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An Approach to Maintain Attendance Using Image Processing Techniques

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ABSTRACT:

Face is a complex multidimensional structure and needs great figuring systems for acknowledgment. Our approach treats face acknowledgment as a two-dimensional acknowledgment issue. This Project work goes for giving a framework to naturally record the understudy's participation during address hours in a lobby or room utilizing facial acknowledgment innovation rather than the customary manual strategies. In this plan face acknowledgment is finished by Principal Component Analysis (PCA). Face pictures are anticipated onto a face space that encodes best variety among realized face pictures. The face space is characterized by eigen face which are eigen vectors of the set of faces, which may not relate to general facial highlights for example, eyes, nose, and lips. On the off chance that the client is new to the face acknowledgment framework then his/her layout will be put away in the database else coordinated against the layouts put away in the database. The variable decreasing hypothesis of PCA represents the littler face space than the preparation set of face

Introduction:

With the fast improvement in the field of pattern recognition and its uses in various zones e.g.(signature recognition, facial recognition)arises the significance of the use of this innovation in various regions in enormous associations. This is principally in light of the fact that these applications help the top-administration take choices that improve the execution and viability of the association. On the other hand, for an association to be powerful, it needs exact and quick methods for account the exhibition of the individuals inside this association. Biometric recognition has the possibility to turn into an essential piece of numerous recognizable proof frameworks utilized for assessing the presentation of those individuals working inside the association. Despite the fact that biometric advancements are being connected in numerous fields yet it has not conveyed its guarantee of ensuring

programmed human recognition. This exploration is the one of its sort to endeavor to give a mechanized participation framework that perceives understudies utilizing face recognition innovation through picture/video stream to record their participation in addresses or segments and assessing their presentation in like manner[1].Furthermore, a mechanized presentation assessment would give increasingly exact and dependable outcomes maintaining a strategic distance from human blunder. Each time when an address begins, the instructor or educating associate defers the address to record understudy's participation. This is an extensive procedure and takes a great deal of time and exertion, particularly on the off chance that it is an address with countless understudies. It likewise causes a ton of aggravation and intrusion when an test is held [1].Biometric examining frameworks ordinarily don't record the whole engraving of a physical element yet just that segment or "layout" that ought to be time-invariant inside some factual point of confinement. Since the body changes after some time, the measurable calculation must be flexible enough to coordinate a put away picture with a later live output from a similar individual without typically coordinating two comparative people [2]. This procedure could be simple and viable with few understudies however, then again, managing the records of an enormous number of understudies frequently prompts human blunders.

Principle Component Analysis

The Principal Component Analysis (PCA) is one of the best methods that have been utilized in picture recognition and pressure. PCA is a measurable strategy under the expansive title of factor analysis. The motivation behind PCA is to decrease the enormous dimensionality of the information space (watched factors) to the littler inborn dimensionality of highlight space (autonomous factors), which are expected to depict the information monetarily. This is the situation when there is a solid relationship between's watched factors. The occupations which PCA can do are expectation, excess evacuation, include extraction, information pressure, and so forth. Since PCA is a traditional strategy which can accomplish something in the direct area,

applications having direct models are appropriate, for example, signal preparing, picture handling, framework furthermore, control hypothesis, correspondences, and so forth. Face recognition has numerous material regions. Besides, it very well may be ordered into face distinguishing proof, face grouping, or gender assurance. The most valuable applications contain swarm observation, video substance ordering, individual distinguishing proof (ex. driver's permit), mug shots coordinating, entrance security, and so on. The fundamental thought of utilizing PCA for face recognition is to express the enormous 1-D vector of pixels built from 2-D facial picture into the conservative principal components of the highlight space. This can be called eigenspace projection. Eigenspace is determined

by recognizing the eigenvectors of the covariance framework got from a lot of facial images(vectors).ge number of understudies regularly prompts human blunders.

