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INTRUDER DETECTION USING FACE RECOGNITION FOR HOME AND PET SECURITY SYSTEM.

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Abstract: Intruder attack and burglary are a serious issue now a days. Currently many systems are using sensors and motion detection devices but these systems cannot be reliable as they can be triggered with little change in climate like heat. The proposed system has solved this problem with the help of computer vision and OpenCV. The system can detect and recognize person from the previously provided data. The proposed system is capable for face detection and reorganization of person for identifying whether a person in the frame is a known person or an intruder. For face detection Haar-cascade models are used in order to detect human as well as pet animal. This detected section of face is the given to face recognition model which is trained on LBPH. The model returns the probability of the recognition for each person in the frame. In addition to this, the system can trigger an alarm once it finds some Intruder with respect to human or pet.

Index Terms – Python, Open CV, Haar Cascade Classifier, LBPH.

I. INTRODUCTION

Technology has been evolving drastically from early 90's and we are now at the stage of replacing humans with technology. Nowadays people are more focused on the easiness of life and very much dependent on the technology for achieving it. Some of example for such areas is Robotics, Building management, Drone surveillance, automated cars, etc.

We can see a significant change in Home surveillance systems which are taking over humans. Now machines are not only able to analyze the surrounding but are also able to make calculative decision because of availability of data and computational resource. On the other hand, crimes are also increasing leading to home theft and security issues. This is where the need of an intelligent system with real-time response provider comes from. Traditionally watchman and guards are kept for home security. Factors like sleep, tiredness, illness may affect the performance of the guard for home security.

Corporates uses CCTV for surveillance, which just records the surrounding activities and can be used for post incidence analysis. But it does not help in real-time i.e. when something abnormal happens. The proposed system can be used as an extension to the CCTV cameras.

II. NEED OF PROJECT

In cities, home security is major concern as crime rate are much higher in cities as compared to rural areas. So appointing watchman or guards becomes necessary which is not affordable for everyone in order to which peoples are shifting towards IOT based security and technological replacements which are easy to install but expensive to maintain some existing IOT systems use PIR i.e. Passive Infrared Sensor which sometimes generates false signals due to environmental changes like heat sources. Such systems can easily be tampered and be misused.

III. LITERATURE SURVEY

Human-face-detection and recognition theory is discussed by Bhupendra Vishwakarma, Pooja in [1]. As we all know face detection and recognition play important roles in many applications like video surveillance and face image management.

