DETECT AND RECOGNIZE FACIAL EXPRESSIONS USING IMAGE PROCESSING TECHNIQUES

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Abstract:-Computer systems which are developed, in order to create smart environments need to follow human interaction patterns in order to allow comfortable usage. These environments are supposed to give benefits to the users and support their interaction among each other. The users must be in focus of attention, not the computer system that supplies certain functionality. In such environments, it is

essential that the computer system is able to identify the people it is dealing with. A feasible approach to identification is the use of facial features. "Face recognition" is a very active area in the computer vision and Biometric fields as it has been studied vigorously for 25 years and is finally producing applications in security, robotics, human-computer interfaces, digital cameras and entertainment.

Keywords: Face Recognition, Facial Features

I. INTRODUCTION

The human face possesses superior expressive ability and provides one of the most powerful and natural means of communicating motivational and affective state. facial expressions not only to express our emotions, But also to provide important communicative cues during social interaction, such as our level of interest, our desire to take a speaking turn and continuous feedback signaling understanding of the information conveyed. Facial expression constitutes 55 percent of the effect of a communicated message and is hence a major modality in human communication .

II. PREVIOUS STUDY

Reeves &Nass posit that human beings are biased to attempt to evoke their highly evolved social skills when confronting a new technology capable of social interaction. The possibility of enabling systems to recognize and make use of the information conferred by facial expressions has hence gained significant research interest over the last few years. This has given rise to a number of automatic methods to recognize facial expressions in images or video.

This project is supposed to detect the faces visible in the camera source and on training the images, the faces are stored in a folder with the name given to it by the user. Whenever the faces that are stored in the source folder are displayed on the camera source, on clicking the identify button, the images are compared and the matched name is displayed on the screen.

A) EXISTING SYSTEM

Traditional facial recognition algorithms identify facial features by extracting landmarks, or features, from an image of the subject's face. For example, it may analyze the relative position, size, and/or shape of the eyes, nose, cheekbones, and jaw. These features are then used to search for other images with matching features which is very inconsistent and less adaptable to the real-time environment. One of the applied fields of face recognition are in security applications like face recognition lock in Android.

B) PROPOSED SYSTEM

Real Time Face detection and recognition implementing Eigen faces algorithm using openCV from a live videofeed. Eigenfaces is a computer vision problem that uses a set of training images to develop data matrix that can be used to project, detect or compare against input images. OpenCV is widely used computer vision and machine learning library compatible with multiple programming languages[9]. The project intends to use Java withOpenCV to realize the solution by diminishing the effect of external environment on the user input image.

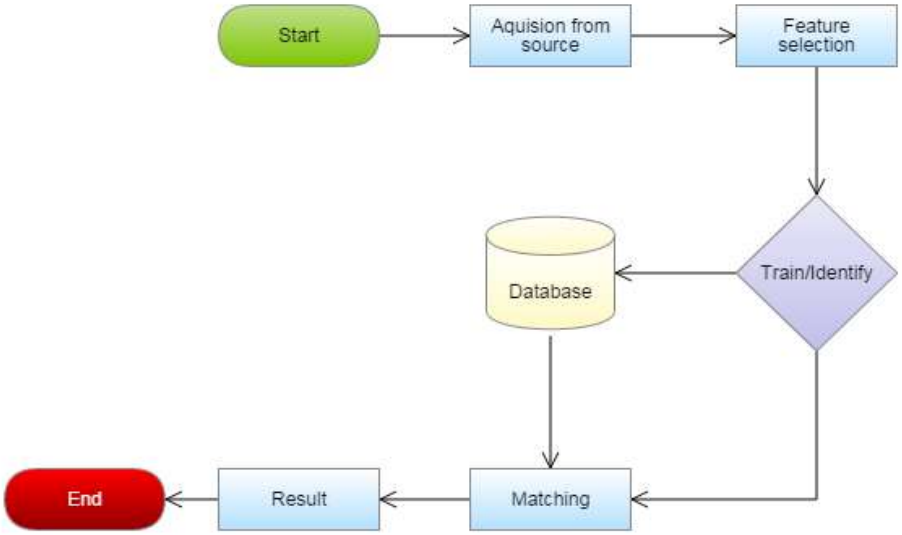
C) Face Detection

Face detection is a computer technology that identifies human faces in digital images. It detects human faces which might then be used for recognizing a particular face. This technology is being used in a variety of applications now-a-days[4]. Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class.Face-detection algorithms focus on the detection of frontal human faces. It is analogous to image detection in which the image of a person is matched bit by bit. The dimensions of the face in the source is compared to the dimensions predicted by the algorithm.

D) Face Recognition

Afacial recognition system is a computer application capable of identifying or verifying a person from a digital image or a video frame from

a video source. One of the ways to do this is by comparing selected facial features from the image and a facial database[5].



