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REALTIME FACE RECOGNITION BASED ON AUGMENT REALITY

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Abstract – This document articulates the intent to create face recognition system based on Augment reality. The basis of this study is on real-time image detection and processing. It's a new convenient measure that allows users to gain information on imagery right on the spot. In Augment reality, one of the key elements to consider is object recognition technology also known as object detection in digital image processing. This term refers to an ability to identify the form and shape of different objects that caught by the device's camera. Past studies have revealed attempts to create image-based applications but have only gone up to creating image finders that only work with images that are already stored within some form of database. Android platform is rapidly spreading around the world and provides by far the most interactive and technical platform for smart-phones. This is why it was important to base the study and research on it. The Eigen face algorithm and principal component analysis is employed for object detection. The work consists of three stages. First is image capturing by using a mini camera, and have to transfer to the image processing platform. Second is object recognition by using the recognition algorithm. Third is speech output - the filtered text will be shared into system to get an audio speech output.

Key Words: Augment reality, face recognition, camera, image processing, object recognition, image-based applications.

1.INTRODUCTION

Face recognition system based on augment reality has been a sought-after problem of biometrics and it has a variety of applications in modern life. The problems of face recognition attract researchers working in biometrics, pattern recognition eld and computer vision. Several face recognition algorithms are also used in many different applications apart from biometrics, such as video compressions, indexing etc. They can also be used to classify multimedia content, to allow fast and efficient searching for material that is of interest to the user. An recent face recognition system can be of great help in forensic sciences, identification for law enforcement, surveillance , authentication for banking and security system, and giving preferential access to authorized users i.e. access control for secured areas etc. The problem of face recognition has gained even more importance after the recent increase in the terrorism related incidents. Use of face recognition for authentication also reduces the need of remembering passwords and can provide a much greater security if face recognition is used in combination with other security measures for access control. The cost of the license for an efficient commercial face recognition system range from 30,000 to150, 000 which shows the significant value of the problem. Though face recognition is considered to be a very crucial authentication system but even after two decades continuous research and evolution of many face recognition algorithms, a truly robust and efficient system that can produce good results in real-time and normal conditions is still not available. The Face Recognition Vendor Test (FRVT) that has been conducted by the National Institute of Standards and Technology (NIST), USA, has shown that the commercial face recognition systems do not perform well under the normal daily conditions. Some of the latest face recognition algorithm involving machine learning tools perform well but sadly the training period and processing time is large enough to limit its use in practical applications. Hence there is a continuous strife to propose an effective face recognition system with high accuracy and acceptable processing time.

1.2. Introduction to Augment Reality

The Augmented Reality (AR) is the ability to create real world simulation of objects whose elements are augmented with the help of computer-generated input. A vast number of sensory feeds such as sound, video, graphics or GPS is used to create a virtual reality experience. AR help create a more digitally manipulative and interactive environment which is appealing to consumers a wide range of consumers and organi- zations.AR is a research area which is in progressive stage and focuses on wearable technology like goggles, contact lenses which will be commonly used in future. The three characteristics of Augmented reality system are:

- •Combine real and virtual environment
- •Real time interaction
- •Registered in 3D

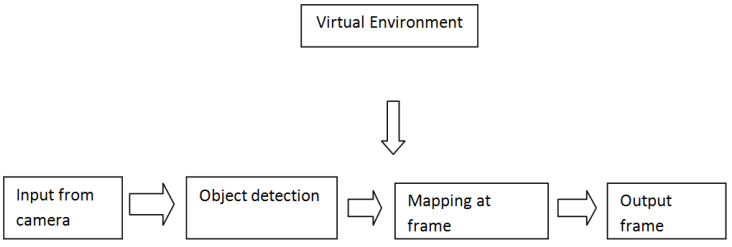

Fig -1: Augment reality layout

The basic goal of augmented reality system is to enhance the user perception of and interaction with real world through supplementing the real world with 3D virtual objects that appear to coexist in some space as real world. Registration of

an image refers to accurate alignment of real and virtual object, without registration the illusion that virtual object exist in real environment is severely compromised [2]. The idea of this project using Digital Image Processing technique satisfy the above-mentioned need using camera and augmented reality. Camera is used as a frame through which a user can see the object in that frame and that by using the feature detection technique, object to augment is obtained and then it is produces as speech output with the help of hardware.

1.3. Background Study

Google 's Android is a new platform for Smartphones that aims to simplify matters for a user by mobilizing tasks through countless applications making it even more convenient for them. Recognition software for Android that adds a notetaking feature helping users to have a search history of images they had previously taken. The application is still fairly limited in its scope of its recognition capabilities. Google has come up with a means to tackle image finding. It has introduced Google Goggles, visual recognition software for Android that adds a notetaking feature helping users to have a search history of images they had previously taken. The application is still fairly limited in its scope of its recognition capabilities.

