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REAL TIME FACE RECOGNITION MECHANISM

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***Abstract*-- Security is one of the important factors to restrict unauthorized access and protect our data. We humans identify others by looking at faces, not by fingerprint or other security documents. This is one of the easiest ways to recognize people. In our paper, we used face recognition as a security feature because the face is the easiest way to identify each other. Last few years many techniques are implemented in this field but many people are avoiding using this technique. In his paper first, we discuss face detection, available technique, and find advantages and disadvantages. After that, we are trying to provide some solutions to overcome these problems.**

***Keywords*-- face recognition, LBPH, Python.**

I. INTRODUCTION

Face detection is an Artificial Intelligence (AI) based computer technology that identifies human faces. It also used in different applications and also applied in various fields like biometric, personal safety. Face Recognition is one of the advanced features in the field of security. Face Detection helps us to identify which part of the face we have to focus to identify age, facial expression, etc. To increase the accuracy of the system we have to train the algorithm using a large dataset with thousands of positive and negative images this process helps the system to easily identify the human faces from the video or images. This application software detects human faces and store's faces in the Database. Face Detection algorithm focus on the frontal-face of the human after that, it extracts features like eye, mouth, etc from the images. The image of the people is matched bit by bit with the images which are store in the database. If the image feature matches successfully with the database then software show all the details of the person through which we can easily identify the person else software. Using these features the software performs techniques like face tracking and face detection. We are not able to monitor the hardware part of the application anytime. If an unauthorized person tries to shut down the hardware part of the system manually and utilized the memory space by implementing a resolution regulator. If no activity is been detected, then the regulator will switch the resolution to 480p. And if the camera detects any activity, then the resolution will be switched to 720p. This process helps us to save memory.

We detect human faces from two different ways:

1) Recognition of the face from the image.
2) Recognition faces in real-time.

1.1) Recognition of the face from the image:

Face detection can detect human face from the image make sure that all faces are focus before taking the image. When the Face Detection algorithm finds any face in images it creates a rectangle and extracts all the features of the face then it matches the features with the images which are store in the database. If the match successfully then it shows all the results of the particular person which is present in the photo. If we want to know about a person, then we search Google or ask someone so a lot of time goes into it, with the help of Face Recognition, at the same time we can find out what the details of that person.

1.2) Recognition faces in real-time:

Face detection can also detect the frontal face of humans in real life then extracts all the features of the face then matches with the images which are store in the database. If the match successfully then it shows all the information about the particular person else it shows unknown person. Then we easily identify the unknown people.We can easily track people by using Face Tracking. With the help of Face tracking, we can easily track criminals and reduce crime and we can save our people.

1.3) Different methods are used in Face Detection:

- Knowledge-Based: This method is also known as a rule-based method. This describes the whole face based on rules.
- Feature invariant methods: This method extracts details from the face like nose, eye, etc and used the details to identify human faces.

- Template-matching methods: This method based on the comparison image with standard face features and patterns that have been stored in the database to detect human faces.

1.4) Some specific techniques:

In Face Detection we used some specific techniques to increase the accuracy of the system.

- Remove Background: If the images contain a background with different colors and items then it creates problems when we try to detect the faces. So we remove the background which helps to reveal the face boundaries.
- Skin Color: In color images, we used skin color to find the human faces. But in every case, it not working properly.
- Motion: In videos, all the human faces are moving state using this method we calculate the moving area.

II. LITERATURE SURVEY

In Today's life technology plays an important role. To secure data it is very tough. So to address the issue we have come up with an idea by which we can recognize a person by the technology called Face recognition. It involves two phases. One of them is face detection and the other is face recognition we perform this process in both images and videos. It uses Haar feature-based cascade classifiers to detect the human face. This application can also be implemented in areas like "school attendance" and many more. A survey is been performed in the mentioned domain and we have found out a list of challenges such as

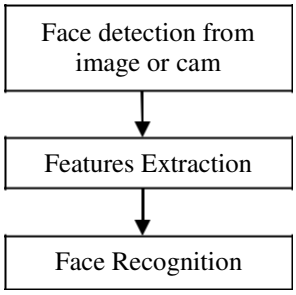
- Facial recognition cannot count the number of people in real-time.
- If we don't monitor our camera and someone tries to harm, we don't get any security alert.
- Throughout the process, there is no regulation strategy for the captured resolution. As a consequence, we will end up capturing the video in high resolution during the period even no object is detected. And that leads to high memory consumption.
- Using Face recognition, we need a high-resolution camera for better results and the cost of the camera is high. But everybody can't effort a high-resolution camera.
- Using maintain the system is a little bit complex.

