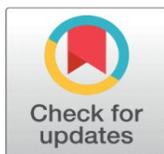


A REVIEW OF IMAGE MINING - FACE DETECTION AND RECOGNITION

Bhaskar H S

¹ Assistant Professor Maharani's Science College for Women, Palace Road, Bengaluru- 560001



Corresponding Author

Bhaskar H S,

DOI

[10.29121/shodhkosh.v4.i1.2023.1846](https://doi.org/10.29121/shodhkosh.v4.i1.2023.1846)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Copyright: © 2023 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.



1. INTRODUCTION

Face is a unique identity for any individual. It is a hassle free and a non-intrusive way of recognizing an individual. The system envisions creating a smart system with face as an identity for the individual, calling it a "SMART FACE ID". The system monitors student attendance, faculty attendance at schools/colleges, library transactions, office and administrative transactions.

The system uses Viola-Jones algorithm for face identification and builds an intelligent system using machine learning techniques. It builds a database containing multiple pictures of the face of an individual. The system is trained using this database.

Convolution Neural Networks like Neural Networks are made up of neurons that have learnable weights and biases. Every neuron gets some inputs, executes a dot product and selectively surveys it by a non-linearity. The total link still carries a distinct score function ranging from the raw pixels in an image to class scores. It still has a loss function on the fully-connected last layer and all the commands created in learning Neural Networks still apply.

ABSTRACT

The Transformation of a picture into digital form to function on and improve the image is image processing. Face is a unique identification of every personality. There is denial disturb complimentary and a troublesome way of recognizing every person. Face identification is a procedure of capturing pictures in remoteness. The face identification involves face alignment and feature mining. The research paper elaborates the process of mining the characteristics and recognizing a face digitally by Convolution Neural Network and Viola Jones process. Pre-processing is minimal in Convolution Neural Network. Investigation is slow but uncovering is fast in Viola and Jones process. Face uncovering is done by OpenCV. Face identification uses the trained structures stored to differentiate various faces. Viola and Jones procedure is worn to identify the appearance and crop the facial region. Convolution Neural Network is an important verification module comprising identification, extraction, and acknowledgement. This research paper develops a novel technique for identification of an individual by recognizing the face.

Keywords: Face Detection, Face Recognition, Digital Image, Viola Jones, CNN, OpenCV

There are layers associated with ConvNet called ConvNet Layers. They are as follows:

- i. Convolutional Layer.
- ii. Pooling Layer.
- iii. Normalization Layer.
- iv. Fully-Connected Layer.
- v. Converting Fully-Connected Layers to Convolutional Layers.

2. LITERATURE REVIEW

Vikram K et.al [1], describes a technique which detects the faces in an image and locates the facial features in an image. The detection of the facial parts such as eyes, nose, mouth and face are an important task in this process. This involves the algorithm of Viola-Jones Cascade Object Detector in this process. In this research paper the face, eyes, nose and mouth of a human is detected in a random set of samples and further tested. These are described as for checking the distance of the eyes and matching the pupil that helped in detecting the left and right eye pairs of the human, the nose with the darker region at the 2 sides and the lighter region at the centre, mouth and the face with several points on it. The algorithm, already defines the distance between the two eyes when any image is given as an input and then it processes the algorithm and matches the eyes distance and pupil distance and therefore the eyes will be detected.

Zhan Wu et.al [2], presents a convolutional neural network (CNN) architecture for thermal face recognition. CNN is a new type of neural network method which can automatically learn effective features from the raw data. Experiment results on RGB-D-T face database show that our proposed CNN architecture achieves higher recognition rate compared with the traditional recognition such as LBP, HOG and moments invariant. In this research paper, we present a CNN method for thermal face recognition. Three conditions, i.e. head rotation, expression variation, illumination variation, which affect recognition rate were considered. Compared with the traditional recognition methods for the thermal face recognition, the proposed method can produce best recognition results. This suggests that CNN is a promising method for the thermal face recognition under extreme conditions, such as side face view and rapid changing illumination environment.

Ramaiah et.al [3], explains that face recognition is not a fully solved problem due to the challenges associated with varying illumination conditions and pose. In this research paper, we address the problem of face recognition under non-uniform illumination using deep convolutional neural networks (CNN). The ability of a CNN to learn local patterns from data is used for facial recognition. The symmetry of facial information is exploited to improve the performance of the system by considering the horizontal reflections of the facial images. Experiments conducted on Yale facial image dataset demonstrate the efficacy of the proposed approach. In this research paper, we propose two approaches for facial recognition under varying illumination conditions using deep convolutional neural networks. These approaches discriminate the human subjects from the local patterns in their facial information. Experimental studies suggest that there is a significant improvement (4.96%) in the performance of CNN classifier when horizontal reflection of facial data is also considered during training. Assuming performance remains unaffected by the inclusion of additional subjects, the proposed approaches recognize facial images effectively. Future work includes the use of horizontally reflected images in testing and the exploration of various approaches to combine evidences for facial recognition.

Lee et.al [4], provides a method which tracks a subject's head in a complex background and then recognize the person by comparing characteristics of the face to those of known individuals. The Computational approach taken in this system is motivated by Colour and Motion Information and PCA (Principal Component Analysis). Our approach treats the face recognition problem as a two-dimensional (2-0) problem rather than three-dimensional geometry. So, the problem is easier to treat. The system functions by two steps, first, extracting face image in a complex background using difference image and colour model, and second, projecting pre-extracted face images onto a feature space that represents the significant variations among known face images. We use this weight vector to recognize each individual. Estimation technique for real time face recognition because Eigen space density estimation technique is encouraged for database searching, we extract the face region and project this region to predefined background image for the recognition of face in different background images.

