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# Essam.H system for Face Recognition

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**Abstract**

Face Recognition Building new system for (face recognition problem).A system based on the integration of the following methods: _ SVD, which is used to extract three matrices, one of these matrices depends on the rows and the other on the columns and the last on the rows and columns together. The three previous matrices are considered to derive image properties. The second way is to convert the image to a single matrix. It depends on the angle. Which makes it convert the database into base properties (the person's term varies and varies with the other)? And then use a new equation for the classification. As for discrimination, it depends on the similarity that has been modified and the correlation which has also been modified by a certain threshold. We use the latest method to compile The previous methods are integrated into a new system in order to work in an integrated manner and the task of distinguishing is very excellent.

**Keywords:_** features extraction, features selection, face classification ,H Equation, face recognition, Essam.H system.

## INTRODUCTION

Plays an important role in life because it is an important element in identifying people and knowing people .And the system works the same principle of human discrimination in people .A person with a naked eye automatically recognizes a person .Building a system of discrimination and simulating human beings with discrimination.Humans often use faces to recognize individuals and advancements in computing capability over the past few decades now enable similar recognitions automatically Early face recognition algorithms used simple geometric models, but the recognition process has now matured into a science of sophisticated mathematical representations and matching processes[1]. Computer face recognition technology is a biometrics identification technology, because of its wide application prospects for safety systems and human-computer interaction, face recognition technology has become the focus of study in the field of computer vision and pattern recognition[2]. new transform for face recognition, Esam haider mageed [11] introduced new system depends on SVD and GLCM with modified Legendre.

## RELATED WORK

### Singular Value Decomposition

The Singular esteem deterioration is a result of direct variable based math. It plays an intriguing, basic part in a wide range of utilizations that is, face acknowledgment, picture pressure, watermarking, protest discovery, logical figuring, flag preparing, surface characterization and so forth[7]. In Incremental SVD Computation Accept we have made a rank-r estimate of An and gotten the comparing components U^r, S^r and V^r. For incremental calculations, we need to dispose of An once a solitary esteem factorization is accomplished so we ought not depend on A to refresh U^r, S^r and V^r when new information arrives[8].

### Gray Level Co_Ocuuerence Matrix

Utilizing just histograms in count will bring about measures of surface that convey as it were data about dispersion of forces, however not about the relative position of pixels as for each other in that surface. Utilizing a factual approach, for example, co-event lattice will give profitable data about the relative position of the neighboring pixels in a picture[9].

**Structure Similarity Indexed Measurement**

The original equation to SSIM be as follows[3]:_

$$SSIM(a,b) = [I(a,b)]^{\alpha}\,[C(a,b)]^{\beta}[S(a,b)]^{\gamma} \quad (1)$$

Another equation to SSIM[10]:_

$$SSIM(a,b) = \frac{(2\mu a\mu b+c1)(2\sigma ab+c2)}{(\mu a^2+\mu b^2+c1)(\sigma a^2+\sigma b^2+c2)} \quad (2)$$

**Legendre Moment**

The moments with Legendre polynomials as kernel functions denoted as Legendre moments were introduced by Teague[4][5][6].

$$Lpq = \lambda pq \sum_{i=0}^{N-1}\sum_{j=0}^{N-1} Pp(xi)Pq(yj)f(i,j) \quad (3)$$

$$\mu_{pq} = \sum_{x=1}^{M}\sum_{y=1}^{N}(X-X^{-})^{p}(Y-Y^{-})q\, f(x,y) \quad (4)$$

$$Lpq = \frac{(2p+1)(2q+1)}{4}\int_{-1}^{1}\int_{-1}^{1} Pp(x)Pq(y)f(x,y)dxdy \quad (5)$$

**Distance classifier**

The simple distance between two points (X , Y) :_

$$distance(X,Y) = \sqrt{\sum_{i=1}^{n}(Xi-Yi)^2} \quad (6)$$

**Feature extraction**

We will use this method to extract properties, this method will draw the three matrices U ,S and V, ready for mind properties are either rational decision or be entered into another way to select Properties.