When the source is open, the feature extractionis done from the available source. From the extracted features, the image is either stored in the database or compared for existence. If the comparison is done, on success it displays the name of the detected face else shows an error.

III. RESULTS AND DISCUSSION

Designing the interface The interface for the face detection and recognition project is designed using the Net Beans IDE. This interface serves the to make program operation more intuitive and interactive thus making it easier to learn and use[7].

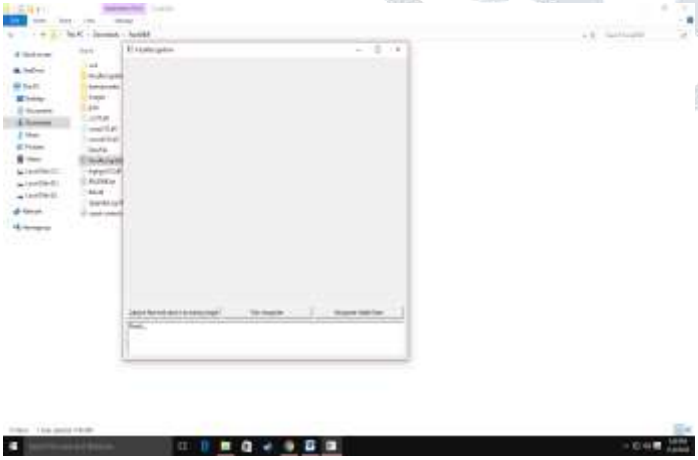


Figure1 Interface design preview

i. Importing the cascades

Cascading is a particular case of ensemble learning based on the concatenation of several Classifiers, using all information collected from the output from a given classifier as additional information for the next classifier in the cascade. Unlike voting or stacking ensembles, which are multi expert systems, cascading is a multistage one.

Cascading Classifiers are trained with several hundred "positive" sample views of a particular object and arbitrary "negative" images of the same size. After the classifier is trained it can be applied to a region of an image and detect the object in question. To search for the object in the entire frame, the search window can be moved across the image and check every location for the classifier. This process is most commonly used in image processing for object detection and tracking, primarily facial detection and recognition[11].

Classifiers successfully serve the requirement of implementing the program on low CPU systems, such as cameras and phones.Cascade classifiers are available in OpenCV, with pre-trained cascades for frontal faces and upper body. Training a new cascade in OpenCV is also possible with either haar_training or train_cascades methods. This can be used for rapid object detection of more specific targets, including non-human objects with Haar-like features.These XML files are stored in openCV/ data/haarcascades/ folder. These files are to be imported into our project file to detect faces.

CascadeClassifierfaceDetector = new CascadeClassifier (FaceDetection.class. getResource("haarcascade_frontalface_alt.xml"). getPath().substring(1));

haarcascade_eye.xml	3/8/2015 9:36 AM	XML Document	495 KB
haarcascade_eye_tree_eyeglasses.xml	3/8/2015 9:36 AM	XML Document	1,070 KB
haarcascade_frontalface_alt.xml	3/8/2015 9:36 AM	XML Document	899 KB
haarcascade_frontalface_alt_tree.xml	3/8/2015 9:36 AM	XML Document	3,560 KB
haarcascade_frontalface_alt2.xml	3/8/2015 9:36 AM	XML Document	818 KB
haarcascade_frontalface_default.xml	3/8/2015 9:36 AM	XML Document	1,226 KB
haarcascade_fullbody.xml	3/8/2015 9:36 AM	XML Document	622 KB
haarcascade_lefteye_2splits.xml	3/8/2015 9:36 AM	XML Document	316 KB
haarcascade_lowerbody.xml	3/8/2015 9:36 AM	XML Document	520 KB
haarcascade_profileface.xml	3/8/2015 9:36 AM	XML Document	1,100 KB
haarcascade_righteye_2splits.xml	3/8/2015 9:36 AM	XML Document	317 KB
haarcascade_smile.xml	3/8/2015 9:36 AM	XML Document	276 KB
haarcascade_upperbody.xml	3/8/2015 9:36 AM	XML Document	1,022 KB

Figure 2.List of available cascades[9]

ii. Face Detection Module

Face detection and recognition includes many complementary parts where each part is a complement to the other. Depending on regular system each part can work individually. Face detection is a computer technology that is based on learning algorithms to allocate human faces in digital images.Face detection also refers to the psychological process by which humans locate and attend to faces in a visual scene.

Face detection takes images/video sequences as input and locates face areas within these images. This is done by separating face areas from non-face background regions. Then the possible human eye regions are detected by testing all the valley regions in the gray-level image[6]. Feature extraction simplifies face region normalization where detected face is aligned to coordinate framework to reduce the large variances introduced by different face scales, poses and lightning effect caused due to uneven illumination and the shirring effect due to head movement[4]. The accurate locations of feature points sampling the shape of facial features provide input parameters for the face identification.

