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Face Recognition for Security System

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ABSTRACT: Face recognition is essential for many applications, including biometrics, security, surveillance, identity, and authentication. In this research, we build and implement a security system for bank lockers that allows access to individuals whose faces are stored in the training database. First, by identifying human motion, we will identify the face. Subsequently, facial recognition is employed to ascertain the individual's authorization to access the sensitive region. We monitor the coordinate of any observed motion simultaneously. When the face cannot be recognized, the anesthetic gun receives the approximated coordinate and uses it to automatically target the intruder. The outcomes of the experiments show how well the suggested bank locker security system works to prevent unwanted entry and improve dependability through the use of live facial recognition.

KEYWORDS: Face detection, Feature extraction, tracking, Machine Learning.

I. INTRODUCTION

Human face detection is the most promising field of image processing that has a vast area of research oriented real life applications. In the real world the concept is widely used for the content annotation, access control, profiling and potential discrimination in the web world. There is always constructive scope of new inventions in the field of technology which is as vast as galaxy on its own. This leads to the better future. There has been a supportive development in the field of technology by the humans since the beginning of mankind. The motive was in rapid development and also in the advancement of technology to ensure the minimization of risk that is prone along with the new inventions which would make life easier, better and much faster. The main intention of face detection is to find out the human face in the given input. The Psychological process of locating the human face in the visual frame is also possible. It is also categorized as a special case of object class detection. The Eigen face approach is considered as a promising technique of face detection. In the field of marketing the facial image detection is playing a role of huge interest for the users. It has always been an issue of personal authentication that needs to be fixed for the purpose of access control of the info-security in the wider context via physical security. Researchers found that the face detection is an issue that needs to be taken into consideration. In terms of appearance, human face has high degree of variability, making it a dynamic object of study. Application of face detection is found in crowd surveillance, video conferencing, biometrics etc. The concept of human face detection makes it difficult for computer vision. Detected face is stored with high level of secrecy and certainty. Assuring that the data is safe, is the most important aspect under discussion. The image data consists of properties associated with, such as high level of redundancy, bulk capabilities and also high correlation between the pixels.

II. RELATED WORK

GURUH FAJAR SHIDIK 1 , EDI NOERSASONGKO 1 , ADHITYA NUGRAHA 1 , PULUNG NURTANTIO ANDONO 1 , JUMANTO JUMANTO 2 , AND EDI JAYA KUSUMA 1- In this paper, Intelligent Video SurveillanT (IVIST) is also introduced. IVIST is a prototype system with EDCAR knowledge that provides automatic support to implement related inference procedures such as object tracking and detection to trigger alarms. IVIST system has been investigated by using several target scenarios such as “steal baggage”, “crowd activity”, “unattended baggage”, and “fighting”. From investigation result, each scenario can precisely be detected using IVIST system integrated with EDCAR Framework.

Ahmed Abdel Moamen, Student Member, IEEE, Nadeem Jamali- In this study, we examine the impact of continuous mobile sensing on the energy usage of wearables and smartphones. We first examine several existing systems for serving such applications before presenting some illustrative continuous mobile sensing applications.

Syed Umaid Ahmed Hamza Khalid , Muhammad Affan - This study introduces a face-identification and face-

recognition intelligent system with applications in private security, home surveillance, and person tracking. In the event of an unidentified or unknown individual, the real-time video stream is processed, motion is detected, and dual-axis pan-tilt servos track that person with a camera. This is how an automatic facial recognition solves security issues with flexibility. Additionally, video recordings of these odd acts are synced from cloud storage, and mobile notifications are generated.

AHMED ABDELMOAMEN AHMED - In this paper, we present a prototype implementation of such systems, Hawk-Eye, an AI-powered threat detector for smart surveillance cameras. Hawk-Eye can be deployed on centralized servers hosted in the cloud, as well as locally on the surveillance cameras at the network edge. Deploying AI-enabled surveillance applications at the edge enables the initial analysis of the captured images to take place onsite, which reduces the communication overheads and enables swift security actions.

