ISSN No. 0976-5697

Volume 11, Special Issue I, May 2020

nternational Journal of Advanced Research in Computer Science

CONFERENCE PAPER

Available Online at www.ijarcs.info

FACIAL RECOGNITION SYSTEM USING IMAGE PROCESSING

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***Abstract*—** Authentication is a major challenge in computer-based communication system operation. Human face recognition is an important branch of biometric verification and has been commonly used in many applications, including video monitoring system, human-computer interaction, door control system, and network protection. A computational neural network can be implemented as a framework in the face classification process. In order to recognize dimensions within the intend-able limits, the test system offers acceptable performance. The device also allows multiple faces to be identified and recognized in live pictures. Using OpenCV and programming with Python, we design a real-time face recognition system.

***Keywords*—** Authentication, Face recognition, OpenCV

I. INTRODUCTION

Face recognition is just as old as computer vision because the subject is of practical importance and the cognitive scientists have a theoretical interest. While other identifying methods (for example fingerprints or iris scans) are more reliable, face recognition is still the main focus of study, both because it is non-invasive and it is the principal tool for recognising individuals. Face recognition technology increasingly evolves into a universal biometric solution because it needs almost zero user effort as compared to other biometric solutions.

II. DEFINITIONS

(i) **Computer Vision**— Computer vision can be defined as a discipline that explains how to reconstruct, interrupt, and understand a 3D scene from its 2D images, in terms of the properties of the structure present in the scene. It deals with the modelling and replicating human vision using computer software and hardware. Computer vision usually overlaps significantly with the following fields —

- **Image Processing** - It focuses on performing operations on an image.
- **Pattern Recognition** - It explains various techniques to classify patterns.
- **Photogrammetry** - It is concerned with obtaining accurate measurements from images.

(ii) OpenCV- OpenCV is a computer vision open source and software library for machine learning. There are over 2,500+ algorithms configured in this library. These algorithms can be used as a means for detecting and recognising faces, identification of objects, classification of human acts in videos, tracking moving images, plotting similar images from an image database, eye movements, scenery recognition and signposts to overlay the reality, and so on.

III. EXISTING METHODOLOGY

Using Neural Networks that have been specifically trained for recognizing images.
ResNet— ResNet, short for Residual Networks is a classic neural network used as a backbone for many computer vision tasks. This model was the winner of the ImageNet challenge in 2015. The fundamental breakthrough with ResNet was it allowed us to train extremely deep neural networks with 150+layers successfully.

IV. IMPLEMENTATION, PERFORMANCE AND TESTING

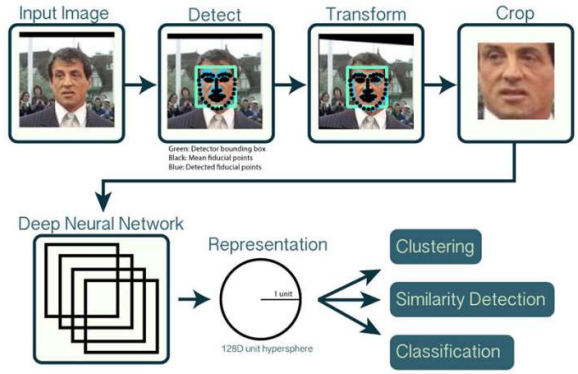
We attempt to solve the power limitation by looking at faces and calculating a 128 dimensional vector that describes the shape of the face. Once we get these vectors, we can use a simple classification neural network to categorise the extracted vectors correctly.

- **Extracting embeddings**— The datasets provided in the form of images are loaded individually and the face detection model will predict the face landmarks in the image and further detect points on the face, align it and perform data augmentation. After this process the embeddings are dumped into a pickle file which are serialized simultaneously.

- **Training the model**— The model is trained with a set of images under each class in such a way that it recognizes some predefined points on every image that contains the face which is converted as a 128 dimensional matrix with distinguishing values . This matrix is fed to a SVM for a better classifier that provides a best fit for the data i.e. divides and categorizes the data. Hence the model is trained with the datasets.

- **Recognition**— This is the step where the user gets to see the result. We use a web camera to get the image. The user has to look into the camera and this is the input fed to the program. The input is matched with the existing datasets , it checks for the threshold percentage which when satisfied displays the name of the person along with the percentage of match.

Block Diagram—



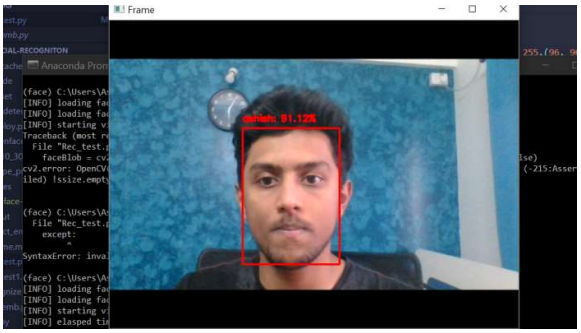
Algorithm—

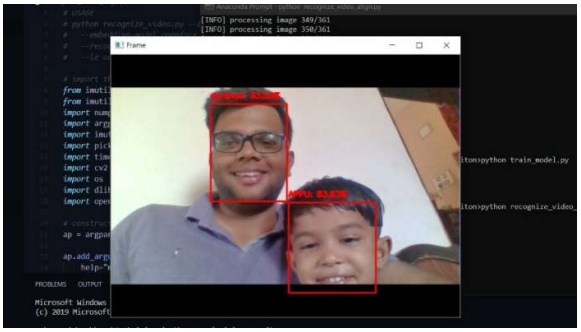
1. Take input from a video source.
2. Load face detector, face alignment model, embeddings extractor and previously trained weights.
3. Load frame from the video. Resize the image to the suitable size and correct aspect ratio.
4. Pass the resized frame into the face detector. This will crop the face part of the image. This lets us use only the area of the image with the face, thus increasing speed.
5. Pass this cropped image to the embedding extractor.
6. The obtained face embedding vector is passed to the pre-trained weights.
7. The image is then displayed along with the name of the person.
8. Press “q” to quit else go to step 3.

V. CONCLUSION

The performance of the program is drastically better than conventional neural network classifiers, this allows us to recognise faces in real time even on low power devices. The accuracy of the detection is also higher and the size of the dataset required is significantly smaller.
This allows us to implement this algorithm on portable devices like Raspberry pi and other single board, low power computers.

Results—





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