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Face identification for Law Enforcement

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Abstract – *We all recognize that face detection is a sort of synthetic intelligence (AI) era that has grow to be an imperative a part of our normal lives, with results on nearly each element of our lives. In diverse fields, there may be a want for better accuracy and better pace for detection and popularity. However, the accuracy of the identity isn't always precisely dependable in lots of cases. In this paper we gift a incredibly correct face popularity version the use of OpenCV and dlib libraries. One of the very best methods to become aware of someone's individuality is to examine their face. Face popularity is a machine for figuring out someone with the aid of using the use of private traits of the person. An individual's face is diagnosed with the aid of using a system such as phases, specifically face detection, in which this system happens in no time in humans, besides in situations in which the item could be very near with the aid of using, and the introduction, which identifies a face as a unmarried individual. Here, we've additionally mentioned approximately detecting faces in a video frame. The most important difficulty in identity and popularity of faces is the storage, on this paper we've additionally addressed that problem with the aid of using handiest storing the facial capabilities in place of storing faces directly.*

Key words – dlib, face detection, artificial intelligence, machine learning, deep learning, CNN.

1.INTRODUCTION

With the growing improvement in technology, there are numerous fields that have evolved immensely. There are many new ideas evolved into the sector of Artificial intelligence and gadget learning. Face detection and identity is one such technology.

Over the years, many tendencies were made in those technologies. There are diverse set of rules the use of which we will put into effect face identity generation. Today, there are quantity of fields wherein face identity may be applied. There is a want of better accuracy and a quick face identity set of rules. This generation may be utilized in extraordinary sectors like banking, finance, regulation enforcements.

So, essentially a facial popularity gadget is used to authenticate or discover someone whose information are saved in a database and this statistics is used to suit a human face from an picture or maybe from a video frame.

A human face may be used to show lot of information. It can carry our mood, intention, and attentiveness. Other than this, it is able to additionally be used to perceive a selected man or woman. There are numerous different methods thru which someone may be diagnosed including fingerprints, voice, frame shape. These identifications may be used whilst facial information aren't available. However, face is the maximum special a part of our frame, and it's miles extensively used to outline someone's identity. Identification of face is a trouble which determines

whether or not specific faces constitute the identical man or woman or not. This is relatively hard due to the fact there are versions withinside the background, lightning, expressions, hairstyle.

The face identity may be used fairly withinside the subject of regulation enforcement. The regulation officers can use a perpetrator's picture to perceive a crook and might effortlessly seize them and punish them with none confusion. This could make catching the criminals loads easier. There won't be any want to preserve any offline records. Using the face identity device, the accuracy of catching a perp might be multiplied significantly. Besides, the primary use of our proposed device might be to perceive and seize a crook the use of a video frame.

Now-a-days there are numerous such locations wherein CCTV cameras are installed. This has accelerated the safety of the society that we stay in. Many times, whilst there may be a suspicious pastime or whilst against the law has already taken place, there may be a want for police officers to undergo the complete CCTV pictures to discover and capture the wrongdoer. This is a tedious assignment because the video may be hours lengthy and it is able to soak up treasured time of the officers to observe the complete pictures. This is wherein we endorse this device wherein we are able to enter a video and offer an photograph of suspected offender and we are able to come across at what locations the wrongdoer has been found.

There are several face identity set of rules to be had however their accuracy isn't as much as the mark. So, right here on this device we can be the use of the dlib library, that is to be had in python and also, we can be the use of OpenCV libraries.

2.LITERATURE REVIEW

Previously, Pournami S. Chandan et al. working for Centre for Development of Advanced Computing have published a paper [3] regarding a similar problem. Their system uses Deep Learning based facial feature extraction and matches them with Support Vector Machine (SVM). In their system, they are working with missing kids in which the images of kids are stored in the database. The database is used to detect a face and Convolutional Neural Network is used by the model to learn the features. This is almost same as our proposed system, but in our system, we are dealing with identifying perpetrator and they had worked with missing children. And in our system, we have used dlib and OpenCV libraries.

Rohit Satle and his team, in August 2016 presented a paper [4] which uses a Principal Component Analysis (PCA) to address a face recognition system. There are two main disadvantages of PCA which are: 1. It can only process faces that have similar type of face expressions. 2. The computational complexity of PCA is very high.

Birari Hetal et. al presented a paper [5] which proposes comparing faces using SWF-SIFT technology. SIFT is based on Histogram of Gradients in which each pixel present in the patch needs to be computed due to which is costs lost of time and also it is computationally heavy.

Professor Sumeet Pate, in 2016 published a paper [6] in which they proposed a method for face recognition using Line Edge Method. The problem in this method is that the efficiency of this method was only 85%.

Peace Muyambo who is from Zimbabwe also proposed a face recognition system in the year 2018 [7]. He used the LBHP method which has the face recognition rate of 67.5%. The disadvantage of using this method is that the LBHP method is insensitive to the luminosity variation.

Verma RC and his team [8] proposed a new system which can be used for detecting and tracking multiple faces in a particular video sequence. The varying scales, postures, multiple dimensions can be dealt in this system. Multiple faces in the video sequence can be detected and tracked.

