International Journal for Modern Trends in Science and Technology, 8(S09): 36-39. 2022

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST08S0909
Available online at: https://www.ijmtst.com/vol8si09.html

Home Safety And Security System From Intruders

Abraham C G | Mariya Stephen | Nima Madhavan

Department of ECE, Mangalam College of Engineering, Ettumanoor, Kerala, India

To Cite this Article
Abraham C G, Mariya Stephen and Nima Madhavan. Home Safety And Security System From Intruders. International Journal for Modern Trends in Science and Technology 2022, 8(S09), pp. 36-39. https://doi.org/10.46501/IJMTST08S0909

Article Info
Received: 26 May 2022; Accepted: 24 June 2022; Published: 30 June 2022.

ABSTRACT

In this project, we worked on how to control home safety, and security systems using face recognition by utilizing a standalone system. Face recognition has become a fascinating field for researchers. The motivation behind the enormous interest in the topic is the need to improve the accuracy of many real-time applications. The complexity of the human face and the changes due to different effects make it more challenging to design as well as implement a powerful computational system for human face recognition. In this paper, we presented an enhanced approach to improve human face recognition using a back-propagation neural network (BPNN) and features extraction based on the correlation between the training images. A key contribution of this paper is the generation of a new set called the T-Dataset from the original training data set, which is used to train the BPNN. We generated the T-Dataset using the correlation between the training images without using a common technique of image density. The correlated T-Dataset provides a high distinction layer between the training images, which helps the BPNN to converge faster and achieve better accuracy. Data and features reduction are essential in the face recognition process, and researchers have recently focused on the modern neural network. Therefore, we used a local binary pattern histogram descriptor to prove that there is potential improvement even using traditional methods. We applied five distance measurement algorithms and then combined them to obtain the T-Dataset, which we fed into theBPNN. We achieved higher face recognition accuracy with less computational cost compared with the current approach by using reduced image features. We test the proposed framework on two small data sets, the YALE and AT&T data sets, as the ground truth. We achieved tremendous accuracy. Furthermore, we evaluate our method on one of the state-of-the-art benchmark data sets, Labeled Faces in the Wild (LFW), where we produce a competitive face recognition performance.

KEYWORDS: Face Recognition, BPNN, Labeld- faces in the wild.

1. INTRODUCTION

Currently, the Face recognition becomes the more Important topic in computer vision and having much importance in many applications such as for security, surveillance, banking and so on. But it becomes more challengeable because of accuracy and efficiency. Over the years, many scholars have developed variety kinds of face recognition algorithms, including Sparse Coding (SC)algorithm [1], Local Binary Pattern (LBP) algorithm [2],Histograms of Oriented Gradients (HOG) algorithm [3],Linear Discriminant Analysis (LDA) algorithm [4], and Gabor feature algorithm [5].These all algorithms provide accuracy rate between 50% - 76% [6. Compared with the above algorithms the LBPH algorithm can not only recognize the front face, but also recognize the side face, with 90% accuracy rate [6]. Face recognition has a significant value to application and study. Especially in the video, face recognition can be used in the security, conference, humancomputer interaction and VR game.

Compared with the image, it has a more broad application in the video.

Face recognition has a large difference between the image and video. Based on video, the resolution is low and the variety of face's detail is large. Face recognition technology is rather complex, and the imaging conditions have an impact on its results; therefore, the application still has many issues to be solved. Among them, the accurate extraction of features is of great help to improve the accuracy rate of recognition.

2. LITERATURE SURVEY

Nowadays, there are lots of methods to detect face object, and most of them have a perfect detection rate. This paper applies the Viola-Jones face detector [5] implemented innocence for the task. By train a new classifier, the detection rate of face can be more than 95%. Before the face alignment, we detect face image by this classifierfirstly.Ren S et al [4] present a highly efficient, very accurate regression approach for face alignment. This approach has two parts to do: local binary features to describe the landmark, and using a standard regression random forest to learn those features. The goal is to predict the facial shape S, which is described by landmark points in a cascaded way. This method initializes a shape S0to get the final S by estimating a shape increment ΔS stage-bystage. The shape increment ΔSt at stage t is related to the functionΦtand the matrix Wt St-1 is the shape from the previous stage, Φtis a mapping function depends on both input image and St-1 to associate the local binary feature from different stage, and Wtis a linear regression matrix. This is a regression process, and the regression goes to the next stage by adding ΔSt to St-1. The key point of this method is to get the function Φtand the matrix because ΔSt= Wt·Φt which is the shape increment.

