iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IX **Month of publication:** September 2022

DOI: https://doi.org/10.22214/ijraset.2022.46704

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IX Sep 2022- Available at www.ijraset.com

Enhanced Technique for Multiple Face Detection Based on LBPH (Local Binary Patterns Histograms): A Review

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Abstract: ***Facial recognition has long been an active study area because of its lack of modelling requirements and the wide range of applications. Because of this, daily tasks are increasingly being completed electronically rather than with pen and paper. Currently, computer vision is a broad topic that deals with complex programming by using input images and videos to carry out automatic tasks including detection, recognition, and classification. Face recognition and its applications have recently been regarded as one of the most successful image analysis applications, especially over the past few years. Even deep learning approaches, they are superior to the typical human visual system. Face Recognition is a special technology that uses distinctive facial traits to identify or confirm a person.***
Keywords: Face recognition, feature extraction, OpenCV, Local Binary Pattern Histogram (LBPH)

I. INTRODUCTION

In cases of crowded classrooms, the conventional method for taking attendance was time-consuming and arduous. Manual attendance is expensive, but thanks to modern practical software, the data are kept, and we can provide a report for each student by using cutting-edge capabilities. Many real-time camera-based attendance systems were previously offered to reduce the time required by manual attendance systems, but due to the models' poor forecast accuracy, the institutions did not take them into consideration. Different machine learning and neural network matching methods were used in the earlier models. A set of geometric features of the facial picture must be calculated in order for the geometric feature matching approach to work. A vector indicating the location and size of the general specification. When preparing images for SIFT based feature matching, various layers of Gaussian filters are used; this is followed by using the difference between the Gaussians and the image pyramid. Because it initially recognises the crucial local characteristics before matching with the fitted data set, SURF feature matching is superior to SIFT. Because CNN is a superior mathematical instrument for complex calculations, particularly in 2D images, it outperforms earlier models. Because of the non-linear nature of the neural network's net system, the neural network approach to face recognition is much more straightforward. Because it chooses a linear projection with reduced dimensionality and so increases the dispersion of all predicted models, the features extraction phase is therefore more effective than the linear technique. A non-invasive form of identification is face recognition.

II. RELATED WORK

"Student Attendance System in Crowded Classrooms Using a Smart phone Camera" (Domingo Mery, Ignacio Mackenney and Esteban Villalobos) [21], For busy schools, manually managing the attendance sheets is time-consuming. The automatic student attendance system that may be employed in crowded classrooms and in which the session photos are captured by a smartphone camera is proposed and evaluated in this research. constructing a FaceNet-based smart autonomous attendance system. The system has five main processes: enrollment, image capture in the classroom, face detection and description, database query, and matching algorithm. The records of the pupils are kept in the sqlite3 data base engine. The process of face detection is straightforward. After comparing about 10 different matching algorithms, the deep learning-based FaceNet, which had a 95 percent accuracy rate, was chosen. an accurate, completely annotated dataset .

"Meerkat: A framework for developing presence monitoring software based on face recognition" (P.Assarasee, W.Krathu, T.Triyason, V.Vanijja, and C.Arpnikanondt.)[22] To build a presence monitoring system with session recording feature.to develop a GUI based interface for the users. the Meerkat framework provides a feature for recording the presence of persons and a set of data management methods for users.

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The framework helps users reduce the number of steps in the implementation phase and provides a set of data management methods for users specifically in the form of the presence log. Furthermore, the framework can help users to apply the Face API to build a presence monitoring software faster and easier. It expands Microsoft Cognitive Services and is based on face recognition. During an event, software applications can detect faces with a high degree of accuracy, which ultimately improves the software's capacity for presence monitoring. Research on the experiment with the greater event is ongoing. However, the availability of the Meerkat framework is constrained because it depends on the Microsoft Cognitive Services Face API, which will be impacted if Microsoft services are down.

"LBPH-based Enhanced Real-Time Face Recognition" (Farah Deeba1, Aftab Ahmed, Hira Memon, Fayaz Ali, Abddul Ghaffar) [23], With the help of the input photos or videos, computer vision is a broad field that deals with complex programming to automatically carry out tasks like detection, recognition, and classification. They are superior than the typical human visual system even with deep learning approaches. The development of a facial recognition system based on the Local Binary Pattern Histogram (LBPH) method to handle real-time recognition of the human face in low- and high-level images. Face detection is the process of identifying faces in an image and extracting them for use in other contexts. The Local Binary Patterns (LBP) and Histograms of Oriented Gradients (HOG) descriptors are combined to form the LBPH algorithm. LBP is a simple yet effective method for removing and labelling the pixels.