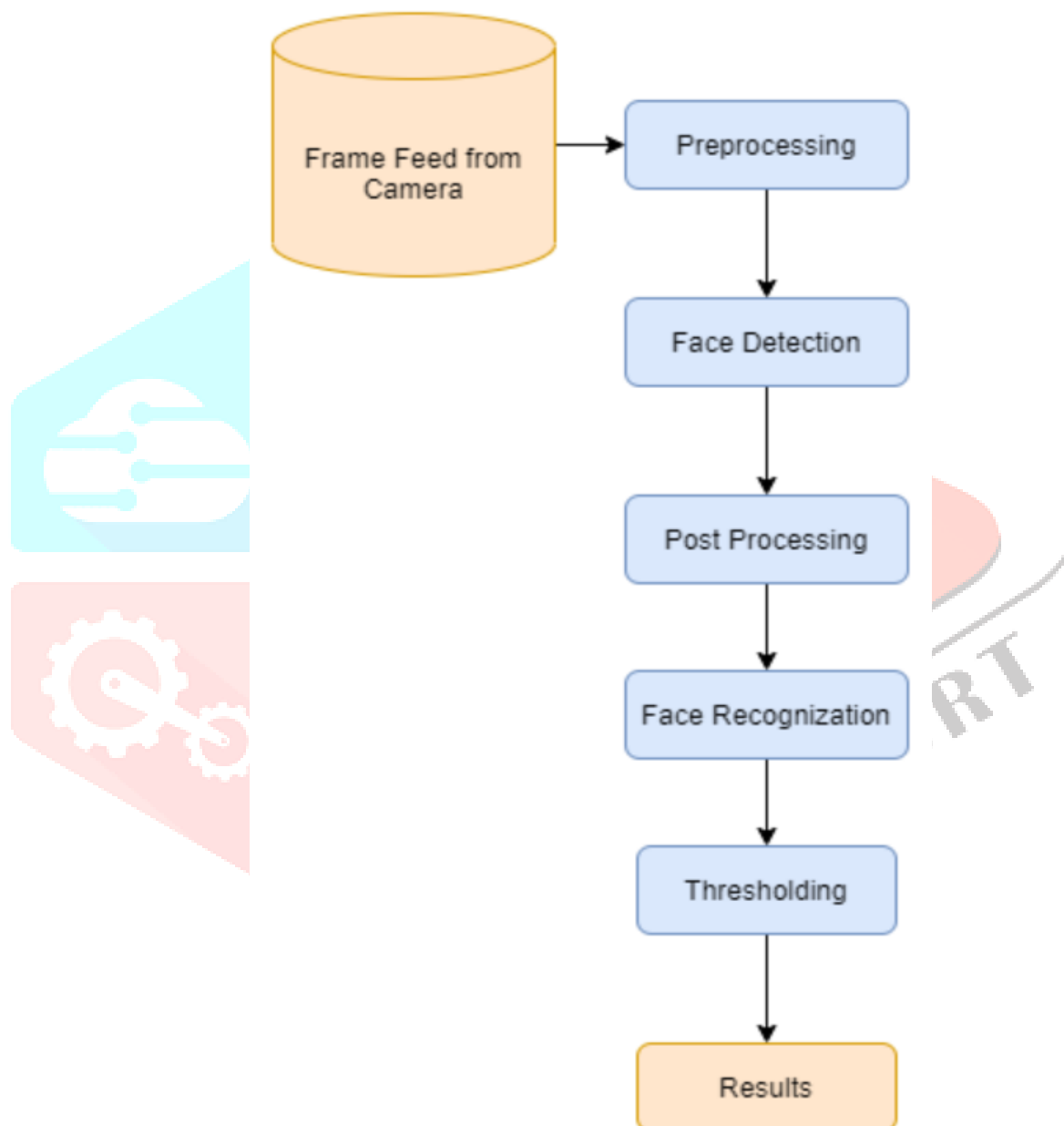
Here they need worked on both face recognition and detection techniques. The user wears glasses with camera and system speaks the saved person's name when his face comes in sight of camera. the entire system simply supported face detection and recognition only. The algorithm for face detection Haar feature-based cascade classifier is used. Which involves detection of face from the captured image by eliminating the background with higher accuracy and less time consumption. In face recognition PCA i.e. Principal Component Analysis algorithm is used. This system recognizes an unknown test image by comparing it with the known training images that are stored in the database as well as give information regarding the person recognized. These algorithms were successfully simulated in MATLAB to apply real time.

Fatih Cherfawi and Si Nabil Yassini proposed the system for determining the facial area, instead of identifying critical points in the facial area, they proposed a comprehensive framework in which the spatial transducer network would be applied.i.e. prior to the classification network to learn face alignment parameters in [2]. A spatial transformer network learns the spatial transformation of an image or feature map. Transformation here includes processes such as scaling, shearing, rotation, and non-rigid deformation. In

this system, facial recognition is done by a well-known algorithm called Principal Component Analysis developed by Turk and Pentland and known as eigen faces, which greatly reduces the dimensions of the original image and the face detection and identification is performed in the miniaturized space. For the purpose of feature extraction, Fisher's method of linear discrimination is used here.

Marko Arsenovic, Srdjan Sladojevic in this paper named Face Time Deep Learning based Face Recognition Attendance System had whole method of building up a face acknowledgement part by joining state of the craftsmanship techniques and advances in profound learning is portrayed [3]. It is resolved that with the more modest number of face pictures alongside the proposed technique for increase high undertaking could possibly prompt accomplishing higher exactness on littler dataset. This profound learning made arrangement doesn't rely with relevance GPU in runtime. on these lines, it can be material in various totally different frameworks as a primary or an aspect half that might keep running on a less costly and low-limit instrumentation, at the same time as a universally helpful net of things (IOT) device. Face-Time Deep Learning-Based Face Recognition Attendance System.