Eigen Face Approach:

It is sufficient and proficient technique to be utilized in face recognition because of its straightforwardness, speed and learning ability. Eigen faces are a lot of Eigen vectors utilized in the Computer Vision issue of human face recognition. They allude to an appearance based way to deal with face recognition that looks to catch the variety in a gathering of face pictures and utilize this data to encode and look at pictures of individual faces in an all encompassing way.The Eigen faces are Principal Components of a dissemination of faces, or proportionally, the Eigen vectors of the covariance framework of the arrangement of the face pictures, where a picture with N by N pixels is viewed as a point in N 2 dimensional space. Past work on face recognition overlooked the issue of face boost, expecting that predefined estimation were applicable and adequate. This recommends that coding and unraveling of face pictures may give data of face pictures accentuating the importance of highlights. These highlights might possibly be connected to facial highlights, for example, eyes, nose, lips and hairs. We need to extricate the applicable data in a face picture, encode it productively and look at one face encoding with a database of faces encoded comparatively. A straightforward way to deal with separating the data content in a picture of a face is to some way or another catch the variety in an accumulation of face pictures. We wish to discover Principal Components of the dispersion of faces, or the Eigen vectors of the covariance framework of the arrangement of face pictures. Each picture area adds to every Eigen vector, with the goal that we can show the Eigen vector as a sort of face. Each face picture can be spoken to precisely as far as direct mix of the Eigen faces. The quantity of conceivable Eigen faces is equivalent to the quantity of face picture in the preparation set. The faces can likewise be approximated by utilizing best Eigen face, those that have the biggest Eigen esteems, and which in this manner account for most change between the arrangement of face pictures. The essential explanation behind utilizing less Eigen faces is computational proficiency.

Eigen Faces and Eigen Vector:

In straight polynomial math, the eigenvectors of a direct administrator are non-zero vectors which, at the point when worked by the administrator, bring about a scalar numerous of them. Scalar is at that point called Eigen esteem (λ) related with the eigenvector (X). Eigen vector is a vector that is scaled by direct change. It is a property of network. At the point when a lattice follows up on it, just the vector extent is altered not the course. Hatchet = λX, where A will be a vector work. $(A - \lambda I)X = 0$,

where I is the character network. This is a homogeneous arrangement of conditions and structure basic straight variable based math. We know a non-unimportant arrangement exists if and just if Det(A − λI) = 0, where det signifies determinant. At the point when assessed turns into a polynomial of degree n. This is called trademark polynomial of A. On the off chance that An is N by N, at that point there are n arrangements or n foundations of the trademark polynomial. Subsequently there are n Eigen estimations of A fantastic the condition.

$$AXi = \lambda i\ Xi \text{ , where } I = 1,2,3,.....n$$

On the off chance that the Eigen esteems are on the whole unmistakable, there are n related straightly autonomous eigenvectors, whose headings are special, which length a n dimensional Euclidean space.In the event that all the eigenfaces removed from the first pictures are utilized, one can recreate the first pictures from the eigenfaces precisely. However, utilizing just a piece of the eigenfaces is pertinent. Consequently, the recreated picture is a guess of the first picture. Be that as it may, misfortunes due to precluding a portion of the eigenfaces can be limited, which is accomplished by choosing just the most significant highlights (eigenfaces).

Along these lines, utilizing these loads one can decide two significant things:

1. Check whether the picture is a face. For the situation the loads of the picture contrast a lot from the loads of face pictures, the picture most likely not a face.

2. Similar faces (pictures) have comparative highlights (eigenfaces) to comparative degrees (loads). On the off chance that loads structure all pictures accessible is extricated, the pictures could be assembled to bunches. In this way, all pictures having comparative loads are probably going to be comparative face [2].

EIGEN FACE APPROACH

The calculation for the facial recognition framework utilizes the idea of eigenfaces. Right off the bat, the first pictures of the preparation set are changed into a lot of eigenfaces E. A short time later; the loads are determined for each picture of the preparation set and put away in the set W. When watching an obscure picture X, the loads are determined for that specific picture and put away in the vector W x.