1.4. Problem Statement

Image searching has been introduced, but the accuracy of the results is poor and yields many undesirable entries. Thus, it is unable to provide specialized precise image resources. Moreover, it is difficult for mobile phones to process images, for which users end up spending a significant amount of time without receiving what they need. Mobile phone image processing technology is still very much ineffective and still cannot provide real-time responses.

1.5. Problem Solving with Image Detection

The objectives of this project;

•To integrate a high-efficiency, real-time architectural image-based application.
•To unify an efficient processing, storing and mining image-technology.
•To enhance usage of Augmented Reality in Android phones allowing for improved result output where imagery is concerned.
•The image will shared to the system to get an audio speech output.

2. LITERATURE SURVEY

2.1 Face Recognition Approaches

LFA method of recognition analyzes the face in terms of local features, e.g., eyes, nose, etc. referred to as LFA kernels. LFA technique are better robustness against local variations on the facial image in carrying out a match, but does not account for global facial attributes. Neural Network are based on learning of the faces in an example set by the machine in the training phase and carrying out recognition in the generalization phase. But in order to succeed in a practical set-up, the examples should large in number to account for variations in real life situations. Model Matching methods of face recognition (like Hidden Markov Model (HMM) train a model for every person during model learning and choose the best matching model, given a query image. Here also a big realistic representative model is necessary for good results. A recognition system based on sparse representation computed by l1 -minimization works with the basic idea of casting the recognition as a sparse representation problem. The main concern in this approach is the presence of large number of features and correct computation of sparse representation. It is a robust and scalable algorithm for face recognition based on linear or convex programming. Focused color intersection with efficient searching for object detection and image retrieval.

2.2 A Paper currency recognition system using im- age detection to improve the reliability with PCA method

Automatic paper currency recognition always depends on the currency note characteristics of a particular country and the extraction of features directly affects the ability of recognition. Currency has great significance in day-to-day life and may be because the currency recognition is a great area of interest. We know that, for people, to count different denomination notes in a bunch is a major task as well as its very difficult for people to recognize currencies from different countries. In this paper, we present an image processing technique to extract paper currency denomination based on the local principal component analysis (PCA) method. Here, we try to give an idea to solve such types of problem to help the people.

2.3 A Survey of Augmented Reality

This paper surveys the field of Augmented Reality, in which 3-D virtual objects are integrated into a 3-D real environment in real time. It describes the medical, manufacturing, visualization, path planning, entertainment and military applications that have been explored. This paper describes the characteristics of Augmented Reality systems, including a detailed discussion of the tradeoffs between optical and video blending approaches. Registration and sensing errors are two of the biggest problems in building effective Augmented Reality systems, so this paper summarizes current efforts to overcome these problems. Future directions and areas requiring further research are discussed. This survey provides a starting point for anyone interested in researching or using Augmented Reality.

2.4 Real-time camera pose estimation based on planar object tracking for augmented reality environment

Real-time camera tracking is steadily gaining in importance due to the drive from various applications, such as AR (augmented reality), mobile computing, and human- machine interface. In this paper, we describe a real-time camera tracking framework designed to track a monocular camera in a desktop workspace. Basic idea of the pro- posed scheme is that the camera pose estimation is achieved on the basis of a planar object tracking framework. As the camera pose estimation and

scene registration is achieved via a non-iterative process, the proposed method is computationally efficient and very fast, and therefore, it can be directly embedded to AR systems running on mobile device platforms. In addition, our system attempts to detect new features as- summed to be present on the reference planar surface, so that the system can be operated even when reference features go out of visible range. The accuracy and robustness of the proposed system are verified on the experimental results of several real-time input video streams.

2.5 Recent Advances in Augmented Reality

The main goal of this paper to complement, rather than replace, the original survey by presenting representative examples of the new advances. We refer one to the original survey for descriptions of potential applications (such as medical visualization, maintenance and repair of complex equipment, annotation, and path planning); summaries of AR system characteristics (such as the advantages and disadvantages of optical and video approaches to blending virtual and real, problems in display focus and contrast, and system portability); and an introduction to the crucial problem of registration, including sources of registration error and error-reduction strategies.

Detection Type	Detection Description
Face Recognition	Not precise (requires database)
Image editor	Provides minimal features(grayscale)
Solar Images	Depends on the climate changes
Ultrasound images	Limited form of detection. Only task specific.
Block images(variables)	technical form

Table - 1: Detection Types

3. PROPOSED SYSTEM

This document proposes a real time face recognition system based on Augment reality using PCA. The main challenge for a face recognition system is of effective feature extraction. The proposed system utilizes the Eigen face method is information reduction for the images. There is an incredible amount of information present even in a small face image. A method must be able to break down pictures so as to effectively represent face images rather than images in general. base faces are generated and then image being analyzed can be represented by the system as a linear combination of these base faces. Each face that we wish to classify can be projected into face-space and then analyzed as a vector. A k-nearest-neighbor approach, a neural network or even a simple Euclidian distance measure can be used for classification.