Tang et al. [9] proposed a new face recognition algorithm which is based on a video frame. New technologies such as time and space frame synchronization and multilevel subspace analysis of video frame processing have been developed by them. It reserves more information compared to single images.

Sharma et al. [10] proposed a valid technique for face recognition which is based on deep learning and applies the convolution neural network with the dlib face alignment for feature extraction.

Name of Author	Technology Used	Work	Research Gap
Pournami S. Chandan et al.	Support Vector Machine	Deep Learning based facial feature extraction	Computational complexity is high
Rohit Satle et al.	Principal Component Analysis	They built a system which addresses a face recognition system	Only process the faces that have similar facial expressions
Birari Hetal et. al	SWF-SIFT	They have presented a paper where they have used SWF-SIFT to compare faces	SIFT is computationally heavy and therefore costs lots of time.
Professor Sumeet Pate et al.	Line Edge Method (LEM)	Used face recognition to find missing people	Efficiency of the system was 85%.
Peace Muyambo	LBPH method	Proposed a face recognition system to find missing people in Zimbabwe	LBPH algorithm is not sensitive to the variation of luminosity.
Sharma et al	Deep learning	Face alignment for feature extraction	Low Accuracy

Table 1. Literature Review

3. PROPOSED METHODOLOGY

In this system, we have proposed a facial identification system in which we are using dlib library available in python as well as OpenCV libraries. We are also using deep learning algorithms. Figure 1 represents a block diagram of our proposed system.

In this system, we can give live input directly using camera or we can feed input from our available

repository. After that, the frames from the input will be extracted. The face from the extracted frames will be detected and once the faces are detected, all the features of the face will be extracted and will be uploaded on the cloud.

In order to detect an image, we can give input from Camera. The same process can be followed of extracting frames and detecting face. Once that is done, the features
are classified and the features from the cloud are compared and then the face is recognized.
In this system, we have used dlib libraries for detecting faces. It uses Convolutional Neural Network (CNN). CNN is a part of deep learning algorithm which takes the input as image and analyzes that image. Dlib is open
source, and it has various machine learning algorithm which is used to solve complex
problems. As this algorithm uses CNN, its features gives an extra edge to our algorithm which helps it to overcome the disadvantages which is shown by some other face recognition algorithms.

There are basically three steps in dlib. First, we have to load the face detection model. The face which we have already trained our model with has to be loaded. This model automatically selects the filter in order to extract features. Secondly, we have to initialize the face detector. Here, the weights file is downloaded. Lastly, we can apply the CNN based face detector on the test images and it will detect the images and provide us with the output. It will return 0 if face is not present and it will give us 1 if the face is present.

This algorithm works very well with non-frontal faces as well as with odd angles where other face identification algorithm fails. Dlib is also very accurate algorithm when we have to detect faces from different angles. It is also very easy to implement as well as it is very easy to train images too.

Our system is also very fast because we are not storing the images directly in our database which usually takes up a lot of space instead of it, we are extracting the features form the image and will be storing the features which requires much less space and also speeds up the entire process.

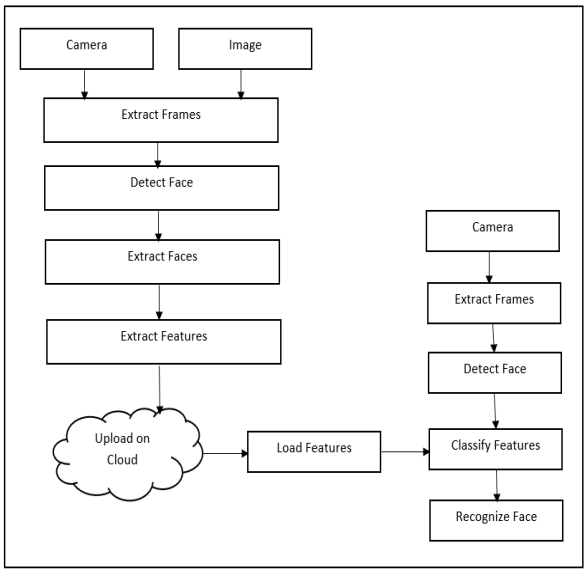

Fig 1. Block Diagram

In this system, there will be two types of users – admin and police. The admin will be able to make new police registrations and the police user will be able to register, train and recognize images. Once, the admin have successfully registered new police, this data will be stored on a firebase cloud. Then, when the police wish to login, the individual has to enter their user id and password and the data will be validated in the backend. If the information is matched, login access will be granted.

After the police have logged in, the police dashboard will be available. There the official could train an image of human being through live camera interfacing or using the browse option which would select images from gallery. Then, the face will be detected from the image, we can detect single or multiple faces in a single image. The name of the individual in the image has to be mentioned and then we can store the features of the image in our database. Next time, when a person is to be detected whose details are already present in our database,

the police have to navigate to the recognize option and the video or image file is given as input. Our system will search through the database and recognize the person.

Fig 2. Represents the admin login page of our system.