A while later, W x is contrasted and the loads of pictures, of which one knows for sure that they are faces (the loads of the preparation set W).

One approach to do, it is view each weight vector as a point in space and figure a normal separation D between the weight vectors from W x and the weight vector of the obscure picture W x (the Euclidean separation). In the event that this normal separation surpasses some edge esteem, at that point the weight vector of the obscure picture W x lays excessively far separated from the loads of the faces. For this situation, the obscure X is considered not a face.

EIGEN VECTORS AND EIGEN VALUES

An eigenvector of a framework is a vector to such an extent that, whenever increased with the grid, the outcome is consistently a whole number various of that vector. This whole number worth is the comparing eigen estimation of the eigenvector. The comparing eigen worth is the extent by which an eigenvector's greatness is changed. This relationship can be portrayed by the condition M *u =k * u, where u is an eigenvector of the grid M and is the comparing eigen esteems. This implies, an eigen estimation of 2 implies that the length of the eigenvector has been multiplied. The eigen estimation of 1 clarifies that the length of the eigenvector remains the equivalent.

Eigen vectors have following properties:

1. They can be resolved distinctly for square networks.

2. There are n eigenvectors (and relating eigenvalues) in a n * n network.

All the eigenvectors are opposite, for example at right point with one another. The scientific strides for highlight extraction are as demonstrated as follows:

Step 1: Gather and prepare the data.

Let the training set of face images be T1, T2… TM.

Step 2: Subtract the mean.

The average matrix ψ has to be measured, then subtracted from the original faces (Ti) and the result is stored in the variable ϕ i.

The average of the set is defined by

$$\Psi = \frac{1}{M}\sum_{n=1}^{M} \Gamma_n \qquad (1)$$

Each face differs from the average by the vector

$$\phi = \Gamma_i - \Psi \qquad (2)$$

Step 3: Calculate the eigenvectors and eigenvalues of the covariance matrix.

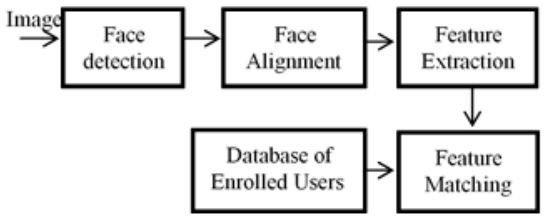
This set of very large vectors is then subject to principal component analysis, which seeks a set of M orthonormal vectors, U_m which best describes the distribution of the data. The K_{th}vector,

$$\lambda_K = \frac{1}{M}\sum_{n=1}^{M} (U_K^T \phi_n)^2 \qquad (4)$$

U_K, is chosen such that is a maximum, subject to

$$U_I^T U_K = \delta_{IK} = \begin{cases} 1, & if\ I = k \\ 0, & otherwise \end{cases} \qquad (5)$$

The vectors U_K and the scalars λ_K are the eigenvectors and eigenvalues.



: Block diagram of face recognition processing

Step 4: Calculate the covariance matrix.

The covariance matrix C is calculated according to

$$C = \frac{1}{M}\sum_{n=1}^{M} \Phi_n \phi^T \quad n = AAT \quad \text{Where the matrix } A = [\phi 1, \phi 2, \phi 3 \ldots \phi M] \quad (6)$$

Following the matrix analysis, the M * M matrix $L = A^T A$ is constructed, where $L_{mn} = \phi^T_m \phi_n$ and the M eigenvectors, V_I of L is computed.

These vectors determine linear combinations of the M training set face images to form the eigenfaces U_I.

$$U_I = \sum_{k=1}^{M} V_{Ik} \phi_k, \quad I=1\ldots M \quad (7)$$

The success of this algorithm is based on the evaluation of the eigenvalues and the eigenvectors of the real symmetric matrix L that is composed from the training set of images. After this step, the "training" phase of the algorithm is accomplished.