IV. PROJECT DESIGN



4.1 PREPROCESSING

It's a process of removing noises and making changes in the images so that it can be easily parsed by the machine. Some of the major pre-processing steps include image Gray-scaling, image augmentation, adding Gaussian noises, etc. Such preprocessing makes the model more robust and accurate.

- **Gray Scaling Image:** This process consists of turning a colored image to black and white image. Images are generally in RGB type and has 3 dimensions whereas grayscale image has 2 dimensions. This down-samples the data and reduces the computational complexities from image. The formula for grayscale conversion is as follows

$$\text{Gray} = (\text{Red} + \text{Green} + \text{Blue}) / 3$$

4.2 DATA AUGMENTATION

It is a process of generation of new data from basic raw data by applying some basic transformation to it. If the model complexity is much more compared to the training size of data, over fitting can occur. Data augmentation helps to avoid over fitting of model by increasing the data size.

4.3 Viola-jones Face Detection Technique for Face Detection

Segmentation is an important step in image processing. It involves converting Viola-jones face detection technique is also known as Haar cascades. In this algorithm for face detection training, it has been feed with a many positive images with face and negative images without face. Trained models are available open source at official OpenCV GitHub repository. All the models are in XML file type which can be loaded and used with OpenCV libraries.

4.4 LBPH Algorithm

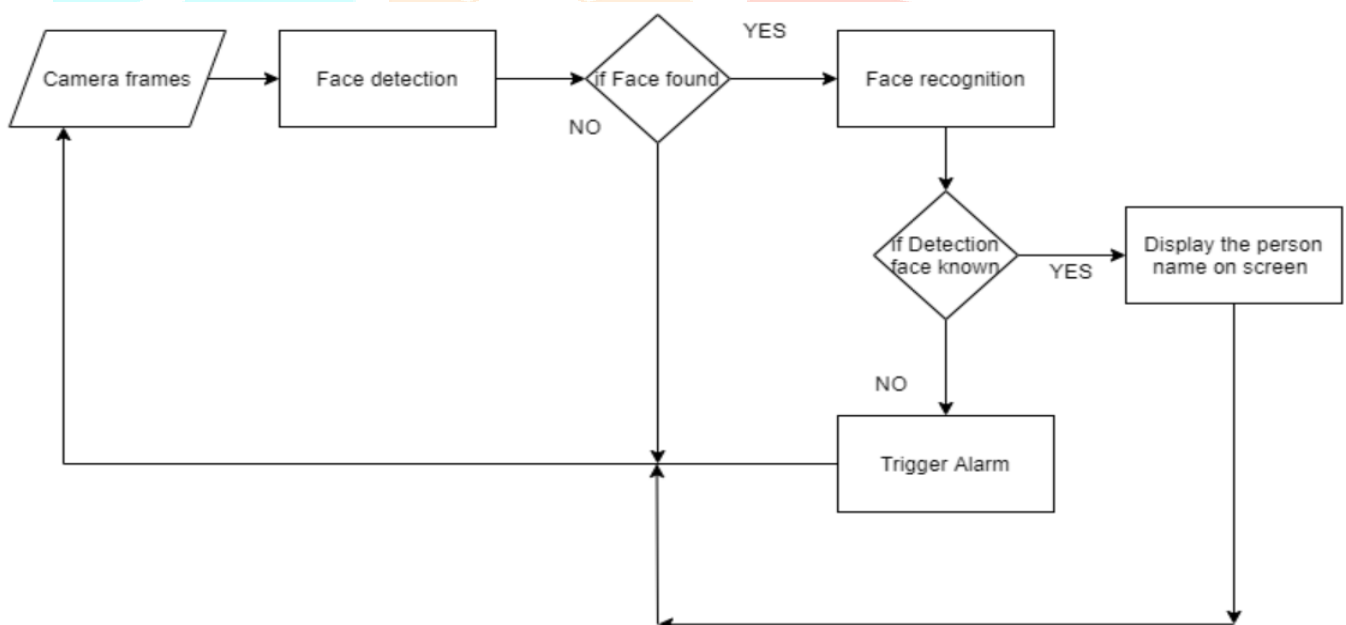
LBPH Algorithm stands for Linear Binary Pattern Histogram. It was initially introduced in 1994 and from that time it had become popular due to its simplicity and less computational expensiveness. This algorithm basically converts image into a linear binary pattern which in turn are combined with the histogram for extracting simple data vectors from the image.

