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Facial Recollection System in Live Stream

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Abstract: ***In our Facial Recollection system, the facial pattern of a person is being noted during Livestream using LBPH algorithms. Faces can be detected through our camera which then reveals their identity on the screen. Faces can be identified through the collection of the previous image of the person and checking with spatial structure and arrangement. Hence we can then able to track the person of our interest. Simultaneous detection and identification of each and every individual within the frame video boundary can be made possible. Hence the image is then used to detect faces visible in the camera and then training the images and are stored in a database with a name given by the user.***

Keywords: Machine Learning, Localization, Threshold, Feature Extraction, LBPH Algorithm

I. INTRODUCTION

Most of the existing biometric system used as the Attendance Management system to hold the record of the number of times a person attends a place or institution. If a person has attended an event, they are marked as present in the back end database.

Figure 1 Simple Face Identification System

The manual attendance record system is not efficient because it requires more time to arrange the records and also processing the average attendance of each student. Hence there is a need for an alternative for the existing biometric system to avoid fake and dummy authentication. Face Recollection is then being a subject of a topic where the individual faces are being stored and identified.

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It not only works well for attendance management systems but also for security and surveillance systems and can be integrated with existing biometric systems. Here the suspect's facial identity is being stored in a database maintained by the police department and if found anywhere in the surveillance camera installed by the police the suspect identity is being revealed and the police agencies can easily find out the suspect who went on missing. Several facial recognition algorithms are being present but an appropriate algorithm must then be chosen which ensures better recognition rate and ability to produce accurate results even in the worst lighting conditions.

II. LITERATURE SURVEY

[3] proposed an Automated Face Recognition System which is implemented Time & Attendance application which will detect the human faces and then it is resized to the required size and processed by using the Viola-Jones Algorithm. Finally, the resized face samples are recognized using a simple Principal Component Analysis based on dimensionality reduction techniques. Once recognition is done, the attendance will be automatically updated in the Microsoft Excel Sheet along with the candidate name, their date and time of entry. Then HTML file is created and the attendance records will be automatically updated in the Application system to make sure only an authenticated user can access the attendance sheet. They are then integrated into an Auto Attendance Management System. [6] proposed a solution where the camera will take an image of the entire classroom and detects each and every individual face of the candidate within the video frame and updates their attendance in the attendance database. The image is captured twice,time of entry and other at time of exit to confirm how long a student is present in the class. [2] states about embedding learning framework for face verification, recognition/classification and clustering. The framework is evaluated on human faces, by verifying whether two faces belong to the same person and grouping faces that belong to the same person as in Google Picasa.It focuses on triplet loss as the main contribution.

III. PROPOSED MODEL

In the proposed system facial recollection system during the live stream, we can able to identify each and every individual who is being captured during the live stream which will show a brief detail about each and every person who is spotted in that frame. Local Binary Patterns Histograms algorithm is being used for Facial recollection process.

From the input face obtained from the camera, we can then rank the similarity of the faces with the existing one present in the database. The probability of the closest matching of the person can also be predicted with their corresponding percentage of facial recognition. This mechanism will identify each and every individual who are all within the boundary of the frame with their respective details. The identification is done with the help of sensing of the individuals face nuances like shades and shapes of the organs present in the face. The proposed system is based on the ISO Standard **ISO/IEC JTC1/SC37** which is used to store and access the dataset to recognize the individual.

A. Workflow of Recollection System

The above use case describes the basic steps of FacialRecollection system.

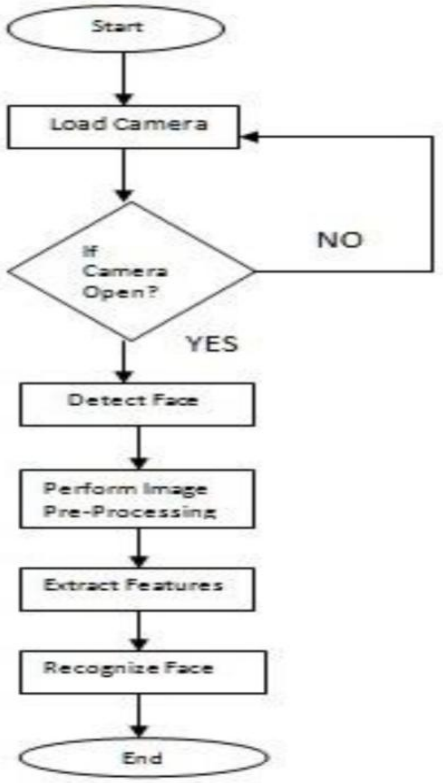

Figure 2: Steps on process of Facial Recollection System

IV. WORKING MODULES

The working of *Figure 2* is performed in several cases and at totally different locations. Therefore, it needs some quite transmission of data. Also, data compression could also be needed to reduce transmission bandwidth. The working of the LBPH algorithm is explained in [7]. Facial Recollection module consists of two phases enrollment phase and recollection phase.

i)Enrollment Phase: To add new datasets in the Face database and then can be recollected later

ii)Recollection Phase: Recollects all the datasets which are being stored and then performs LBPH Algorithm on it.