This document entails a full analysis and a step-by-step layout of the proposed application. This application will work with camera-enabled Android smart phones. The user focuses the Smartphone then takes a picture of some objects or faces and the image taken is detected and perform the object identification while taking the picture through camera., there is an output or display of results about the image. This can be performed with the help of a microcontroller. The three processes which include is screen capturing, data processing and audio output. The screen capture components which capture the scene by motion-based object-deduction using an IP Webcam application in Android smart phones. The proposed algorithm is used for the object identification. The proposed algorithm includes the face detection and data compression. The identified images are stored in the data set. Then while executing the system the user will takes picture some objects and faces. Then the system performs the compare the motion-based input images with the dataset. The face detection algorithm will work hereafter the system will identify the face it will give a speech output about the image. The audio output components read the correct text code. The Bluetooth ear piece or any mini speaker is used for speech output.

4. METHODOLOGY

4.1. Object or Face recognition using PCA

The whole recognition process involves two steps: A. Initialization process B. Recognition process The Initialization process involves the following operations:

- Acquire the initial set of face images called as training set.
- Calculate the Eigenfaces from the training set, keeping only the highest eigen values. These M images define the face space. As new faces are experienced, the eigenfaces can be updated or recalculated.
- Calculate distribution in this M-dimensional space for each known person by projecting his or her face images onto this face-space.

These operations can be performed from time to time whenever there is a free excess operational capacity. This data can be cached which can be used in the further steps eliminating the overhead of re-initializing, decreasing execution time thereby increasing the performance of the entire system. Having initialized the system, the next process involves the steps:

- Calculate a set of weights based on the input image and the M eigenfaces by projecting the input image onto each of the Eigenfaces.
- Determine if the image is a face at all (known or unknown) by checking to see if the image is sufficiently close to a free space.
- If it is a face, then classify the weight pattern as either a known person or as unknown. iv. Update the eigenfaces or weights as either a known or unknown, if the same unknown person face is seen several times, then calculate the characteristic weight pattern and incorporate into known faces. The last step is not usually a requirement of every system and hence the steps are left optional and can be implemented as when the there is a requirement.

The various steps to calculate eigenfaces are:

- Prepare the data A 2-D facial image can be represented as 1-D vector by con- catenating each row (or column) into a long thin vector. Let's suppose we

have M vectors of size N (= rows x columns of image) representing a set of sampled images Then the training set becomes: Γ1, Γ2, Γ3

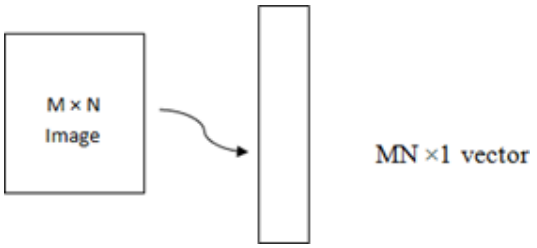

Fig -2: Conversion of M N image into MN 1 vector

- Subtract the mean the average matrix has to be calculated, then subtracted from the original faces (Γi) and the result stored in the variableφ

  n=1Γn

  φi = Γi - ψ

- Calculate the co-variance matrix in the next step the covariance matrix A is calculated according to:

  A = φT

- Calculate the eigenvectors and eigenvalues of the covariance matrix in this step, the eigenvectors (eigenvectors) Xi and the corresponding eigenvalues λ i should be calculated.

- Calculate eigenfaces [φ]Xi = fi where Xi are eigenvectors and fi are eigenfaces.

- Classifying the faces the new image is transformed into its eigenface components. The resulting weights form the weight vector ΩT k:

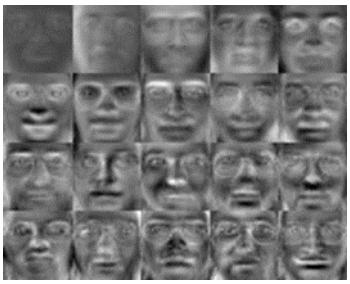

Fig -3: Sample Eigen face images of normal face images

Let X, Y be eigenfeature vectors of length n. Then we can calculate the following distances between these feature vectors.

Mahalanobis Distance

Mahalinobis space is denned as a space where the sample variance along each dimension is one. Therefore, the transformation of a vector from image space to feature space is performed by dividing each coefficient in the vector by its corresponding standard deviation. This transformation then yields a dimensionless feature space with unit variance in each dimension. If there are two vectors x and y in the unscaled PCA space and corresponding vectors m and n in Mahalinobis space. First, we dene λi = 2 i where i are the PCA eigenvalues, 2i is the variance along those dimensions and i is the standard deviation. Where λi is the Eigenvalue corresponding to the ith Eigenvector.