For training a LBPH model following steps are carried out:

- 1) Images gets converted to grayscale in scale of 0 to 255 intensity (2-Dimensional image).
- 2) Sliding window technique for extracting 3x3 matrices and from these matrices linear binary patterns are obtained. Central pixel of these 3x3 matrix is the threshold for the binary calculation, any pixel above this value is set to 1 and any pixel below this threshold value is set to 0.
- 3) Next step is to get all the binaries and combine them to form an 8-bit binary and then convert that value to decimal and set it to the central pixel. This way LBPH helps to get a new feature which has proper representation of the image.
- 4) Histogram are generated from the result of previous step. This histogram stores the complete facial feature of the person for face recognition.

V. IMPLEMENTATION

5.1 FLOW CHART



The above chart shows the flow of the project. At very first we start Device camera i.e. Laptop Camera or CCTV Camera. Once we started CCTV camera it will capture the video but however the video is not needed, frame is needed therefore we need each frame in real time. After that each of those frames are needed to be feed to the face detection system. We'll try to find or allocate all the faces from each frame. Now let us consider the three persons so it will locate three faces. It will build up bounding box around those faces. The next step is to send those detected faces to the face identification system, that will show us whether the given face will be matching with the faces store in the database or not. If it matches then system will identify the person and will show the person name or else it will show intruder detected. If intruder is detected then the alarm is triggered. Now the project being performed is on small scale instead of CCTV the laptop web camera is used. Instead of trigger alarm it would just play an alarm audio on laptop or music of alarm on laptop.

5.2 DATA FLOW DIAGRAM



The above flow chart shows how the system works efficiently in the process of recognition and identification. Describing the data flow of system. Firstly, the input data i.e. frames from CCTV camera is given to the face detection system. Then further it is given to the face identification system. The face identification system has again two results one is “Known Person Detected” and another is “Intruder Detection” when Intruder is detected in the system it leads to trigger the alarm. Which really causes to boosting up the security.

5.3 STEPS OF IMPLEMENTATION

Sr. No	Steps
1.	Grayscale frame
2.	Face detection using haar cascade models
3.	Face recognition using LBPH trained model
4.	Thresholding operation
5.	Profile matching from DB
6.	Alert if intruder

VI. RESULTS

The below fig (6.1), first the created environment is activated, then Run CreateDataset.py for dataset creation and preprocessing, after that Train LBPH algorithm on the previously created data by python train.py and lastly Run testing code for real time detection python by Recognize.py

```

C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19041.867]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\Rohit\Desktop\FinalUpdate>ENV\Scripts\activate

(env) C:\Users\Rohit\Desktop\FinalUpdate>Create Dataset.py
If pet Enter 1 or Enter 0 for Humans 0
Enter User Id 1
Enter User Name DEEPALI
Enter User Age 20
Enter User Gender F
Enter User Criminal Records N
INSERT INTO People(ID,Name,Age,Gender,CR) Values(1,"DEEPALI",20,"F","N")
[ WARN:0] global C:\Users\Rohit\AppData\Local\Temp\pip-req-build-qjdp5db9\opencv\modules\videoio\src\cap_msmf.cpp (435) "anonymous-namespace"::SourceReaderCB::Sou
rceReaderCB terminating async callback
(env) C:\Users\Rohit\Desktop\FinalUpdate>Create Dataset.py
If pet Enter 1 or Enter 0 for Humans 1
Enter User Id 2
Enter User Name MANJAR
Enter User Age 3
Enter User Gender M
Enter User Criminal Records N
INSERT INTO People(ID,Name,Age,Gender,CR) Values(2,"MANJAR",3,"M","N")
[ WARN:0] global C:\Users\Rohit\AppData\Local\Temp\pip-req-build-qjdp5db9\opencv\modules\videoio\src\cap_msmf.cpp (435) "anonymous-namespace"::Sou
rceReaderCB terminating async callback
(env) C:\Users\Rohit\Desktop\FinalUpdate>Train.py
(env) C:\Users\Rohit\Desktop\FinalUpdate>Recognize.py
62.741106485694815
24.1621543277292
68.5597943022201
25.88066228164725
48.958321605274915
24.05236160133367
65.79928511423549
23.81163451803987
69.48089356957515
22.7978583886083
54.06670407649915
20.610508156173157
59.1804062220153
26.618910171426208
  
