International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2020 IJSRCSEIT | Volume 6 | Issue 3 | ISSN : 2456-3307
DOI : https://doi.org/10.32628/CSEIT206392

Proposing SVM and HOG Techniques for Effective Face Recognition in Video Surveillance

Prof. A. V. Deorankar*, Neha S. Tadam

Department of Computer Science and Engineering, Government College of Engineering, Amravati, Maharashtra, India

ABSTRACT

Face Recognition is an active topic among Machine Learning Researchers for two decades owing to its increasing demand in security monitoring applications. The present Techniques while being working has some constraints. The challenges emerge with the orientation, quality, and expression, variations in lightning, or facial occlusions, which has a direct impact on the facial captures using video-based surveillance. This results in performance and accuracy issues. The current surveillance applications require more computational complexity with less accuracy and performance. The proposed video surveillance system overcomes these limitations of existing systems and provides maximum effective security with minimum computational complexity. The proposed Video security monitoring system provides a complete face localization, detection, and recognition. The draw out facial image data is compared with facial dataset images. The facial data is obtained from the video dataset accessed from the real environment. The face image is authenticated if a match is found and is declared unauthenticated otherwise. The security alarm after the unauthenticated alerts the security personal for further action. Hence, the proposed system is more non-evasive, accurate and reliable.

Keywords : Face Recognition; HOG Features; Feed forward Back propagation Neural Network; Surveillance Video; Principal Component Analysis.

I. INTRODUCTION

In today's information era technology plays an important part in uplift, simplify, and secure lives and living. With increasing, security demands face recognition is used in many practical applications such as security monitoring and video surveillance. Face recognition (FR) system in computer application uses biometrics to match facial features from a digital image or video frame from a video source. Video Face Recognition System automatically identifies and/or verifies persons' face. Video Face recognition is thus crucial to execute various applications and it is employed in a wide spectrum of areas. As an identity, human face is utilized wide across for identification and authorization purposes. This fact makes Video Face Recognition as a very important technology for numerous monitoring and surveillance applications. There are a huge number of applications that require face detection and recognition for their implementation. With the help of face recognition technology, we can minimize fraud and crime. If the system is further enhanced it can be used for tracking facial features and hence the person. There is much of the researches going on in this area.

FR has received immense interest across the world in many areas like payment as MasterCard launched a new selfie pay app called MasterCard Identity Check. Facial biometrics can be integrated with physical

devices and objects. Instead of using passcodes, mobile phones and other consumer electronics will be accessed via owners' facial features. Facial recognition work by mapping the image data with the input image to identify the face.

In this proposal, SVM along with HOG is employed to perform Face Detection. The HOG feature descriptor counts the occurrences of gradient orientation in localized portions of an image. HOG outperforms wavelets and degree of smoothing before estimating gradients damages, results emphasize much of the available information is from sudden edges at fine scales that blurring this for reducing the sensitivity to the spatial position is a mistake.

Face detection comprises segmentation and extraction of facial features from an unknown background followed by the verification. The object, which is the face here, is hence detected. Face detection can be done by two approaches namely feature-based and holistic. In a feature-based approach, the separate features like nose and eyes are segmented to felicitate the feature detection. Part based and sub-window based are the two human detection techniques. Sub-window based approaches use different types and combinations of features like histograms of oriented gradients (HOG) covariance matrices and multi-level versions of HOG. Part-based approaches split the body into several parts that are detected separately and, finally, the results are combined Surveillance using a histogram of oriented gradients (HOG) and feed-forward neural networks presented here. HOG utilized for the retrieving of facial features followed by the feed-forward back propagation neural network classifier. For recognizing image, a sliding window approach is used.

Geometric and template matching methods are some of the frameworks used for face detection and recognition. Principal component analysis (PCA) is used to reduce a large number of features into a smaller number.

The organization proposal paper is as follows. In Section 2 (Methods and Material), presents the literature review of existing systems. In Section 3 (Result and Discussion), explains the proposed system. Discussed in Section 4(Conclusion) a conclusion is the last part of the proposal.

