transactions, retail sales, law enforcement, and health and social services are already benefiting from these technologies. Utilizing biometrics for personal authentication is becoming convenient and considerably more accurate than current methods (such as the utilization of passwords or PINs) Biometric System A biometric system is essentially a pattern recognition system that operates by acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing this feature set against the template set in the database.

II. LITERATURE REVIEW

Enjie Jiang 2020: The birth of face recognition technology began in the 1960s and has undergone an overall development process: based on facial structural features (1970-1990), statistical features (1991-2000), big data, and complex algorithms (2001 to present). Among them, the first phase of face recognition technology is mainly to establish a grayscale image model by studying facial features, but at the same time it can not complete automatic recognition.

In the second step, multidimensional function vectors are used to represent facial features, and previous empirical knowledge should be used to judge. With the development of artificial intelligence, modern face recognition technology combines artificial intelligence, machine learning, image processing and other technologies to investigate the problem of face recognition under realistic conditions. Face recognition technology based on artificial intelligence algorithms, through the establishment of face models, face function representation, the accuracy of the algorithm and other influencing factors, the advantages and disadvantages of each face recognition algorithm in different areas are analyzed, and then these problem was analyzed. The algorithm is evaluated and prospected.

Yongjing Lin; Huosheng Xie 2020: Automatic face recognition is a widespread task in computer vision. It's easy for humans, but very challenging for computers. A face assessment classification algorithm based on the face recognition function vector is proposed. First, face recognition and pre- treatment are performed on the input image, and the face is adjusted to a uniform format. Second, the face recognition model is used to extract function vectors as a representation of the face in the function area.

Finally, machine learning methods are used to classify the extracted function vectors. At the same time, this study uses t-distributed Stochastic Neighbor Embedding (T-SNE) to visualize face recognition function vectors to verify the effectiveness of face recognition function vectors on gender classification problems. The degree of recognition of the proposed method on the FEI dataset and the SCIEN dataset is 99.2% and 98.7% respectively. In addition, its recognition rate on the Asian facial data set has reached 97.4%, which is better than existing methods, indicating that this method is useful for facial gender research.

Vladimir Sivtsov 2020: Face recognition is a technology that uses a person's face image to verify their identity by finding the person in a given photo database. It becomes

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very convenient in the access control system because it does not require any physical interaction to achieve the traditional entered access method.

Moreover, these systems only require a camera to identify them and are easy to install and use. Therefore, companies have used them for access control in offices, home automation systems, etc. This article studies different face recognition methods. The first step in any face recognition system is face recognition and cropping, so we analyzed the classic Viola-Jones face recognition and multitask folding neural network (MTCNN) in terms of detection quality and processing time. The online camera takes pictures from a given database. We are also considering reducing the vulnerability of independent face recognition by adding spoofing detection methods so that the system does not respond to any method of bypassing the system, like displaying a photo of an authorized person on a phone screen.

Wang; Hongzhi Yu; 2020: With the development of computer vision and artificial intelligence, face recognition has been used a lot in everyday life. As one of the most concerned methods in biometric technology, face recognition has become one of the research hotspots in computer vision and artificial intelligence. However, face recognition is easily affected by internal and external differences, and traditional face recognition methods are usually difficult to achieve ideal results.

To further improve the recognition accuracy of current face recognition algorithms, a face recognition algorithm based on improved degradation neural network is proposed. Experiments show that the improved algorithm can be effectively applied to datasets

Nawaf Alsrehin 2020: Face recognition is the process of recognizing people through facial features in digital images or video frames. Face recognition has a wide range of applications and future technology will evolve tremendously. The main contribution of this research is to conduct a comparative study of different statistics-based face recognition technologies, namely: self-surface, Fisher face and local binary pattern histogram (LBPH) to use real database images to measure its effectiveness and efficiency.

These recognizers are still used in commercial face recognition products. In addition, this research extensively compares the 17 facial recognition technologies using artificial neural networks used in research and industry, critiques them, and categorizes them into understandable categories. In addition, this research provides some directions and suggestions for overcoming the direct and indirect problems of face recognition. It has been found that there is no existing recognition method agreed upon by the face recognition community and that it cannot solve all the problems that face recognition faces, such as various bag changes, lighting, blurring and low resolution images.

This research is very important for the recognition community, software companies and public security officials. It has a direct impact on drawing a clear path to the new face recognition proposal. This study is one of the studies on the scope of its review methods and techniques.

Abul Abbas Barbhuiya 2020: In recent years in the computer vision society, research into pattern recognition and biometric technology has received considerable attention, but there are still many problems in practical applications. This paper makes a detailed and direct comparison between the two face recognition algorithms, namely principal component analysis (PCA) and Fisher linear discriminant (FLD).