Haoren Cui, Zhihua Wei, Pengyu Zhang, Di Zhang - In this paper, we propose a multiple granular cascaded model of object tracking under surveillance video. For frames in surveillance video, we analyze the frames from different granularity levels. At the coarse level, we utilize Gaussian mixture model combined with a three-frame difference method to extract the foreground region of the frame. At the fine level, a cascaded multi-source feature fusion method is used to classify the region proposal and obtain the location of the target. Finally, we propose some optimization strategies for the online tracker updating. We conduct several comparative experiments on actual surveillance video.

Abhishek Dutta Andrew Zisserman - In this paper, we introduce a simple and standalone manual annotation tool for images, audio and video: the VGG Image Annotator (VIA). This is a light weight, standalone and offline software package that does not require any installation or setup and runs solely in a web browser. The VIA software allows human annotators to define and describe spatial regions in images or video frames, and temporal segments in audio or video

Yun-Xia Liu, Yang Yang, Aijun Shi, Peng Jigang, LiuHaowei- the monitor faces dozens of surveillance video images, which is easy to fatigue. It may not be able to respond in time to abnormal situations due to lack of concentration, and loss key information in the video. In addition, because a large amount of surveillance video needs to be stored for months or years, it will result in a large storage cost. Therefore, the intelligent video surveillance system is urgently needed to assist the monitoring personnel to use the intelligent detection technology to process, analyse and understand the video signal while retaining the original video key information, and automatically detect the target category and location information without manual intervention

Umadevi V Navalgund ,Priyadharshini.K – In this paper author described an automatic handgun detection system in surveillance videos, System controls the occurrences of crimes by detecting the guns in the surveillance videos, it will classify objects like gun or not, predict the crime occurred or not, it gives the solutions which have been compared with sliding window proposal approach, the good results are obtained by FRCNN and RCNN based models trained on dataset. This model shows a high crime prediction occurrence even in low quality videos then produces the best satisfactory results

Ya Wang, Tianlong Bao, Chunhui Ding, Ming Zhu - In this paper, we propose a method for face recognition in real-world surveillance videos by deep learning. First, a novel dataset from target real-world surveillance videos is constructed automatically and incrementally with the process of face detection, tracking, labeling and purifying. Then, a convolutional neural network with the labeled dataset is finetuned. On the testing dataset collected from the campus surveillance system, the network after fine-tuning achieves recognition accuracy of 92.1 %, which obviously outperforms the network without fine-tuning, which returns a recognition accuracy of 83.6%.

Yi Zhou, Li Liu, Ling Shao - In this paper, we present a fast algorithm: detection and annotation for vehicles (DAVE), which effectively combines vehicle detection and attributes annotation into a unified framework. DAVE consists of two convolutional neural networks: a shallow fully convolutional fast vehicle proposal network (FVPN) for extracting all vehicles' positions, and a deep attributes learning network (ALN), which aims to verify each detection candidate and infer each vehicle's pose, color, and type information simultaneously

III. PROPOSED SYSTEM

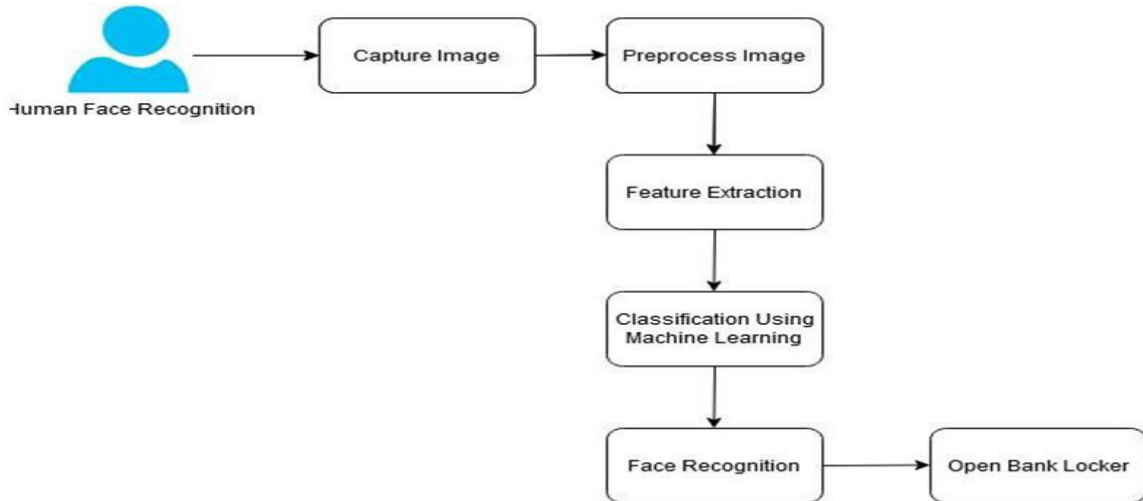


Figure1. System Architecture

Algorithm

1) Haar Cascade Algorithm:

Haar Cascade Algorithm is a machine learning based algorithm proposed by Paul Viola and Michael Jones in which the cascade image is trained by providing a lot of positive and negative images, that is used to detect the object in images. This algorithm needs a lot of positive images (images of faces) and negative images i.e. images without faces to train the classifier.

Haar features are used to extract the features from images.

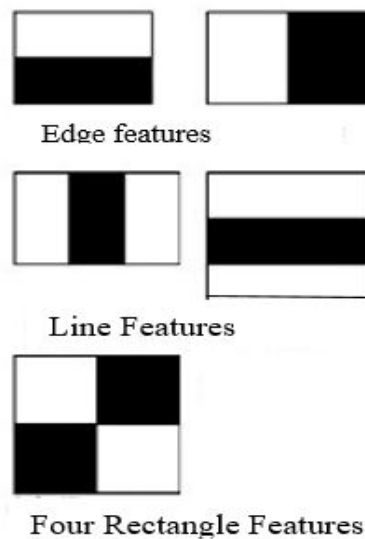


Fig 2. Haar Features

First set of two rectangle features is responsible for finding out the edge, Second set of 3 rectangle features is responsible for finding out if there is a lighter region surrounded by the region and the same if implemented conversely. Third set of 4 rectangle features is responsible for finding out the change of pixel intensity across diagonal. Every feature has a single value which is obtained by subtracting the sum of the pixel under the white rectangle from the sum of the pixel under the black rectangle. All possible locations of every kernel are used to calculate the feature. To calculate each feature we need to find sum of the pixel under the white and black rectangle for solving these integral images are introduced. It makes the calculation of the sum of the pixels simple.

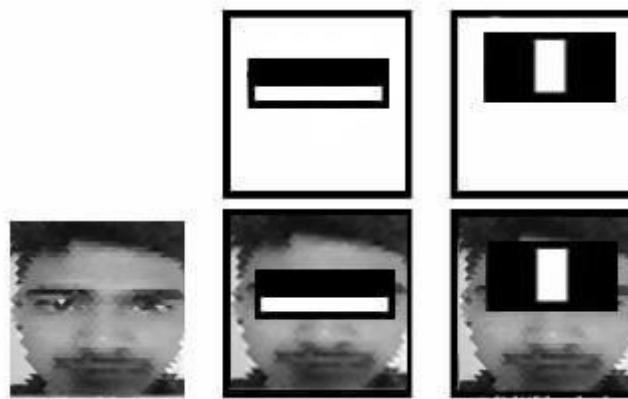


Fig -3: Haar Features

Among all the features calculated, many features are irrelevant. If we take the following example first feature focuses on property that describes a region of the eye that is often darker than the region of nose and cheeks. The second feature focuses on the eye region is darker than the bridge of the nose, but if the same window when applied on cheeks or any other place is irrelevant, so to minimize such irrelevance AdaBoost is used. To minimize the irrelevance in a feature, we apply every feature on every training image. For each feature, we get the best threshold value which discriminates faces into positive and negative. We select the feature which has a minimum error rate. The final classifier is the weighted sum of these different weak classifiers. It is called weak because it alone is not able to classify an image but together with others, they form a strong classifier. The final setup has 6000 approximate features. But implementation of 6000 features is a time-consuming process, so the further process is carried out. In an image, most of the part is non-face part. So we check if a window has a face region. If it is not then it gets discarded and no further process will be carried out on that region. So the possibility of finding face increases. Cascade classifier is used for this, instead of implementing 6000 features on a window. A group of features are applied step by step. If window fails at first stage window gets discarded. If it is passed then second stage of features is applied and it continues the process, and the face gets detected.

2) LBPH Algorithm:

Face recognition includes verification and identification. In verification or authentication, a person's face is compared with the face in the database in order to give him access, and in identification, we have to find if the person's face is present in the database, so it is compared with n number of faces.