II. METHODS AND MATERIAL

Divya Malik, Shaloo Bansal et al [1] presented Face Recognition Based on Principal Component Analysis and Linear Discriminant Analysis. Face recognition plays very vital role because it will not allow hackers or attacker to fetch password. The Eigen face task utilizes the linear unsupervised dimensionality reduction technique known as Principal Component Analysis (PCA) for subspace production and the "Fisher face" utilizes linear supervised dimensionality reduction technique Linear Discriminant Analysis (LDA). In classification systems, LDA is better than PCA, it provides higher-class discrimination by utilizing the class data hence, LDA is massively utilized in face recognition systems

M. A. Abuzneid and A. Mahmood et al [2] presented an improved approach to enhance human face recognition utilizing a back-propagation neural network (BPNN) and features extraction based on the correlation among the training images. Face recognition is vital part of research. The objective is to enhance the accuracy of many real-time applications. T-dataset utilized to train BPNN.

In [3] term ReLU is utilized in neural network operation. It is an element wise operation and it is tilted pixel per pixel. ReLU generally replaces all the negative pixel values by 0's so in that way it would become non-linear. There is also numerous nonlinear functions like sigmoid or tan h instead of ReLU, but

ReLu has outdone other techniques in terms of de-noising.

Grega, Michael, Andrzej Matiolanski, Piotr Guzik, and Mikolaj Leszczuk et al [4] presented Automated Detection of Firearms and Knives in a CCTV Image. Author proposed an algorithm for detecting firearm and knife in image. That algorithm utilizes OpenCV. It shows that a near zero false alarm it can produce but in order to do that it ignores positive alarms with the cost of sensitivity. Therefore, actual percentage of firearm and knife detection reduced. However, in real time environment, if we missed a single in detecting firearm or knife, which leads to fail in saving many important lives.

Erhan, Dumitru, Christian Szegedy, Alexander Toshev, and Dragomir Anguelov et al [5] proposed object detection utilizing deep neural network (DNN). DNN can give good performance on image classification, here author only focused on the issue of object localization in the image. For image classification, they utilized classification algorithm as DNN It can detect objects with localization but they focused less on detection of any particular objects used as weapon for doing crime.

Here B. S. Satari, N. A. A. Rahman, and Z. M. Z. Abidin et al [6] proposed a system that monitors the visitors of an organization by utilizing FR as an authentication technique. After authentication and verification process done authenticated visitor a printed visitor card is given that printed card consist of the image of the visitor, date and timing of visiting and the name of contact person or visiting person. Face recognition visitors management system (FRVMS) is proposed by author to increase the security of an organization from unauthenticated individual. This is necessary to ban illegal entry purpose such as stealing assets or confidential data.

Z. Shao, J. Cai, and Z. Wang et al [7] present a novel intelligent processing and utilization solution to big surveillance video data depends on the event detection and alarming messages from front-end smart cameras. This technique consist of two parts first is pre alarming if abnormal events found and second is storage of surveillance video for fast retrieval of evidence. Pre alarming is helpful to prevent crime

III. RESULTS AND DISCUSSION

Figure 1 shows the face recognition system using the HOG feature extraction. Here the input taken is a Surveillance Video. The extracted images/frames from Videos are subjected to HOG Feature Extraction. Next Image Enhancement is performed using some techniques. Next Object from Videos are detected and PCA is applied to reduce the dimensionality of images. The detected images are sorted using a classification algorithm using SVM. The training dataset is loaded to classify persons as authorized or unauthorized. If provided face found a match then, that face is termed as authorized. If not then it is unauthorized.