AUTOMATIC FACIAL RECOGNITION PROCESS FLOW

We implement this face recognition process in matlab using GUI functions. In GUI there is a callback function which is used to callback the each function used in the code such as capture video ,crop image ,save ,exit and recognize .In our project we use Microsoft excel sheet for databse storage of student information like phone number ,their Roll number and array is maintained for attendance marking and if student is not recognized during testing than SMS is sent to that particular student by fetching the data from the database which we had stored

For the most part any biometric framework experiences similar procedures of the four modules clarified before, biometric catch, include extraction and correlation with layouts accessible in the database.

The facial recognition procedure is like the general biometric recognition process. The facial recognition procedure can be separated into two principle stages: preparing before detection where face detection and alignment happen (restriction and standardization) and a short time later recognition happen through element extraction and coordinating advances.

1.Face Detection: This procedure isolates the facial zone from the remainder of the foundation picture. On account of video streams, faces can be followed utilizing a face following component.

2.Face Alignment: This procedure center around finding the best (viii) confinement and standardization of the face; where the detection step generally appraises the situation of the face. This progression traces the facial components, for example, face plot, eyes, nose, ears and mouth. A short time later standardization as for geometrical changes, for example,size and posture, notwithstanding photometrical properties, for example, enlightenment and dim scale occur.

3.Feature Extraction: After the past two stages, include extraction is performed coming about ineffectual data that is valuable for recognizing faces of various people and stable as for the geometrical and photograph metrical varieties.

4.Face Matching: The extricated highlights are contrasted with those put away in the database and choices are made by the adequate trust in the match score

Creating a Database

A 8.1 MP static camera is utilized for picture securing which catches pictures at spatial goals (640 x 480) pixels having a casing rate of 25 outlines for each second. The pictures are additionally prepared and trimmed (240 x 180) goals with the goal that rest of the foundation is avoidable and centered around wanted faces. The separation between the camera and the individual is approximately 7 to 8 meters.

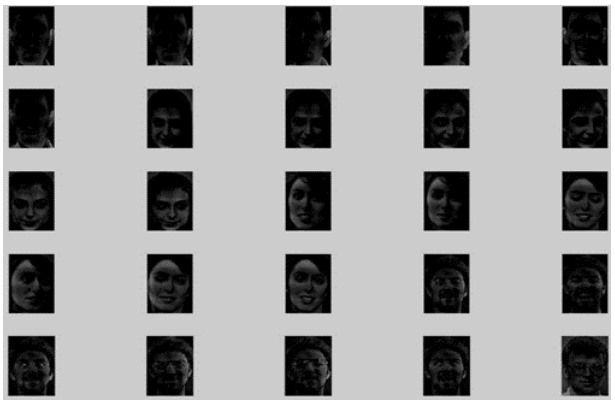


Image Represents some examples of eigenfaces

Classifying an image with the eigenfaces, a new face image (Γ) is transformed into its eigenface components (projected onto “face space”).

$$W_k = U_k^T (\Gamma - \phi)$$

For k=1…M (8)

The weights form a feature vector,

$$\Omega^T = [W_1\ W_2 \ldots\ldots W_M] \quad (9)$$

Order is performed by looking at the component vectors of the face library individuals with the element vector of the information face picture. This examination depends on the Euclidean separation between the two individuals to be littler than a client characterized limit Θ k. In the event that the examination falls inside the client characterized limit, at that point face picture is delegated "Referred to", else it is named "obscure" and can be added to face library with its element vector for later use, along these lines making the framework figuring out how to perceive new face pictures [13].