Principle Component Analysis (PCA): Problem Formulation

For the problem of dimensionality reduction, the most commonly used algorithm is PCA. Here, we align a set of face images (the training set x1, x2, ..., xM). This means we reshape all 2D images of the training database into 1D column vectors. Then, we put these 1D column vectors in a row to construct 2D matrix 'X'.

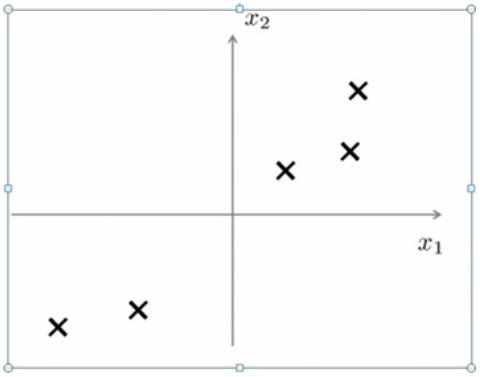

Fig -4: Training image samples

Steps involved in proposed system

Suppose all P images in the training database have the same size of MxN. So, the length of 1D column vectors is MxN and 'X' will be a (MxN)xP 2D matrix.

- finding number of training images in the data path specified as argument

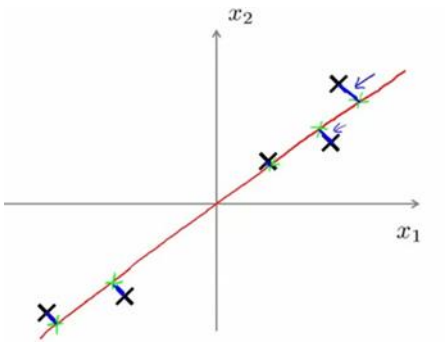

Fig 5-: Projection of training samples

- creating the image matrix X
- Now we calculate m, A and eigenfaces
- calculating mean image vector
- calculating A matrix, i.e. after subtraction of all image vectors from the mean image vector
- Perform calculation of Eigenfaces.

- finding the projection of each image vector on the face space (where the eigenfaces are the co-ordinates or dimensions.
- extracting PCA features of the test image
- calculating and comparing the euclidian distance of all projected trained images from the projected test image.

Algorithm

Before applying PCA must do data preprocessing

- Given a set of m unlabeled examples we must do Mean normalization
-

Mean normalization-Replace each xji with xj - j, In other words, determine the mean of each feature set, and then for each feature subtract the mean from the value, so we re-scale the mean to be 0.

Feature scaling (depending on data) -If features have very different scales, then scale so they all have a comparable range of values e.g. xji is set to (xj -j) / sj, where sj is some measure of the range, so could be Biggest - smallest Standard deviation (more commonly)

- With preprocessing done, PCA finds the lower dimensional sub-space which minimizes the sum of the square.
- Need to compute two things;
- Compute the u vectors, The new planes
- Need to compute the z vectors, z vectors are the new, lower dimensionality feature vectors
- A mathematical derivation for the u vectors is very complicated, but once you've done it, the procedure to find each u vector is not that hard

Decision on the test

Having calculated the distance between the two feature vectors, the training image closest to the given test image is returned as the result of the query. If the subject of the test image and the subject of the training image closest to the given test image are the same then a correct match is said to have occurred or else it is taken as an incorrect match. And then the detected face will produce as text speech from the recorded module with the help of hardware components.

5. RESULTS AND DISCUSSION

Face recognition based on augment reality using pca has been implemented This project entails a full analysis and a step-by-step layout of the proposed application. This application will work with camera-enabled Android smart phones. The user focuses the Smartphone then takes a picture of some objects or faces and the image taken is detected and perform the object identification while taking the picture through camera., there is an output or display of results about the image. This can be performed with the help of a microcontroller. . The three processes which include is screen capturing, data processing and audio output. The screen capture components which capture the scene by motion-based object-deduction using a IP Webcam application in Android smart phones. The output is organized as speech with the help of hardware component.

6. CONCLUSIONS

Face recognition-based augment reality had given us an opportunity to study about many popular methods used in the eld of face recognition and about the augment reality. The elaborate literary survey provided us with the pros and cons of many recognition systems and the trade-o associated with them. We also came to know that combining two or more techniques can improve the accuracy of system greatly. In this project we have developed a PCA based face recognition system for feature extraction and matching using various distance classifiers. The Distance classifiers used are Eucledian distance. The results this have been presented. The results clearly shows that a recognition system based on Eucledian distance based classier. The proposed system provides the solution to the problems faced by blind people. In proposed system we have applied a simple and fast method which works suitably to recognize image and convert it into speech.

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