LBPH algorithm is a combination of LBP (Local Binary Patterns) and HOG (Histogram Oriented Gradient) descriptors. It is a very powerful way of efficiently labeling the pixel of an image.

In face recognition, unique face is detected and then matched with the particular person. It can be achieved using a training and testing model by providing a set of images. LBPH uses radius, neighbour's axis x, and axis y parameters.

Radius is the distance from the center pixel to the circumference

Neighbor's is the number of data points circular local binary pattern.

Grid x is the number of cells horizontal direction.

Grid y is the number of cells vertical direction.

First dataset is made by taking pictures Using a Camera and providing personal information.

Following steps are done during face recognition using the LBPH algorithm:

First we have to train the algorithm. For that we need to provide a dataset that has images with their unique id. It is

because when a match is done algorithm will show the output with id.

In the first step, computation is done and an intermediate image is created which represents an original image. Image is created using the sliding window concept which is based on radius and neighbors.

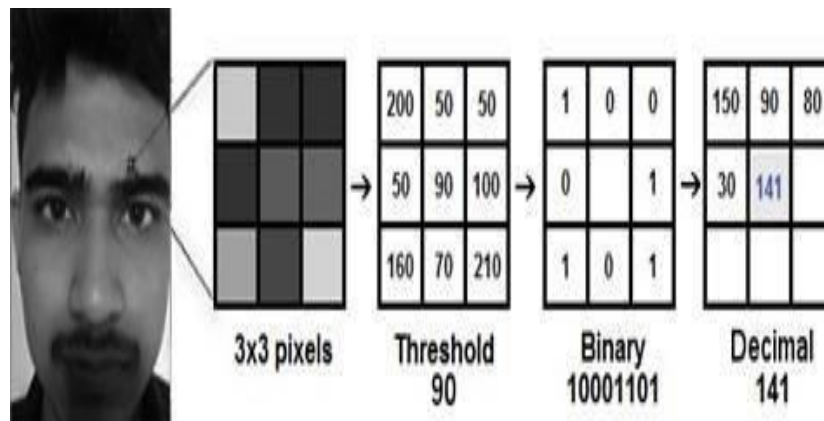


Fig 4.LBP algorithm for a face

Consider we have the above image. We can take 3x3 part of an image for understanding. This matrix has pixels of different intensities, we take the central value as a threshold value and this threshold value is used to define the new values from all 8 neighbour's. If neighbour value is greater than that of threshold value it is set to 1 and for a neighbor having less value than the threshold, it is set to 0. The central value is created by converting binary numbers to decimal numbers. We will get an image that better describes the original image. When we get the intermediate image next step is extraction and creation of histogram. We use grid x and grid y to divide the obtained image into multiple grids.