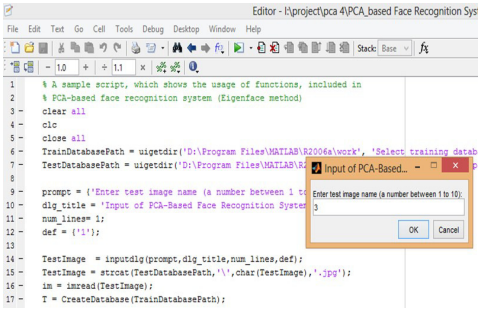
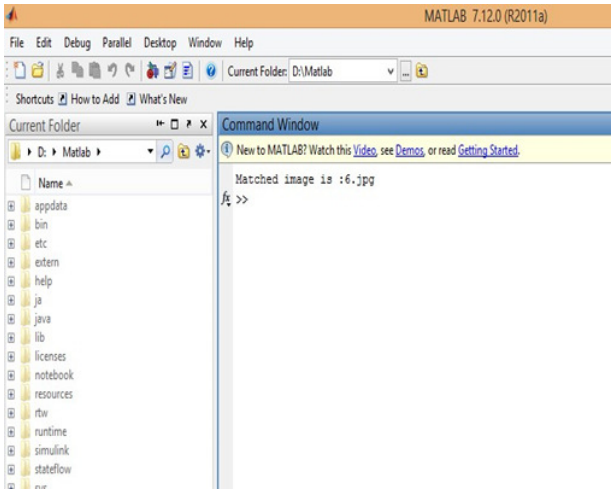


Figure : Request User Input in Matlab for finding out the equivalent image in training database that has the same face which is requesting by the user from the test database.

The yield of the framework will comprise of the face ID with the nearest coordinate, just as a worth speaking to how close this match is (a separation esteem). This data will be shown on the GUI of the PC. It will consistently call a put away technique in the database with picture ID as its parameter to record the understudy's participation in the database.



The presentation of the proposed Face Recognition System is tried on various pictures in various postures recorded in various conditions. A portion of the pictures incorporate one individual while some incorporates two people. The database is pivotal to the execution of the framework and the subtleties of each understudy taken as predictable. The database is refreshed according to the changes. The picture catching and preparing stage is the wellspring of the contribution to the framework. The enhancement for the picture is changed by the consolidation of the 3D model of every understudy.

This model is made from the three perspectives on the understudy's face by applying PCA and permits the catching edge go between - 180 to 180 degrees.

LIMITATIONS AND CHALLENGES OF FACE RECOGNITION TECHNOLOGIES

Face recognition innovation, similarly as some other biometric innovation, has not yet conveyed it guarantee. Disregarding the entirety of its possibilities, it is still very restricted in its connected degree. Numerous scientists have recognized various issues or the biometric framework; they can be ordered in four fundamental difficulties:

Precision: Two biometric tests gathered from a similar individual are not the very same because of the flawed imaging conditions. Furthermore, the face recognition innovation isn't vigorous enough to deal with uncontrolled and unconstrained.

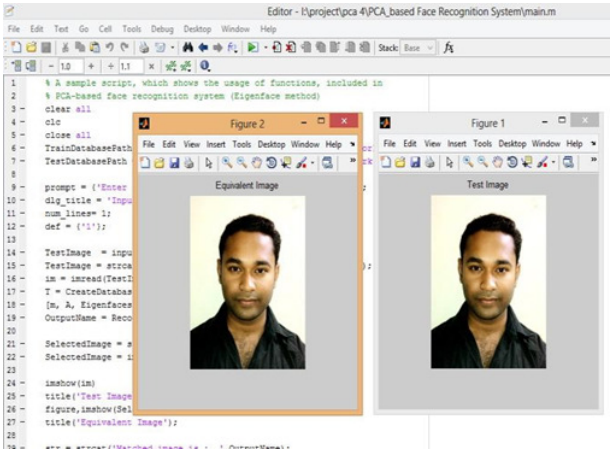


Figure:Image comparison from image database

OPTIMIZATION

Unconstrained conditions. In consequence, the outcomes precision isn't satisfactory. As clarified in figure, incorrectness can happen in two unique structures, either False layouts in the database.