3. PROPOSED METHODOLOGY

A. FACE DETECTION AND RECOGNITION

The existing system include the Manual attendance that follows the system of marking the attendance for a student using a ledger It is tedious procedure and prone to human errors. The RFID system has an item tagged with tiny silicon chip and

an antenna collectively called a tag. This tag can be mobile or stationary and be scanned by stationary or mobile reader respectively, using radio waves. The tag is encoded with unique identifier allowing it to be individually identified by the reader. High volume of hardware requirement and the system is not faithful. In the Bluetooth system each individual has to be a part of the network to identify the individual. It is a Pico-network and can accommodate up to 8 devices in a single network.

The project proposes face as a unique identification criterion in our system. It generates a database of all the individuals (with factors into consideration like illumination and orientation). It takes multiple images of individuals which are pre-processed to reduce noise and glitches and form a database and train the system with this database. The system learns over a period of training sessions with appropriate datasets and is able to record uniquely each student.

The advantage over the existing system is, elimination of use of hardware and also saves time and is not prone to human error.



Fig. 1. Face Detection.

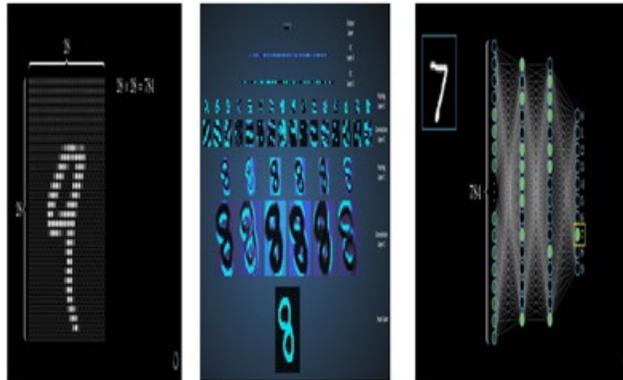


Fig. 2. Face Recognition.

Fig. 1 and 2. Shows the trained neural network model which is used to detect and classify new images.

B. FACE DETECTION AND RECOGNITION APPROACH

- Step 1 : Face Detection using OpenCV
- Step 2 : Face Recognition using Convolutional Neural Network
- Step 3 : Creating user interface
- Step 4 : Connection Face Detection and face recognition code
- Step 5 : Display the final output on the UI

C. DESCRIPTION ON FACE DETECTION AND RECOGNITION APPROACH

Step 1: Face detection using OpenCV. Viola and Jones algorithm has to be used to detect the face in the camera and check where exactly the person is present near the camera. Viola and Jones algorithm is one of the best algorithms for face detection. OpenCV library is an open-source computer vision library which is free of cost and can be easily commercialized without paying any price for distribution of the software after the final software is ready.

Step 2: Face recognition has always been a challenging task from traditional image processing technique to modern image processing. To obtain higher accuracy and better prediction of the recognized face Convolutional neural network is used where Artificial Intelligence Model (CNN) needs to be integrated. This involves the following steps:

- Dataset: Collecting the dataset is an important work where we need to collect images of person's faces. If we have 2 people, then we need a dataset of at least 200 images. More the data better the accuracy in modern AI
- Training the Model: We need to train the new faces (200 images) and teach our model who the particular person is for example, we load 200 images of Ramesh and train the model and 200 images of Suresh and train the model.
- Face Recognition: Finally, we should be able to detect the faces that we have trained with good prediction accuracy.
- Retraining the model: If the model has lower accuracy, then we need to retrain the model and start from step1 for better accuracy.

We need to make use of Tensor flow (Googles Open-Source library) for face recognition where python is used as a base language.

Step 3: Creating an UI using C# where an UI is integrated with some buttons, picture boxes, and timers as per coding requirement.

Step 4: Connection of face detection code which is from another library said OpenCV needs to be integrated with the modern Tensor flow library.

Step 5: Final output has to be displayed on the output with no glitch.

4. CONCLUSION

Viola and jones algorithm is used to detect the human face and crop the facial region. On basis of the Inception-v3 model of Tensor flow platform, we use the transfer learning technology to train the human face for classification model on Student face category datasets.

CONFLICT OF INTERESTS

None

ACKNOWLEDGMENTS

None

REFERENCES

- Vikram, K., & Padmavathi, S. (2017). Facial parts detection using Viola Jones algorithm. 2017 4th International Conference on Advanced Computing and Communication Systems (ICACCS), 1-4.
- Wu, Z., Peng, M., & Chen, T. (2016, June). Thermal face recognition using convolutional neural network. In Optoelectronics and Image Processing (ICOIP), 2016 International Conference on (pp. 6-9). IEEE.
- Ramaiah, N. P., Ijjina, E. P., & Mohan, C. K. (2015, February). Illumination invariant face recognition using convolutional neural networks. In Signal Processing, Informatics, Communication and Energy Systems (SPICES), 2015 IEEE International Conference on (pp. 1-4). IEEE.
- Lee, S. J., Jung, S. B., Kwon, J. W., & Hong, S. H. (1999). Face detection and recognition using PCA. In TENCON 99. Proceedings of the IEEE Region 10 Conference (Vol. 1, pp. 84-87). IEEE.
- Tsong-Yi Chen, Chao-Ho Chen, Da-Jinn Wang, and Yi-Li Kuo. A People Counting System Based on Face-Detection –IEEE 2010.
- Patrik KAMENCAY, Miroslav BENCO, Tomas MIZDOS, Roman RADIL A New Method for Face Recognition Using Convolutional Neural Network. IEEE – 2017.
- Nilesh D. Veer, B. F. Momin. An automated attendance system using video surveillance camera. – IEEE 2016.