Face identification generates the final output of complete face-recognition system: the identity of the given face image. Based on normalized face image and facial feature locations derived from previous stages, a feature vector is generated from given face and compared with a database of known faces.

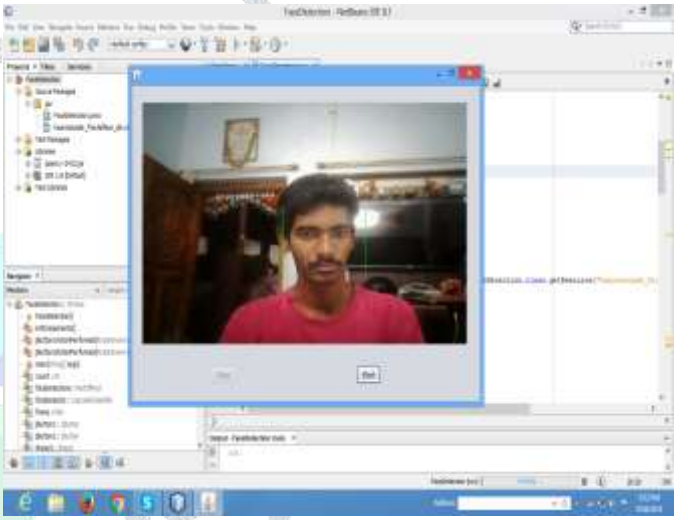


Fig .3 Code Snippet for detection

iii. Face Recognition Module

Facial recognition or face recognition is a type of biometric software application that can identify a specific individual in a digital image by analyzing and comparing patterns. Facial recognition systems are commonly used for security purposes but are increasingly being used in a variety of other applications. The Kinetic motion gaming system, for example, uses facial recognition to differentiate among players[5].

Some facial recognition algorithms identify facial features by extracting landmarks, or features, from an image of the subject's face. For example, an algorithm may analyze the relative position, size, and/or shape of the eyes, nose, cheekbones, and jaw.These features are then used to search for other images with matching features. Other algorithms normalize a gallery of face images and then compress the face data, only saving the data in the image that is useful for face

recognition[2]. A probe image is then compared with the face data. One of the earliest successful systems is based on template matching techniques applied to a set of salient facial features, providing a sort of compressed face representation.

Recognition algorithms can be divided into two main approaches, geometric, which looks at distinguishing features, or photometric, which is a statistical approach that distills an image into values and compares the values with templates to eliminate variances.

iv. Eigen Faces

Eigen faces is the name given to a set of eigenvectors when they are used in the computer vision problem of human face recognition. The approach of using eigenfaces for recognition was developed by Sirovich and Kirby and used by Matthew Turk and Alex Pentland in face classification.[1]

The eigenvectors are derived from the covariance matrix of the probability distribution over the high-dimensional vector space of face images[6]. The eigenfaces themselves form a basis set of all images used to construct the covariance matrix. This produces dimension reduction by allowing the smaller set of basis images to represent the original training images. Classification can be achieved by comparing how faces are represented by the basis set.

A set of eigenfaces can be generated by performing a mathematical process called principal component analysis (PCA)[3] on a large set of images depicting different human faces. Informally, eigenfacescan be considered a set of "standardized face ingredients", derived from statistical analysis of many pictures of faces. Any human face can be considered to be a combination of these standard faces.[1]

Figure 5.5.3 Sample training images[2]

Figure 4 Project files generated

IV. CONCLUSION

The face recognition and detection algorithms were thoroughly studied taking a number of test images and varying the conditions and variables. All the work mentioned above involved real time data. The success rate depends upon certain external factors like brightness, angle with respect to camera, etc. The overall success rate when performed in ideal conditions is 95%.

Among the different biometric techniques, facial recognition may not be most reliable and efficient. However, one key advantage is that it does not require the cooperation of the test subject to work. Properly designed systems installed in airports, multiplexes, and other public places can identify individuals among the crowd, without passers-by even being aware of the system. Other biometrics like fingerprints, iris scans, and speech recognition cannot perform this kind of mass identification.

FUTURE EXPANSION

Face Recognition is a technology just reaching sufficient maturity for it to experience a rapid growth in its practical applications .Face Recognition technology can be utilized to build an automated attendance system that makes counting and identifying students much easier and convenient with robustness and reliability .Further Face Recognition can be used in Anti-theft smart car security, in which one alarm signal could be given to make an alarm or “call” the police and the host soundlessly with the help of other modules in the system prototype. Face Recognition technology can automatically spot shoplifters in a crowd. Verification systems for physical and electronic access security are available today, but the future holds the promise of passive customization and automated surveillance systems enabled by Face Recognition.

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