**Features selection**

To choose the characteristics using the way Gray Level Co_Ocuuerence Matrix . Already been using this method to choose 4 properties relative to previous studies. Either we proposed method we choose 12 property to be ready for our check we programmed these 12 property to set properties that is discrimination on the basis of decision.

**Modified Legendre**

The basic law has been changed to legendre way to become a new law proposal. The change in the law led to become similar to legendre but adopting value to p and q only has one. The difference between this proposed law the previous law (law legendre ) decision taking several values to p and q in the proposed law rely on one value to P and q. the new law proposal :_

$$modified_{\Delta PQ} = \frac{(2p+1)(2q+1)}{(M-1)(N-1)} \sum_{x=1}^{M} \sum_{y=1}^{N} 2p(x) f(x,y) \quad (7)$$

$$p(x) = \sum_{p=0}^{\frac{q}{2}} (-1) \frac{(2q-2p)!}{p!(p-q)!(q-2p)!} \quad (8)$$

**Face classification**

Guild law is set up like the distance means the classification decision is based on a new format, but any new law depends upon the classification function as below:_

$$essam(f,a) = \left(\frac{f-a}{M}\right)^2 \quad (9)$$

Where f if training features matrix ,a single value of input image feature and M the mean of training matrix.

**H Equation**

Proposal equation for find location of person image. Because he had been reading the database before one, when we want to find a specific database person must use a certain equation go directly into the database and find a person, the other reason that we should be equivalent, each person has 10 shots that first person is from site 1 to site 10 second person is from the site 11 to 20 and so on. For example, when we want to find the first person is located. If the second person it just go to the second site but the site 11 which should get through the first 10 sites because they are the same person that we use the following equation that satisfy it. This equation applies to all persons. That anyone we have will go directly and the equation as:_

$$H = (x * 10) - 9 \quad (10)$$

Where x is value from single column ,10 number of poses and 9 is(number of poses-1):this equation for ORL database. For Brazilian database the number of poses become 14.

**Modified Structure Similarity Indexed Measurement**

Amendment to SSIM either hit its output vector or value or anything else improves work way. Here we rely on the programming of the basic way and put and put this threshold does not exist before the threshold we choose must not lead to overlap the same person shots means leads to value method only for same person shots. The mechanism that take well to say if the result is greater than or equal to the threshold chosen it directly the result one if it stays on smaller nature so as not to overlap**,** the value of threshold is 0.5225 .

**Modified Correlation**

The same amendment on SSIM any selection threshold but choose must be more than the value of SSIM, the threshold is 0.9135.

**Essam.H System**

New system for face recognition .The name of (E.H system) according to (essam haider) consist of Singular Value Decomposition and Gray Level Co_Ocuuerence Matrix and 12 Features are taken and modified legendre and modified SSIM modified correlation and new equation for face classification and new equation apply when we use only ne loop for read database(this is new way for read (previously they are used two loop)),So the E.H system are(SVD_GLCM_twelve features_ essam classification _H equation _modified SSIM_modified correlation). Details in proposed method.

**Face recognition**

According to the proposed system a (Essam.H) system discrimination would be as follows:_

the person is marked based on the biggest similarity and greater correlation between the portal and the person only persons originating from the rating formula. It is marked on the basis of the person who owns the biggest thread or the biggest similarity is that person the entrance. Depending on the modification on the similarity and correlation.

**Algorithm of Essam.H System**

This algorithm is a new system of discrimination involve drawing properties and choose properties by using SVD and GLCM as above explanation , as for classification by using new and discrimination as exists in face recognition the following steps in Part 1 and Part 2:_

**Part 1 algorithm**

**This part for training :_**

Step1:- Put loop from 1 to total number in database. In (ORL) ,400 images, current file is load by calling (folder of database ) by name not by (to take index of each images) and read current file .

Step2:- Convert (step1) to grayscale image ,finally convert to double.