"LBPH based improved face recognition at low resolution," (A. Ahmed, J. Guo, F. Ali, F. Deeba and A. Ahmed) [24], The main issues in face identification remain the automatic face recognition system for blur situations, illumination, resolution, and lighting. There is a minimum image size of 35px. to develop a low-resolution facial recognition system. The Local Binary Patterns Histogram (LBPH) algorithm architecture is used in this paper to solve real-time, low-resolution human face recognition. To detect the human face in various angles, side stances, and monitoring the face during human motion, the suggested method performs better at the minimum low resolution of 35px. For training and classification, use dataset LR500. For face identification in this paper, low resolution local binary patterns are used. where the accuracy was 94% at 45 pixels and 90% at 35 pixels.

Cox et al. [9] proposed a hybrid distance method for automatic face recognition. He scored 95% peak recognition accuracy on a dataset of 685 subjects. Each face image in the hybrid distance method displays 30 manually induced distances. B.S. The database's storage capacity was reduced when Manjunath et al. [10] introduced the fragmentation procedure for the identification of feature units of each and every face image. This process created 35–45 feature units per facial image. Face detection using statistical models and geometrical approaches based on the geometrical ratio between regular features. These models measure the separations between the features, and they might be more useful for finding anticipated matches in a big dataset. Geometric Feature-based algorithms have some advantages over other methods like rotation independently, faster with execution time, scaling [11]. Like geometrical feature matching and feature-based face recognition approach, graph matching face recognition approach is one of them [12]. Introduced dynamic link architecture to falsification invariable object identification, in this approach researcher utilize elastic graph matching approach for calculating the nearest saved graph. This approach called Dynamic link structure is an addition to standard ANN. Sparse graphs represented memorize objects. The vertices of sparse graphs are tagged through a multiresolution statement in the context of a local power spectrum, and their borders are tagged with geometric distance vectors. Recognizing the object from multimedia (Video, image) is called object recognition, can be identifying by employing any efficient method like elastic graph matching. Elastic graph matching process by matching the cost function randomly modified at every node. The better testing outcomes were obtained on the dataset of 87 subjects and a group of office objects containing various expressions with an alternation of 15 degrees. The matching procedure takes more computation time; it takes 25 secs to match with 87 saved objects on the symmetric device by 23 carriers. After that L. Wiskott [13] modified this approach and compared individual front view faces of 112 images. Probe pictures were deformed because of the rotation in depth and variation in facial appearance. Functional outcomes were achieved with facial images on big rotated angles. Results obtained 86.5% recognition percentage on testing of 111 face images at 15 degrees' rotation, and 66.4% recognition percentage on testing of 110 face images at 30 degrees' rotation of 112 neutral frontal views [14]. Generally, dynamic link structure is dominant in various facial recognition approaches in the context of rotation stability; though, the matching procedure is extensive in terms of computation. The neural network is so much simplified face recognition approach because of its non-linear architecture in the net system. Therefore, the features extraction phase is more effective than the linear technique, it selects a dimensionality-reducing linear projection that increases the scatter of all expected models [15]. ORL database contains 40 objects, with 400 images of each object, recognition accuracy was 96.2% obtained on this dataset. It offers only minimal invariance to transformation, variation, scale, and distortion and requires 4 hours of training time and less than 0.5 seconds for classification. However, the amount of people affects how long calculations take. As the number of people increases, so does the computation time.

In general, as the population grows, the neural network method faces challenges. Additionally, a neural network approach is not suited for a single model image recognition experiment because it takes multiple model images for each participant to train the system with the "optimal" parameters. The most popular and commonly used method for feature extraction is SIFT. This method combines the principles of the picture pyramid and the difference of Gaussians (DOG). Using this method, the Gaussian filter processes the image at various scales. This method performs well when different lighting conditions or points of view are present, and it is also rotation- and scaling-invariant [16]. Each feature of the test images is compared to the dataset images using the SIFT feature matching approach. The optimal feature vector is extracted using Euclidean distance. Scale-Space Extreme Detection, Key Point Localization, Orientation Assignment, and Key Point Descriptor are the SIFT algorithm's four main feature matching steps [17]. The SIFT method is simple and provides superior.

The human-graphical method-based Gabor wavelet frequency and alignment demonstrations are better suited to illustrate texture learning because they integrate local characteristics with some share of weights, which is also used for subsampling functions like level shifting, scale invariance, and deformation. The Gabor wavelet can analyse images at different scales and orientations and facilitates feature extraction from particular spots. These methods address variations in frequency and rotation [26]. When the Gaussian envelope is applied, the Gabor wavelet is improved [27]. The principal component analysis is a well-known approach that is extensively applied to feature extraction, pattern recognition, and machine vision [28]. According to this algorithm, "any face can photograph.