To overcome the challenges, we train our algorithm thousand of positive and negative images; test the algorithm in different situations. Now we have come up with an application that helps:

- To detect human faces and show how many people are present in a particular place.
- We are not able to monitor the hardware part of the application anytime. So, we have integrated a monitoring feature that triggers the alarm if an unauthorized person tries to shut down the hardware part of the system manually.
- In our application, we utilized the memory space by implementing a resolution regulator. If no activity is been detected, then the regulator will switch the resolution to 480p. And if the camera detects any activity, then the resolution will be switched to 720p. This process helps us to save memory.
- For face detection and recognition, we integrated a feature that uses a mobile camera as camera hardware of the application.
- Maintain the system is not easy for everyone so we create AI, a virtual desktop assistant.

III. METHODOLOGY

Face Recognition process is divided into 3 phases:



3.1) Face Detection: In this step, the algorithm checks whether the face is present or not in the cam or the given image. Then find where the faces are located. If the algorithm finds faces and location then detect the face and generates a rectangle.

Fig 3.1: Face Detection

3.2): In this step, the algorithm focus on the frontal-face of the human after that, it extracts features like eye, mouth, etc from the image and store in the Database for future face recognition.

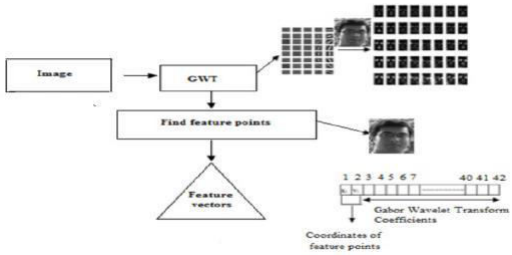


Fig 3.2: Features Extraction

3.3) Face Recognition: After extracts all the features like eye, mouth, etc from the image and store in the Database. In this step algorithm matched the image of the people bit by bit with the images which are store in the database.

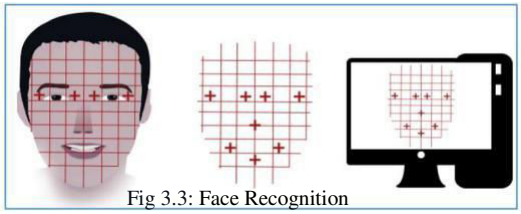


Fig 3.3: Face Recognition

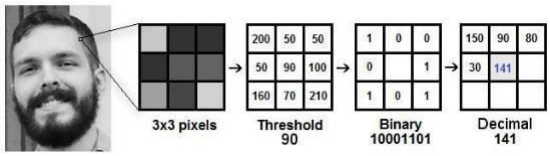
3.4) *Local Binary Pattern (LBP):* It is an easy and very effective texture operator that points every pixel of an image by thresholding the area of each pixel and generate the result as a binary number. It is one of the powerful features for texture classification. It the future when LBP is combined with histograms of oriented gradients (HOG) descriptors, it improves the Detection & Recognition performance considerably on some datasets. When the LBP combined with histograms we can show the face images with a simple data vector. As LBP is a visual configuration it can also be used for face Detection & Recognition tasks, as can be seen in the following step-by-step explanation.

a) Parameters: For processing, the LBPH uses 4 parameters:

- Radius**:** In this step, the radius is used to create the circular local binary pattern and generate a radius around the central pixel. It is usually set to 1 step.
- Neighbors**:** The number of points used to create the circular local binary pattern. The more points you include, the higher the computational cost. It is usually set to 8.
- Grid X**:** The cells are set in the horizontal direction. The more cells, the excellent the grid, the higher the dimensionality of the resulting vector. It is usually set to 8.
- Grid Y**:** The cells are set in a vertical direction. The more cells, the excellent the grid, the higher the dimensionality of the resulting vector. It is usually set to 8.

b) Training the Algorithm: For good results first, we need to train the algorithm properly. For that, we need to use a dataset with the thousand facial images of the people. We need to put an ID (it may be a number or the name of the person) for every image so that the algorithm will use this information to recognize it. Images of the particular person must have the same ID. With the training set already included.

c) Applying the LBP operation: First, the LBPH is to create an intermediate image that properly describes the original image, by showing the features of the images. For that, the algorithm uses a process called a sliding window, based on the parameters **radius** and **neighbors**.



d) comparision of different methods for Face recognition:

Algorithm: Eigenfaces	
Pros:	-Agnostic to object even being a face. -Reduces statistical repetition in a face image representation.
Cons:	-Sensitive to light -Sensitive to pose, facial expressions. -Sensitive to pixel misalignment
Algorithm: Fisherfaces	
Pros:	-Achieves greater between-class scatter thus making classification easier compared to Eigenfaces. -Insensitive to light.
Cons:	-If between-class scatter is large, then within-class scatter could be large.
Algorithm: Local Binary Patterns	
Pros:	-Resistance to light changes. -low computational complexity. -Ability to code fine details.
Cons	-Produce long histograms, which can slow down recognition speed especially on a large training Databases.

e) Conclusions

- LBPH is one of the easiest face recognition algorithms.
- It can represent local features in the images.
- It is possible to get great results.

IV. Results and Discussion

To increase the accuracy of the system we have to train the algorithm using a large dataset with thousands of positive and negative images this process helps the system to easily identify the human faces from the video or images. This system was tested under different conditions and a different dataset which help to increase the real-world performance. The result or the accuracy of the system depends on the quality of images or videos.

Fig 4.1: Face Detection from image and videos

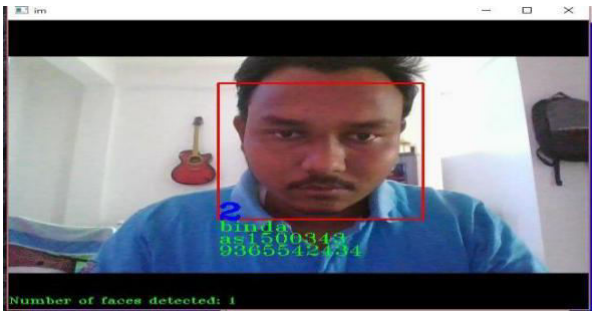


Fig 4.1: Face Recognition from image and videos

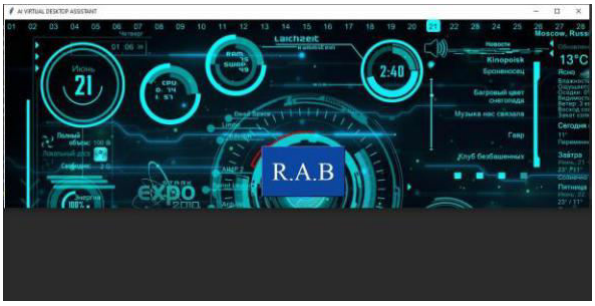


Fig 4.3: AI Virtual Desktop Assistant

V. CONCLUSION

Our goal is to provide the users with a wonderful experience of studying and gathering knowledge. The algorithm, which was implemented in this project, was chosen after research, and the successful testing using a different dataset, results confirm that the system was reliable. The frontal-face detection system displayed virtually perfect accuracy. The fully automated face detection and recognition system were not robust enough to achieve high recognition accuracy. In the future, if we include eye detection, mouth detection is added in our project the accuracy of our project is increase and it gives proper results. There are better techniques such as iris or retina recognition and face recognition using the thermal spectrum for user access and user verification applications since this needs a very high degree of accuracy.

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