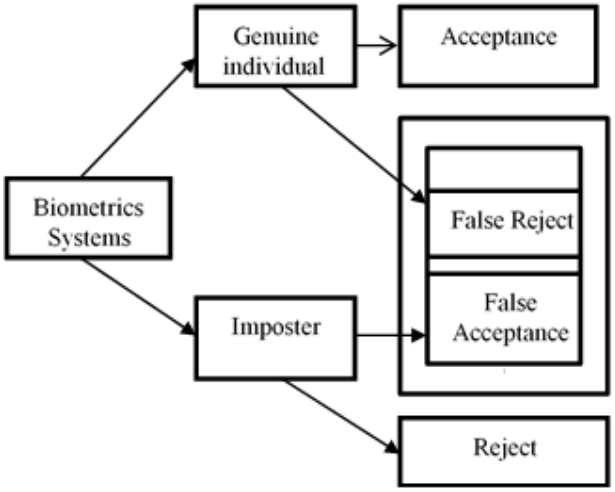


Figure : Blunder in Face recognition

These blunders are for the most part brought about by the intricacy and troubles of the recognition procedure due to the wild factors, for example, lighting, present, articulation, maturing, weight increase or misfortune, hairdo and frill. This test is diminished as all the more preparing information is accessible to improve the presentation of the biometric framework.

2. Scale: The quantity of elements tried out the database of the biometric framework significantly influences the speed, exactness and execution if there should arise an occurrence of ID frameworks; where each new occasion is contrasted with every one of those in the database to discover a match. Not at all like check where balanced examination happens. As referenced in this article, as indicated by certain examinations directed, a facial validation takes around 90 msec, while an enormous scale ID throughput needs about 0.66/min. That is the reason, in biometric ID frameworks, it is completely important to discover increasingly effective ways for biometric examination. This can be come to by performing course pattern grouping. For instance: the caught face is right off the bat characterized into male or female and after that an age range can be resolved. Along these lines, the inquiry in the framework's database can be limited in a proficient manner. The enormous intra-class variety still speaks to an extraordinary test in the field of pattern recognition, where numerous investigations are being led to locate the most ideal route for ordering patterns like the ways utilized in traditional databases.

3. Security: Facial recognition and other biometric frameworks are utilized for some security applications guaranteeing that biometrics is a safe method for verifying access. Be that as it may, actually, security of biometrics (particularly face), is entirely sketchy. This is brought about by two primary reasons:

a) Biometrics is definitely not a mystery: This implies anybody including the assailant knows precisely the biometric highlights of the focused on client.

b) Biometrics isn't recoverable: This implies one can't change his face, on the off chance that it is moved toward becoming bargained.

4. Security: The issue of utilizing recognition based frameworks has raised numerous worries of conceivable protection infringement; which is a noteworthy worry in numerous areas, for example, the American Civil Liberties Union (ACLU) which contradicts the utilization of face recognition programming at airplane terminals because of ineffectualness and protection concern.

The database of a biometric framework hold unquestionable evidence of one's character; and there are no guidelines or certifications on how these data may be utilized or what it could be utilized for. These security issues for the most part bring about the hesitance of clients to utilize these biometric frameworks.

Then again, it is said this isn't valid and biometrics is a security assurance instrument instead of interruption to social liberties. This would be accomplished through overseeing information assurance and encryption along the biometric framework [9].

Conclusion:

The point is to robotize and make a framework that is valuable to the association, for example, an organization or in college. The proposed research work has executed a face recognition framework by utilizing PCA which is eigenvector based multivariate examinations. Regularly, its activity can be thought of as uncovering the inner structure of the information in a manner which best clarifies the difference in the information. By actualizing PCA the proposed Face Recognition System supplies the

client with a lower-dimensional picture, a "shadow" of this item when seen from its most enlightening perspective. The calculation has been tried with numerous spectators in the scene and furthermore caught faces at various points in the scene.

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