The PCA projects the image on the first few main components, the most important component is the direction that maximizes the variance of the projected image, and the final main component captures the direction that minimizes the variance between the images. Although light and facial expressions vary widely, FLD creates a set of images in the same category and creates images in different categories.

The function vector in the face dataset is used as an important function for classification. Six facial databases (FEI facial database, Face94'Essex facial database, CASIA, FERRET database and NITH facial database) are used here for performance comparison. These six databases provide comprehensive datasets for testing the performance of PCA and FLD algorithms.

Chao Qi; Lei Yang 2020: In this epidemic situation, face recognition technology wearing masks provides convenience to humans and reduces the risk of viral infection caused by removal of the mask. Face recognition technology is based on extracting a large number of facial features to judge.

At present, the main implementation method for masked face recognition technology is to improve the recognition of key areas such as eyes and eyebrows through model training. The LBP function (local binary pattern) is a function that effectively depicts the structure of the face image, which can further increase the robustness of the face recognition method.

Based on the above analysis, this paper uses an enhanced multi-task cascade neural network to detect the occluded area caused by the mask and then find the LBP function in the non-occluded area and finally the input function in the support. Face recognition vector machine

III. SIFT ALGORITHM

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SIFT is quite an involved algorithm. There are mainly four steps involved in the SIFT algorithm. We will see them one-by-one.

- **Scale-Space Peak Selection:** Potential location for finding features.
- **Keypoint Localization:** Accurately locating the feature keypoints.
- **Orientation Assignment:** Assigning orientation to keypoints.
- **Keypoint Descriptor:** Describing the keypoints as a high dimensional vector.

1. Keypoint Matching:

1.1 Scale-Space : Real-world objects are only meaningful on a certain scale. You may see a sugar cube perfectly on the table. But if you look at the whole galaxy, it does not exist at all. This object on several scales is very common in nature. Scale Space is trying to replicate this concept on digital images.

Fuzzification

In one octave, the image is gradually blurred using the Gaussian blur operator. In mathematics, "blurring" is called mixing the Gaussian operator with the image. Gaussian blur has a specific term or "operator" that applies to each pixel. The result is a blurry image.

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

G is the Gaussian Blur operator and I is an image. While x,y are the location coordinates and σ is the "scale" parameter. Think of it as the amount of blur. Greater the value, greater the blur.

$$G(x, y, \sigma) = \frac{1}{2\pi\sigma^2} e^{-(x^2+y^2)/2\sigma^2}$$

1.2 Finding Key Points: So far, we have generated a scale range and used the scale range to calculate the Gaussian difference. They are then used to calculate the Laplacian of the Gaussian approximation with invariant scale.

Compare one pixel in the image with its 8 neighbours, 9 pixels on the next scale and 9 pixels on the previous scale. In this way, a total of 26 inspections were carried out. If it is a local extremum, it may be a key point. Basically, the key point is the best representative.

1.3 Keypoint Localization: The local gradient data used is also used to create keyboard descriptors. Rotate the gradient information to align it with the direction of the key point, and then weight it by Gaussian with a variance of 1.5 * key point ratio. This data is then used to create a set of histograms on a window centered on the key points. The keypoint descriptor typically uses a set of 16 histograms aligned in a 4x4 grid, each histogram having 8 orientation trays, one for each main compass direction and one for each midpoint in these directions. This results in a function vector containing 128 elements.

These generated vectors are called SIFT keys and are used in the nearest neighbor method to identify possible objects in the image. When three or more keys are uniform in model parameters, a set of keys is identified that is consistent in possible models, and the model is highly likely in the image.

Due to the large number of SIFT keys in the object image, a 500x500 pixel image is usually generated in an area with 2000 functions, so although the image can still be recognized by this technology, there may be a large amount of occlusion, thank you see Recognition of objects locally invariant is this example.

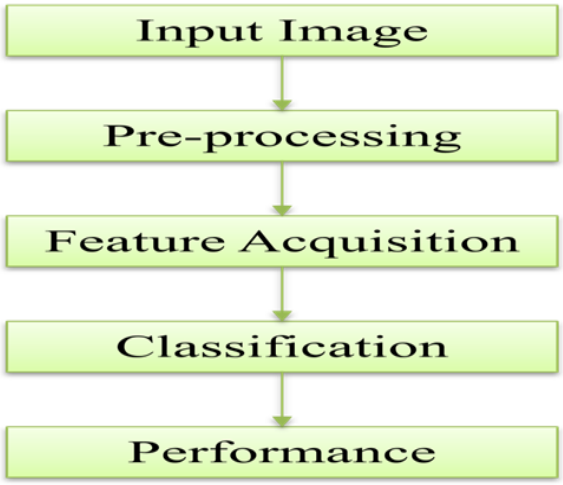

Fig 1. Proposed Flow Chart.

IV. CONCLUSION

In this article, we introduce a face recognition method using DRLBP and SIFT function extraction. ATM securities and several military services suitable for domestic use can use this feature.