```

Fig:6.1

The fig (6.2.a, 6.2.b) is showing the system detecting and recognizing the human and pet cat, whose data is entered in the system. We didn't have any pet cat so as an alternative we have used images of cat from our mobile phone.

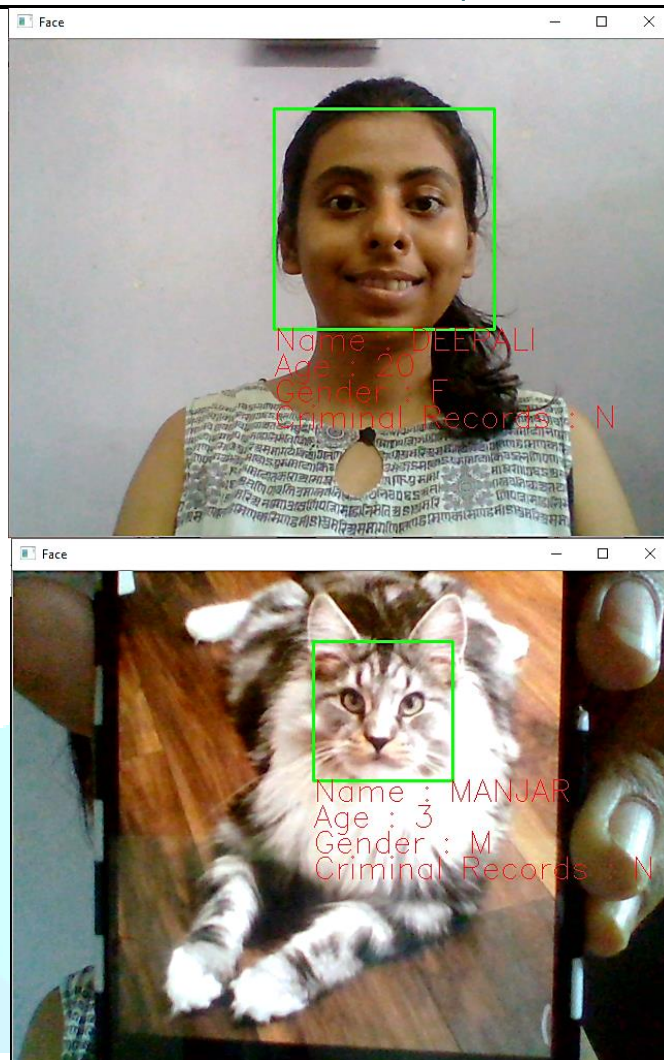


Fig:6.2. a

Fig:6.2. b

The fig (6.3) shows how system detect and recognize the intruder, upon detecting any intruder the system will recognize it as an UNKNOWN and the alarm will start ringing.