Face Detection

We have used OpenCV which presents a Haar cascade classifier [8], [12], which is used for face detection. The Haarcascade classifier uses the AdaBoost algorithm to detect multiple facial features. First, it reads the image to be detected and converts it into the gray image, then loads Haarcascade classifier to decide whether it contains a human face. If so, it proceeds to examine the face features and draw a rectangular frame on the detected face. Otherwise, it continues to test the next picture.

Feature Extraction

The LBP operator is applied to describe the contrast Information of a pixel to its neighborhood pixels. The original LBP operator is defined in the window of 3*3.Using the median pixel value as the threshold of the window, it compares with the gray value of the adjacent 8 pixels. If the neighborhood pixel value is larger or equal compare tothe median pixel value, the value of pixel position is marked as 1, otherwise marked as (0) [9].

Dataset LR500

We have designed our own database named LR500, Which stores 500 images of each person. It is created on the basis of face detection. Make different facial expressions and postures to a scene and detect faces. The saved pictures are stored in the same folder to form the generated face database. During image acquisition step, the dataset images have been converted into gray scale images for features extraction; and then normalized those images for good recognition results. Normalization technique has been applied on all images to remove noise and set the alignment position of images.

3. FACE RECOGNITON ALGORITHM

To perform the face recognition system here the Local Binary Pattern Algorithm has been applied. The LBPoperator is used in local features through Local Binary Pattern acts which shorten the local special arrangement of a face image [10]. The LBP operator is the number of binary ratios of pixels intensities within the pixel of center and it's around eight pixels. It can be shown in below equation.

7) = ∑ ,) ه

=0 (−)2 (3)

Where ic indicates the value of the center pixel and (xc,yc), shows eight surrounding pixels information. Therefore, it is very helpful in determining the face features. From the original matrix Features of the image are extracted then these values are compared with the center pixel values, the later binary code is generated.

The Algorithm works as below:

1. First, we need to start with temp=0

2. Where I, is the training for each image 3. H=0,then Initialize the pattern histogram.

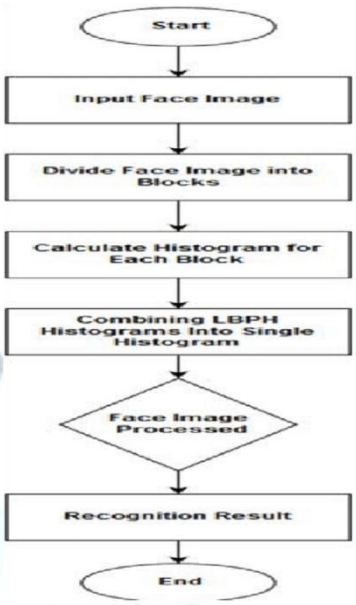
4. Calculate the model label of LBP 5. Keep adding the corresponding bin by 1.

6. Get the greatest LBP feature during each face image and then merging into the unique vector.

7. It's time to compare the features.

8. Finally, if it resembles with the stored database the image is recognized.

In this experiment, each image in the face database has the distinct ID number. First, prepare the face database, and then extract the LBP texture features of each test image. Finally, classify and recognize the face information. For this test we have collected 2500 face images, those face images are taken with a TTQ HD 1080px camera. We compare the input face images with database face images and work as if the given appearance images, after extracting features compared with the dataset so finally we can figure-out the face image is favorably recognized otherwise the face image would not be recognized



LBPHAlgorithmflowchart

Feature Vectors

In order to receive the feature vectors, the pattern for each pixel is obtained [11]. To represent all faces efficiently, the image has to be subdivided into K2 regions, i-e 82= 64regions. A histogram with each potential label is composed. Each bin in a histogram gives the information about a pattern. While the feature vectors can be obtained from thehistograms. So we can say that each regional histogram hold
of P (P − 1) + 3 bins: P (P −1).