A. Image Capture:

A Webcam is being placed at the entrance to capture the facial images of the incoming person. The captured image may be of different size based on the resolution and position of the camera. A fixed resolution must be set for each captured image dataset. Auto-resizing of the image results in degradation in performance of the recollection system**.**

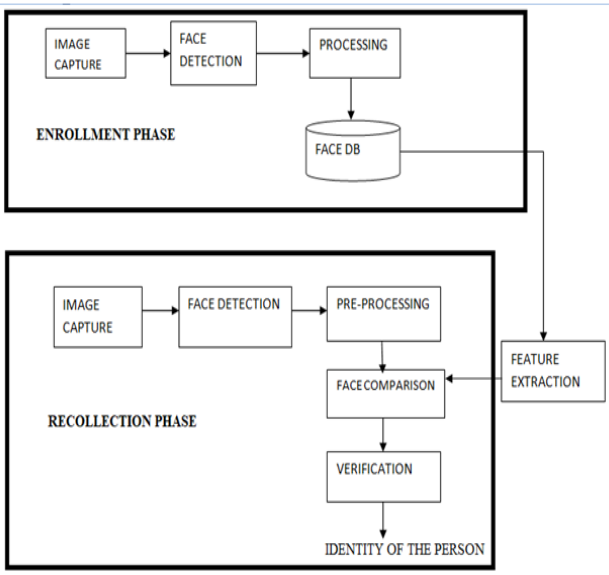

Figure 3: Internal Working Of Facial Recollection System

B. Preprocessing:

The detected face is extracted and is then subjected to the preprocessing step. This preprocessing step involves equalization of histograms from the extracted face image and then resized. The equalization of histogram most common normalisation technique which improves the contrast of the image which makes it more clear. *Figure 4* represents the standard image preprocessing technique with appropriate steps.

B.1. Image Resizing

When the incoming face is detected, they are resized to a fixed resolution. This fixed resolution depends upon the environment and lighting conditions.

B. 2. Contrast Intensification

For a better Contrast Intensification, the Minimum-Maximum Contrast Stretch Enhancement Technique.In this technique, the resized image is being transformed into a grayscale image where the facial parts are being identified from the image. *Figure 4* explains about image preprocessing steps with a sample image dataset.

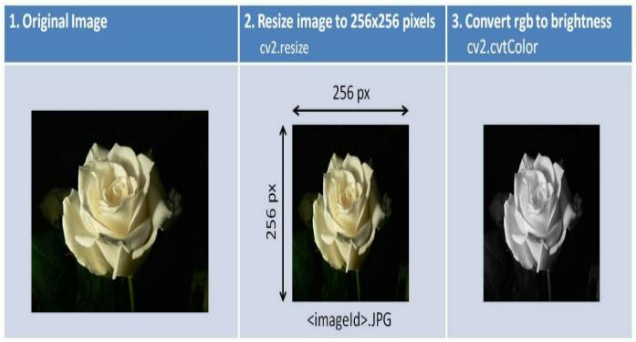

Figure 4: Image Pre Processing

C. Image Segmentation:

In the Recollection system segmentation of the image are based upon the Threshold. The Threshold values are used in both processing the datasets and to recognize the images based on the lighting support of the environment. Here the Simple Threshold for processing of the input datasets. The Adaptive threshold is used in the matching of the human face and comparison of the human face.Cv.adaptivethreshold is built in function in OpenCV for image segmentation. The threshold value can be assigned manually based on different environmental lighting conditions.

D. Facial Detection:

A proper facial detection method will enhance the performance of facial recollection systems. Localization is done if the face of the person is detected on the screen, a bounding box is then being drawn around it to achieve liveness detection. There are several algorithms which are then are present for face detection like Geometry-based strategies, various Feature-Invariant strategies, Machine learning strategies. Face detection using Haar Cascades to recognize the faces.

E. Database Processing:

Here the image is being captured, processed and stored in Face Database.It is a Database collected of frontal face images taken under different days, with webcam or camera. The processing module in face recognition may convert the initial information (or perhaps the degraded data when compression and expansion) into a feature vector, to preserve all the discriminant data that can be accustomed to distinguish two different people, and removing all redundant data.

F. Feature Extraction:

The features from the images could be extracted by the LBPHFace Face Recognizer present in the OpenCV.The input image removes unnecessary extra information which is not required for classification. It simplifies the image by extracting the necessary features contained in the image and avoids the rest of the features. Equation (1) is applied to describe the variation of the current pixels to its neighbourhood pixels.