This idea is realized through the investigation of criminals and it can help the police identify the faces of criminals. This article is used to find the number of real faces and the number of wrong faces. Therefore, they found that the accuracy of the image was 99%.

We propose a framework that can use dominant rotating local binary patterns and scale-invariant feature extraction to detect whether a person is a real identity or unauthorized face recognition. Therefore, it can be performed using parameters such as sensitivity, specificity and accuracy using mat lab simulation.

REFERENCES

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[1] Face Recognition Using DRLBP and SIFT Feature Extraction M. Sushama E.Rajinikanth 2018 International Conference on Communication and Signal Processing (ICCSP).
[2] A review of the comparative studies on traditional and intelligent face recognition methods Enjie Jiang 2020 International Conference on Computer Vision, Image and Deep Learning (CVIDL) Year: 2020 | Conference Paper | Publisher: IEEE DOI: 10.1109/CVIDL51233.2020.00010.
[3] Face Gender Recognition based on Face Recognition Feature Vectors Yongjing Lin; Huosheng Xie 2020 IEEE 3rd International Conference on Information Systems and Computer Aided Education (ICISCAE) Year: 2020 | Conference Paper | Publisher: IEEE DOI: 10.1109/ICISCAE51034.2020.9236905.
[4] Access Control System Based on Face Recognition Sergei Shavetov; Vladimir Sivtsov 2020 7th International Conference on Control, Decision and Information Technologies (CoDIT) Year: 2020 | Volume: 1 | Conference Paper | Publisher: IEEE DOI: 10.1109/CoDIT49905.2020.9263894.
[5] Face Recognition System Based on CNN Di Wang; Hongzhi Yu; Ding Wang; Guanyu Li 2020 International Conference on Computer Information and Big Data Applications (CIBDA) Year: 2020 | Conference Paper | Publisher: IEEE DOI: 10.1109/CIBDA50819.2020.0011.
[6] Face Recognition Techniques using Statistical and Artificial Neural Network: A Comparative Study Nawaf Alsrehin; Mu'tasem A. Al-Taamneh 2020 3rd International Conference on Information and Computer Technologies (ICICT) Year: 2020 | Conference Paper | Publisher: IEEE DOI: 10.1109/ICICT50521.2020.00032.
[7] Face Recognition Using Computational Efficient Algorithms Rahul Jain; Ram Kumar Karsh; Abul Abbas Barbhuiya 2020 4th International Conference on Electronics, Materials Engineering & Nano-Technology (IEMENTech) Year: 2020 | Conference Paper | Publisher: IEEE DOI: 10.1109/IEMENTech51367.2020.9270115.
[8] Face recognition in the scene of wearing a mask Chao Qi; Lei Yang 2020 International Conference on Advance in Ambient Computing and Intelligence (ICAACI) Year: 2020 | Conference Paper | Publisher: IEEE DOI: 10.1109/ICAACI50733.2020.00021.
[9] Representation of Pose Invariant Face Images Using SIFT Descriptors Nthabiseng Mokoena; Kishor Nair 2018 International Conference on Advances in Big Data, Computing and Data Communication Systems (icABCD).
[10] PNN-SIFT: An enhanced face recognition and classification system in image processing W. Sylvia Lilly Jebarani; T. Kamalaharidharini 2017 4th International Conference on Electronics and Communication Systems (ICECS).
[11] Robust face recognition and classification system based on SIFT and DCP techniques in image processing W.Sylvia Lilly Jebarani; T. Kamala Hari Dharini 2017 International Conference on Intelligent Computing and Control (I2C2).
[12] Image matching with SIFT feature Rajkumar N. Satare ; S. R. Khot 2018 2nd International Conference on Inventive Systems and Control (ICISC).
[13] Moghaddam, C. Nastar and A. Pentland, "A Bayesian similarity measure for deformable image matching," Image and Vision Computing, vol. 19, no. 5, pp. 235-244, 2001.
[14] David G Lowe, "Distinctive Image Features from Scale-Invariant Keypoints," International Journal of Computer Vision, vol.50, No. 2, 2004, pp.91-110.
[15] Karami, M. Shehata, A. Smith, "Image Identification Using SIFT Algorithm: Performance Analysis Against Different Image.
[16] Deformations," in Proceedings of the 2015 New foundland Electrical and Computer Engineering Conference, St. john's, Canada, November, 2015.
[17] Güzel, 'A Hybrid Feature Extractor using Fast Hessian Detector and SIFT', Technologies, vol. 3, no. 2, pp. 103-110, 2015.
[18] Liang-Chi Chiu, Tian-Sheuan Chang, Jiun-Yen Chen and N. Chang, 'Fast SIFT Design for Real-Time Visual Feature Extraction', IEEE Trans. On Image Process., vol. 22, no. 8, pp. 3158-3167, 2013.

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