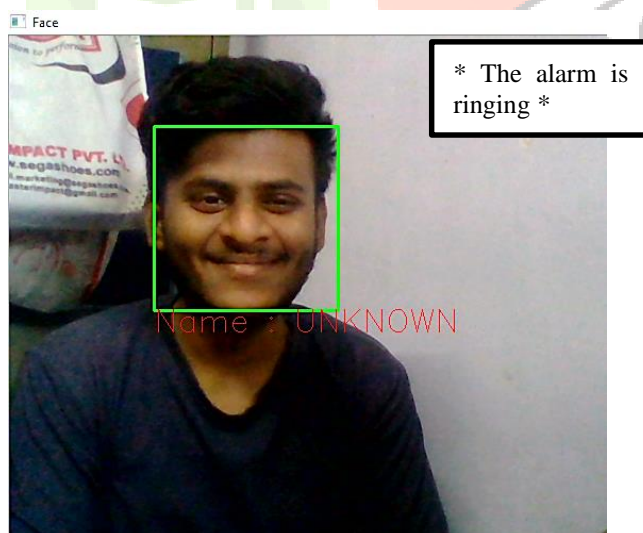


Fig:6.3

The fig (6.4) shows both human and pet detection and recognition, since we didn't have any real pet so as an alternative, we have used picture of pet on our mobile phone. As seen in picture below it brilliantly detect and recognize the human and pet.

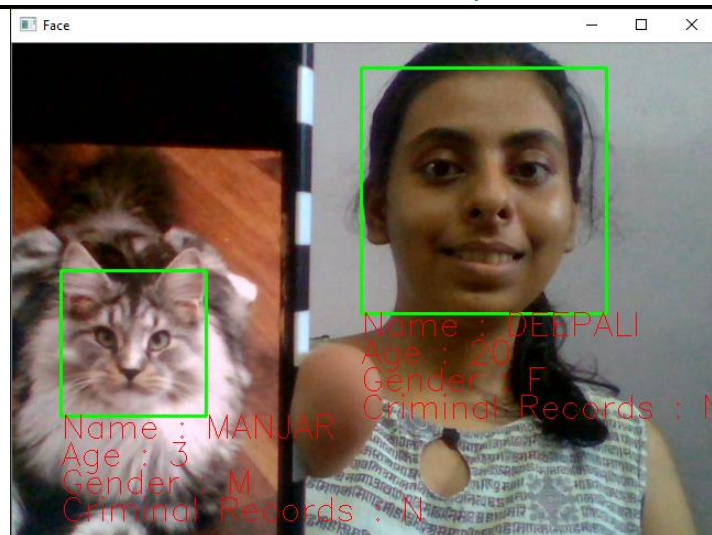


Fig:6.4

VII. APPLICATIONS

- This application is helpful in corporate offices, houses.
- It is also helpful where the entries are restricted example banks locker, government offices and hazardous labs.
- It can also be helpful in exams for verifying the student.

VIII. CONCLUSION

The proposed system detects known and unknown faces of pet and human from the camera and triggers an alarm if any intruder is found. It uses Viola-jones Face Detection Technique for detection of face from frames for both human and pet i.e. cat. For recognition of face the system uses model trained on LBPH algorithm. LBPH prediction confidence is set to 100 where the system is getting maximum correct results.

IX. FUTURE SCOPE

In future, the system can be integrated with CCTV for real-time detections and an alarm system or a door lock can be programmed if the system found intruder.

X. REFERENCE

- [1] Bhupendra Vishwakarma, Pooja Dange, Abhijeet Chavan, "Face and facial expression recognition for blind people", International Research Journal of Engineering and Technology (IRJET), 2017.
- [2] Fateh Cherfaoui and Si Nabil Yacini and Amine Nait-Ali, "Fusion of face recognition methods at score level", International Conference on Bioengineering for Smart Technologies (BioSMART), 2016.
- [3] Priya Pasumarti, P. Purna Sekhar, "Classroom Attendance Using Face Detection and Raspberry-Pi", International Research Journal of Engineering and Technology (IRJET) 2018.
- [4] Yang, X., Peng, G., Cai, Z., Zeng, K. Occluded and low-resolution face detection with hierarchical deformable model Journal of Convergence 2013 421114.
- [5] Bhattacharjee, D. Adaptive polar transform and fusion for human face image processing and evaluation Human-centric Computing and Information Sciences 2014 111810.1186/s13673-014-0004-z.
- [6] Viola, P., Jones, M. J. Robust real-time face detection International Journal of Computer Vision
- [7] Zhun Zhong, 1, 2 Liang Zeng, 3 Guoliang kang, 4 Shaozi Li, 1* Yi Yang 2 "Random Erasing Data Augmentation".