To achieve the area with a distance with the help of theLBP system from the edges of the image, if it's not then it means some area on the border of the image is not used. For the image (NxM), the feature vector is designed with the help of calculating the LBP code for all pixels (Xc, Yc) with xc є {R +
1,. .., N − R} and yc {R + 1, . . . , M − R}. If an image is divided into k × k regions, then the histogram for region (kx, ky), with kx є {1, . . . , k} and ky є {1, . . . , k},

Training Face Images

After image acquisition and pre-processing task, we have to perform dataset training. For training phase, the training recognizer is applied to store the histogram values of face images.

Recognize Face Image

The final task is to recognize face images. The Haar cascaded classifier and training recognizer will be used

for face recognition. The classifier will compare the stored face images with input face images. If the face features of input images matched with the database images, the recognition result will be displayed on the camera screen.

4. CONCLUSION

In this experiment, each image in the face database has the distinct ID number. First, prepare the face database, and then extract the LBP texture features of each test image. Finally, classify and recognize the face information. For this test we have collected 2500 face images, those face images are taken with a TTQ HD 1080px camera. We compare the input face images with database face images and work as if the given appearance images, after extracting features compared with the dataset so finally we can figure-out the face image is favorably recognized otherwise the face image would not be recognized Based on the algorithm, this information of face image of known and an unknown identity is compared with the face image of known individuals from the available database. In the research, we have performed major three tasks, capture, train, and recognize the face images by using the camera. In this study, we utilize landmark to normalize the face image, and also use it to calculate the LBPH of facial feature which can help to reduce the dimension of the LBP histogram. Using landmark can extract the key point of the facial feature and the points surround it instead of utilizing the whole image pixel. But too small of landmark grid will lose some feature. So in the future study, we need to to extract more useful features by using these landmark points, so that we can improve the true positive rate of recognition

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] Ahonen T, Hadid A, Pietikäinen M. Face recognition with local binary patterns [M]//Computer vision-eccv 2004. Springer Berlin Heidelberg, 2004: 469-481

[2] V. Le, J. Brandt, Z. Lin, L. Bourdev, and T. S. Huang. Interactive facial feature localization. In 12th European Conference on Computer Vision (ECCV). 2012.

[3] K. Messer, J. Matas, J. Kittler, J. Luettin, andG. Maitre. Xm2vtsdb: The extended m2vts database. In Second international conference on audio and videobased biometric person authentication. Citeseer, 1999

[4] X. Cao, Y. Wei, F. Wen, and J. Sun. Face alignment by explicit shape regression. In Computer Vision and Pattern Recognition (CVPR), 2012 IEEE Conference on. IEEE.

[5] X. Xiong and F. De la Torre. Supervised descent method and its applications to face alignment. In Computer Vision and Pattern Recognition (CVPR), 2013 IEEE Conference on. IEEE,

[6] J. Olshausan B A, Field D J.Emergence of simple-cell receptive field properties by learning a sparse code for natural images. Nature, 1996, 381(6583):607-609

[7] J. CHAO W L, DING J J, LIU J Z. Facial expression recognition based on improved local binary pattern and class-regularized locality preserving projection. Signal Processing, 2015, 117:1-10.

[8] J. HU Liqiao, QIU Runhe. Face recognition based on adaptive weighted HOG. Computer Engineering and Applications, 2017, 53(3): 164-168

[9] XueMei Zhao, ChengBing Wei, A Real-time Face Recognition System Based on the Improved LBPH Algorithm, 2017 IEEE 2nd International Conference on Signal and Image Processing.

[10] Varun Garg, Kritika Garg, Face Recognition Using Haar Cascade Classifier, Journal of Emerging Technologies and Innovative Research (JETIR) , December 2016, Volume 3, Issue 12.

[11] Hongshuai Zhang, Zhiyi Qu Liping, YuanGangLi, A Face Recognition Method Based on LBP Feature for CNN, 2017 IEEE 2nd Advanced Information Technology, Electronic and Automation Control Conference (IAEAC).

[12] T. Chen, Y. Wotao, S. Z. Xiang, D. Comaniciu, and T. S. Huang, "Total variation models for variable lighting face recognition" IEEE Transactions on Pattern Analysis and Machine Intelligence, 28(9):1519{1524, 2006

[13] Zhao and R. Chellappa "Robust face recognition using symmetric shape from-shading" Technical Report, Center for Automation Research, University of Maryland, 1999

[14] Zheng Xiang, Hengliang Tan, Wienling Ye. The excellent properties of dense girdbased HOG features on face recognition compare to gabor and LBP, 2018 volume issue 99.