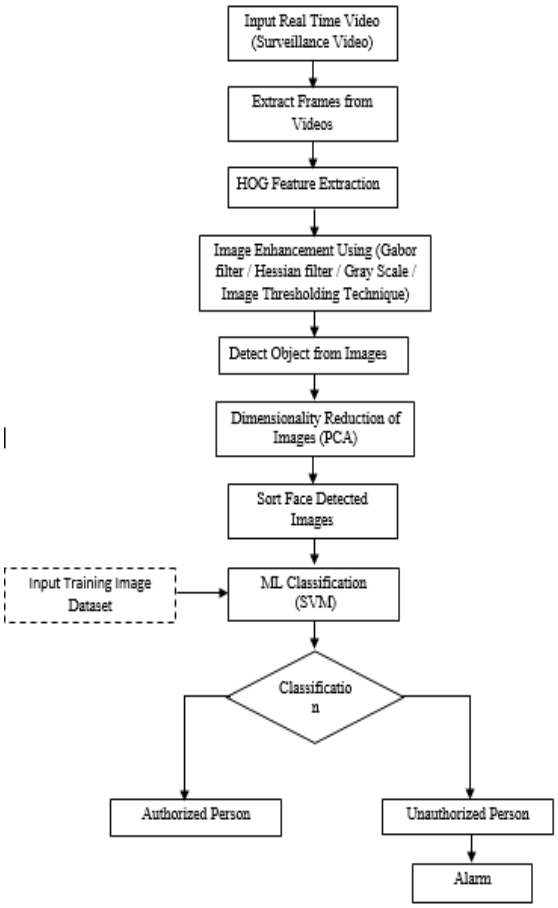

Figure 1. Face recognition

A. Face Detection and Localization

The surveillance video is taken as input for the recognition purpose. The images/frames are then extracted from the video. The extracted frames are then fed to HOG (Histogram Oriented Gradient) for feature extraction. The images are enhanced using the Gabor filter / Hessian filter / Grey Scale / Image Thresholding Technique. Next images with the facial features are extracted and are further subjected to dimensionality reduction. The dimensionality reduction is done using PCA. PCA helps to reduce the complexity of recognizing the face in the video frames in the next step. The face-detected images are then sorted and forwarded for the recognition phase.

B. Face Recognition

The training dataset of the people's faces image samples is loaded to the system. Based on the training dataset the input pre-processed, detected face image samples from the input surveillance video are classified. The classifier used in the proposed system is the SVM classifier.

The support vector machine-learning algorithm that is SVM works well with the limited dataset and gives better accuracy in comparison with the many other techniques. Thus, the SVM algorithm effectively classifies the face images.

If the match is found then the person is authorized and if the match does not found then the person is unauthorized. If not authorized the system generates alarm alerting the security personal about the unidentified person.

IV. CONCLUSION

Proposed face recognition and detection systems use HOG for feature extraction and PCA for dimensionality reduction. Proposed a system to overcome the limitations of the existing system and provide effective face detection and recognition using lesser computation complexity, greater accuracy, more performance, and lower cost. This system is fruitful in avoiding fraud and crimes. The proposed system offers protection from an unauthenticated person by generating a security alarm.

V. REFERENCES

[1]. Divya Malik, Shaloo Bansal, “Face Recognition Based on Principal Component Analysis and Linear Discriminant Analysis”, International Journal of Research in Electronics and Communication Technology (IJRECT 2016)

[2]. M. A. Abuzneid and A. Mahmood, "Enhanced Human Face Recognition Using LBPH Descriptor, Multi-KNN, and Back-Propagation Neural Network," IEEE Access, vol. 6, pp. 20641-20651, 2018.

[3]. "An Intuitive Explanation Of Convolutional Neural Networks". The data science blog, 2017. Web. 10 Feb. 2017. Available: https://ujjwalkarn.me/2016/08/11/intuitive-explanation-convnets

[4]. Grega, Michael, Andrzej Matiolanski, Piotr Guzik, and Mikolaj Leszczuk. "Automated Detection of Firearms and Knives in a CCTV Image." Sensors 16.1 (2016): 47

[5]. Erhan, Dumitru, Christian Szegedy, Alexander Toshev, and Dragomir Anguelov. "Scalable Object Detection Using Deep Neural Networks." 2014 IEEE Conference on Computer Vision and Pattern Recognition (2014).

[6]. S. Satari, N. A. A. Rahman, and Z. M. Z. Abidin, "Face recognition for security efficiency in managing and monitoring visitors of an organization," in 2014 International Symposium on Biometrics and Security Technologies (ISBAST), 2014, pp. 95-101.

[7]. Z. Shao, J. Cai, and Z. Wang, "Smart Monitoring Cameras Driven Intelligent Processing to Big Surveillance Video Data," IEEE Transactions on Big Data, vol. 4, pp. 105-116, 2018.