$$D=\sqrt{\sum_{\square=1}^{\square}(h\square\square\square 1_{\square}-h\square\square\square 2_{\square})^{2}} \quad (1)$$

where D is an LBP operator

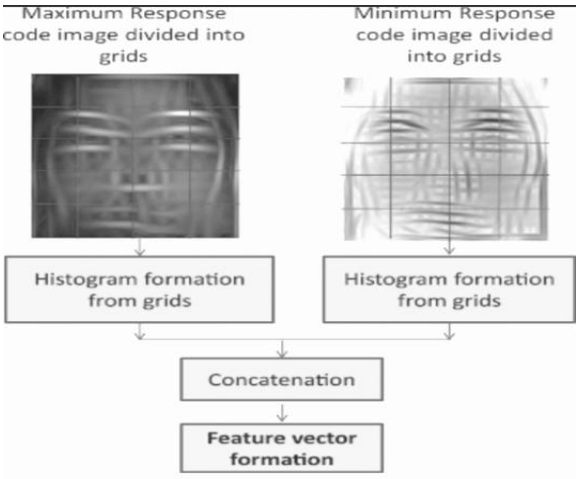

Figure 5: Histogram Extraction

F.1 *Feature Vector*

From *Figure 5* facial part is divided into multiple smaller regions.From the image Contrast Intensification phase the minimum and maximum code images are obtained and then the histograms are extracted from those regions and they are combined to form a unique feature vector. A Feature Vector is a design matrix in which each row in a matrix is termed as a feature vector. It gives an efficient representation of the face and used to find similarities between images.

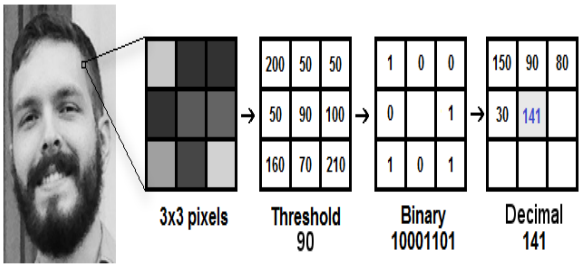

Figure 6: Feature Vector

G. Face Recognition:

In the Face Recognition phase, the LBP operator works by finding the facial parts in the image by comparing each pixel with their surrounding pixels step-by-step according to Equation (1). Localization is then achieved and the name of the facial datasets is then recollected if the appropriate dataset matches then the name of the individual will be displayed with the bounding boxes.

V. PRECAUTION:

- A Single Individual must be present in a dataset for efficient face recognition
- Distance between camera and person should be 70 cm to 110 cm.

- Environment lighting condition should be between 250 lux to 740 lux.
- Training data of a person should be error free that is only his/her image should be there in a dataset.
- Training data of a person should be free from image filters.
- A WebCam is suggested for better resolution
- Minimum of 2 datasets must be present for training.

VI. REPORTS & DISCUSSIONS:

A. *Input Datasets*

The input datasets are then being stored in the computers with around 200 datasets of each and every person are being stored in Face Database. From *Figure7* A dataset with different facial expression are being stated below. Unknown folder dataset contains random test images to display when any of the datasets do not match with any face dataset.A Third collage in *Figure7* is the image dataset is a default value for the UNKNOWN datasets.

Figure 7: Test Images

B. *Face Before Training*

In the training phase of the system, LBPH Recognizer is then being applied to store the histograms of the input datasets. The Live Input Face is then being compared with the series of already present facial datasets. If the live input face does not match with any of them **UNKNOWN** is specified for the incoming individual

Figure 8: Output Before Training the dataset of the person

C. *Face After Training*

Name of the individual is being displayed on the screen with bounding boxes localizing the face of the individual. This system provides an accuracy of around 70% in the lowlight environment.

Figure 9: Recognized image

VII. CONCLUSION

LBPH algorithm is being used to extract facial structures and recollect the faces if present in the database.The input datasets are then being stored in the computers with several input datasets of each and every person are being stored in Face Database.In the training phase of the system,LBPH Recognizer is then being applied to store the histograms of the input datasets. The Live Input Face is then being compared with the
series of already present facial datasets by ranking of test images by feature extraction process,the name of the individual is being displayed.Otherwise the person is denoted as **UNKNOWN.**

FUTURE ENHANCEMENTS

Future enhancements can be made in this project by revealing some additional information about a person such as their address or domain of the organisation where the person is placed. The distance between the webcam and the target individual can be reduced to avoid mismatch of faces.

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AUTHORS PROFILE

Presently,**Ms.Julie M.E.,** is working as an Assistant Professor in the Department Of Information Technology at Sri Sai Ram Engineering College with a teaching experience of 10 years.She have published several research papers in various National &International Conferences and have attended several workshops and Faculty Development programs.Ms Julie is specialized in the area of Mobile Application Development, Cloud Computing, Big Data Analytics.

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Sreeram G is currently pursuing B.Tech.Information Technology at Sri Sairam Engineering College who have been an Active Volunteer in IEEE conducting several IEEE events in his college.His final year project paper has been selected in IEEE Standard Education Grant (2019) .He has also published papers in Scopus Indexed Journals and also IEEE Xplore Digital Library.

Srinivasa Raghavan M is currently pursuing B.Tech Information Technology at Sri Sairam Engineering College. He is a Member of IEEE Computer Society and won the IEEE Standard Education Grant (2019).He also Presented a paper on "Community Hub" at 3rd International Conference on Advancement in Engineering, Applied science and management in Mumbai.