The admin can add the police details to the database and the police officers can use this data to login to the system. Fig 3, shows the police login page of the system.

Fig 2

Fig 3

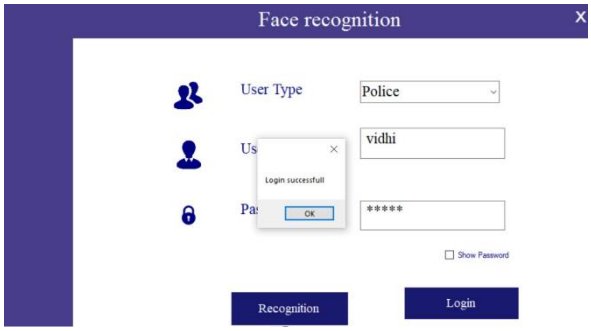

Fig 4

After the police logs in with their correct details, a login successful message pops up. And if the details provided in login are not correct then user will not be able to login to the system successfully.

Once, the police successfully gets logged in to the system, a dashboard will appear as shown in the Fig 5. Here, there are various options. To select an image, we can either browse an image or we can detect face by capturing the person by live camera.

After deciding the source of the input image, the police can click on the option detect face and all the faces in the image will be detected. After that, we have to mention the name of the person detected and we can store this information. This information or the person's details will be used later on where we will be detecting the face.

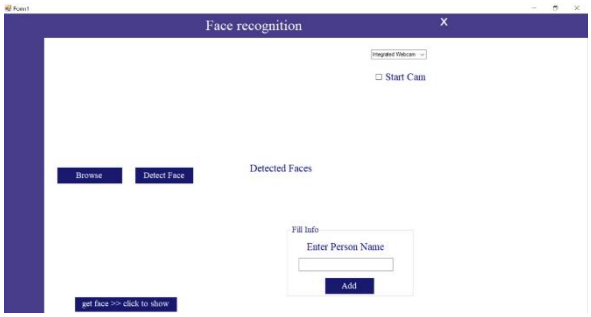

Fig 5

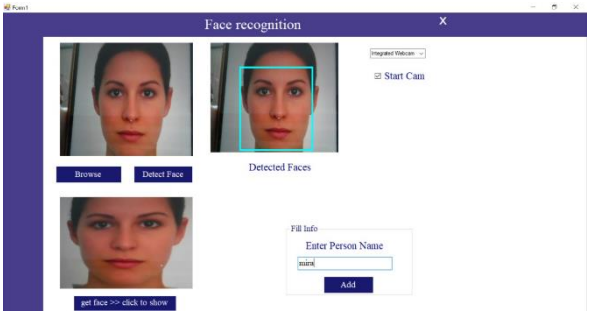

Fig 6

To recognize an image, we first have to load the train files so that all the data which we have trained before is loaded in the system. Then Sync data is used to synchronize the data. Next, to recognize the image we can use the camera and our system will recognize the face which was already trained.

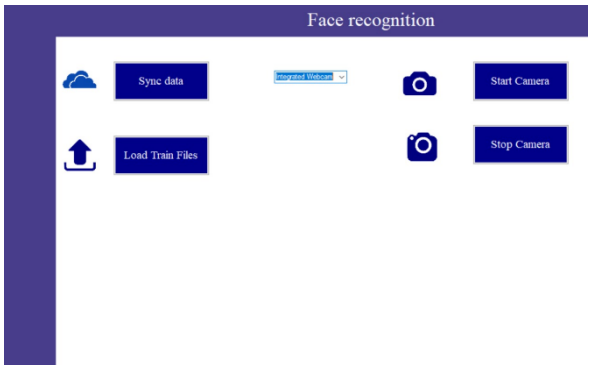

Fig 7

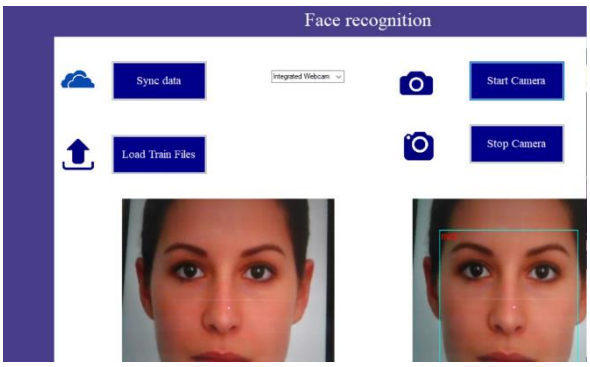

Fig 8

3. CONCLUSION

Face detection systems have found applications in every domain. In the field of security also the face identifications and recognition system can be of great use. In this paper, we have mentioned one such application of face detection system in security or law enforcement domains. With our proposed system, the field of video surveillance will also greatly change. With this system, our police officers need not waste their valuable and precious time watching hours of CCTV footage in order to catch a criminal. With the help of this system, we aim to reduce the time taken to identify a criminal in a video or an image. This proposed system will have high accuracy and require minimum storage. Hence, we aim at providing a highly reliable and efficient system for law enforcement.

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