III. CONCLUSION

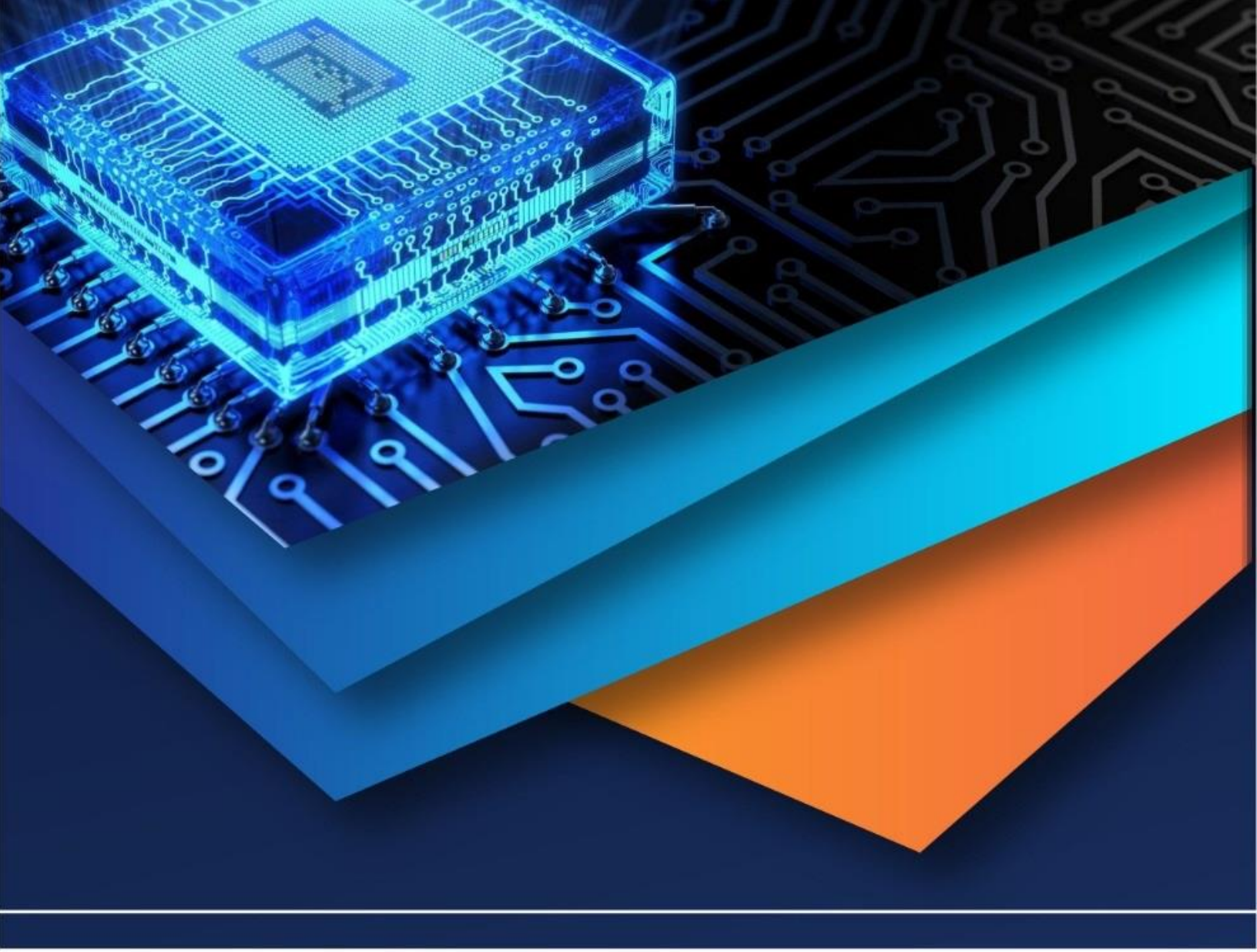
We employed local binary patterns for facial recognition. It is divided into three primary sections: facial representation, feature extraction, and classification. Although the behaviour of the input face is specified in the Face representation, it also restricts the methods for detection and recognition. In addition, this LBP histogram has generated a fresh result for feature extraction, allowing us to ultimately classify observed face input in comparison to the suggested DATASET. The next step is to evaluate a known or unknown person that our system has identified. For security services, this proposed model will be more useful in the future for identifying offenders with criminal history in the database.

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