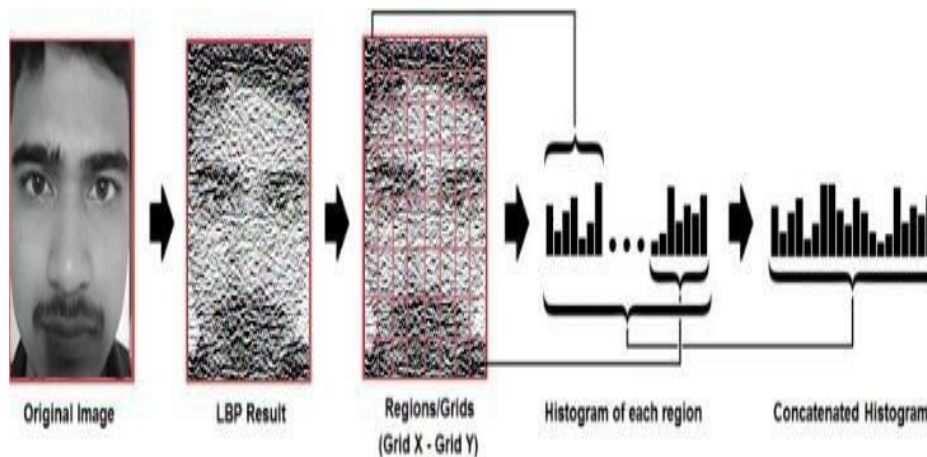
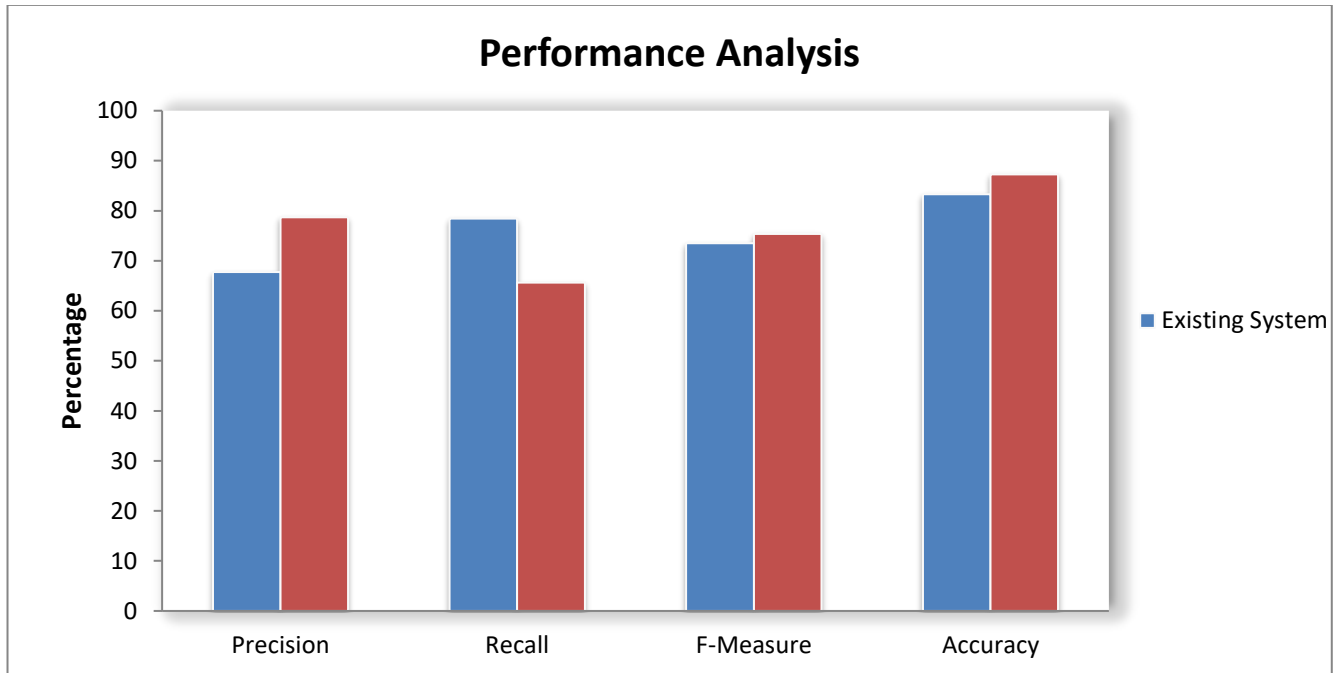


Fig 5. LBPH algorithm with Histogram

After this process ,we can extract the histogram of each region .Our image is in greyscale every histogram i.e. the histogram in every grid will contain around 256 positions which represents the intensity of the pixel.

After getting the histogram of all the grids, we need to concatenate them and a final histogram is get created .this final histogram gives characteristics of the original image .now the algorithm is trained and histograms are created. When we give an input image, we perform the same steps and create the histogram of an input image, and if we want to find if the face is present in the dataset we just compare the input image's histogram with a histogram of images in the dataset. We can use chi-square, Euclidian distance, the absolute value approaches to compare the histogram. We use threshold and the 'confidence' to estimate if the algorithm has correctly recognized the image.

IV. RESULT AND DISCUSSION



	Existing System	Proposed System
Precision	67.78	78.70
Recall	79.84	65.64
F-Measure	73.11	74.31
Accuracy	83.29	87.26

V. CONCLUSION

This paper presents an intelligent system for facial recognition and identification that has applications in home surveillance, person monitoring, and private security. When an unfamiliar or unidentified person appears, motion is recognized in the real-time video stream, dual-axis pan-tilt servos use a camera to follow them. This is how flexible automatic facial recognition addresses security concerns. In future scope, smartphone notifications are generated and video recordings of these strange activities are synchronized from cloud storage.

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