[8]. N. Jamil, S. Lqbal, and N. Iqbal, "Face recognition using neural networks," in Proceedings. IEEE International Multi Topic Conference, 2001. IEEE INMIC 2001. Technology for the 21st Century, 2001, pp. 277-281.

[9]. K. Bong, S. Choi, C. Kim, D. Han, and H. Yoo, "A Low-Power Convolutional Neural Network Face Recognition Processor and a CIS Integrated With Always-on Face Detector," IEEE Journal of Solid-State Circuits, vol. 53, pp. 115-123, 2018.

[10]. Y. Kim, H. Kim, S. Kim, H. Kim, and S. Ko, "Illumination normalization using convolutional neural network with application to face recognition," Electronics Letters, vol. 53, pp. 399-401, 2017.

[11]. Malik and S. Bansal, "Face Recognition Based on Principal Component Analysis and Linear Discriminant Analysis" International Journal of Research in Electronics and Communication Technology (IJRECT 2016), vol. 3, pp. 7-10, June 2016.

[12]. Meena and R. Sharan, "An approach to face detection and recognition," in 2016 International Conference on Recent Advances and Innovations in Engineering (ICRAIE), 2016, pp. 1-6.

[13]. Bhattacharyya, Suman & Rahul, Kumar. (2013). Face recognition by linear discriminant analysis. International Journal of Communication Network Security. 2. 31-35.

[14]. Javed, Ali. (2013). Face Recognition Based on Principal Component Analysis. International Journal of Image, Graphics and Signal Processing. 5. 38. 10.5815/ijigsp.2013.02.06.

[15]. F. Z. Chelali, A. Djeradi, and R. Djeradi, "Linear discriminant analysis for face recognition," in 2009 International Conference on Multimedia Computing and Systems, 2009, pp. 1-10.

[16]. J. Dhanaseely, S. Himavathi, and E. Srinivasan, "Performance comparison of cascade and feed forward neural network for face recognition system," in International Conference on Software Engineering and Mobile Application Modelling and Development (ICSEMA 2012), 2012, pp. 1-6.

[17]. K. Vikram and S. Padmavathi, "Facial parts detection using Viola Jones algorithm," in 2017 4th International Conference on Advanced Computing and Communication Systems (ICACCS), 2017, pp. 1-4.

[18]. R. Arroyo, J. J. Yebes, L. M. Bergasa, I. G. Daza, and J. Almazán, "Expert video-surveillance system for real-time detection of suspicious behaviors in shopping malls,"

Expert Systems with Applications, vol. 42, pp. 7991-8005, 2015/11/30/ 2015.

[19]. S. C. Loke, "Astronomical Image Acquisition Using an Improved Track and Accumulate Method," IEEE Access, vol. 5, pp. 9691-9698, 2017.

[20]. M. P. Rajath Kumar, R. Keerthi Sravan, and K. M. Aishwarya, "Artificial neural networks for face recognition using PCA and BPNN," in TENCON 2015 - 2015 IEEE Region 10 Conference, 2015, pp. 1-6.

[21]. M. Slavković and D. Jevtić, "Face Recognition Using Eigenface Approach," Serbian Journal Of Electrical Engineering, vol. 9, pp. 1211-130, 2012.

[22]. H. M. Desai and V. Gandhi, "A survey on Background subtraction techniques," International Journal of Scientific & Engineering Research, vol. 5, pp. 1365–1367, 2014.

[23]. Y. Wong, S. Chen, S. Mau, C. Sanderson, and B. C. Lovell, "Patch-based Probabilistic Image Quality Assessment for Face Selection and Improved Video-based Face Recognition," in IEEE Biometrics Workshop, Computer Vision and Pattern Recognition (CVPR) Workshops, ed, June 2011, pp. 81-88.

Cite this article as :

Prof. A. V. Deorankar, Neha S. Tadam, "Proposing SVM and HOG Techniques for Effective Face Recognition in Video Surveillance", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 6, Issue 3, pp.805-810, May-June-2020. Available at doi : https://doi.org/10.32628/CSEIT206392
Journal URL : http://ijsrcseit.com/CSEIT206392