Step3:- Find SVD converter, the result of SVD are three matrix (U, S, and V) for features extraction.

Step4:-Apply Gray Level Co_Ocuuerence Matrix for U matrix (to allow us to select features of GLCM ), with angle (45).

Step5:-Apply function of (newfeature1), we build it that are for features take to matrix of (step4), this function return 12 property ,(entropy,moment1, moment2, moment3, moment4,information of correaltion1 ,information of correlation2, sum average, sum entropy, sum variance, difference variance ,and difference entropy).

Step6:-Because we need only one feature for each pose of each person , in this (ORL) person with 10 poses , so we find mean for each pose for column to become for each pose one value.

Step7:-Apply (leg1) function to find modified legendre transformation as single value. And then end of loop.

Step8:- We need to save training in (matrix of persons and poses) , in feature_vector1 of 40*10, where 40 persons and 10 poses, to do that we call function of re_shape for( step6), the form of re_shape , we call(step6) and then re_shape in size of (10*40), to put each 10 poses for one person , after that we transpose (10*40) to become (40*10), this is training matrix for (svd+glcm+12features). Save feature_vector1.

Step9:- We need to save training in (matrix of persons and poses) , in feature_vector2 of 40*10, where 40 persons and 10 poses, to do that we call function of re_shape for( step7), the form of re_shape , we call(step7) and then re_shape in size of (10*40), to put each 10 poses for one person , after that we transpose (10*40) to become (40*10), this is training matrix, this matrix for (svd +glcm + legendre). Save feature_vector2.

**Part 2 algorithm**

**This part for testing:_**

Before any step for test load training matrices .

Step1:- We apply equation before apply our method , we find standerd_devation and skewness of all images in database.

Step2:- Read image need to test it , and then we find standerd_devation and skewness for this image.

Step3:- Apply new equation of **multiple_Std** this function we build it , the work of this function is, ( input:- matrix and single value), take matrix and then subtracted single value from each value of matrix) and apply new equation of multiple_skewness this function we build it.

Step4:-Find index of minimum value of step3, put result into (q , q1), if test_std of (q,q1) equal to zero or test_sk equal to zero this leads to be image inside of database , go to step6 else go to step 5.

Step5:-Print ('not found').

Step6:-Convert input image into gray scale and then to double.

Step7:-Find SVD .

Step8:- Apply Gray Level co_ocuuerence Matrix for U matrix.

Step9:- Apply function of (newfeature1).

Step10:-Find mean of step9.

Step11:- Apply (leg1) as single value for input image.

Step12:-Apply essam function between (step10 and features_vector1).

Step13:-Apply essam function between (step11 and features_vector2).

Step14:-Find mean of (step12 and step13) .

Step15:-We apply a new function min_row ,this function will find minimum value for each row and then result in one column become 40 *1.

Step16:-Sort result of (step15).

Step17:-Take ten minimum value from step16.

Step18:-Start loop from 1 to 10 to find index of (step17) equal to step15.

Step19:-Apply H=(x1*10)-9.

Step20:-Start loop h from 1 to size of (step19) , currentfilename=imagefiles(X1(h)).name; read(currentfilename), convert gray scale

and then to double, find modified_ssim between input image and images from minimum distance.

Step21:-Start loop h from 1 to size of (step19) , currentfilename=imagefiles(X1(h)).name; read(currentfilename), convert gray scale and then to double, find modified_correlation between input image and images from minimum distance.

Step22:-If result of (step20) greater than or equal to result of (step21) then go to step 23, else go to step 24.

Step23:-Show person with maximum similarity.

Step24:-Show person with maximum correlation.

**End of algorithm**

**System analysis**

Analysis of the system depends on the system's error rate and its algorithm execution time so I'll point out a few things on the analysis of the proposed system: _show in table(1), table(2) and figure(1).

**Table 1 :** Recognition performance according to this method and another's

| Method | Performance |
|---|---|
| LTV | 77% |
| The original quotient image method | 96% |
| Essam.H system | 99% |

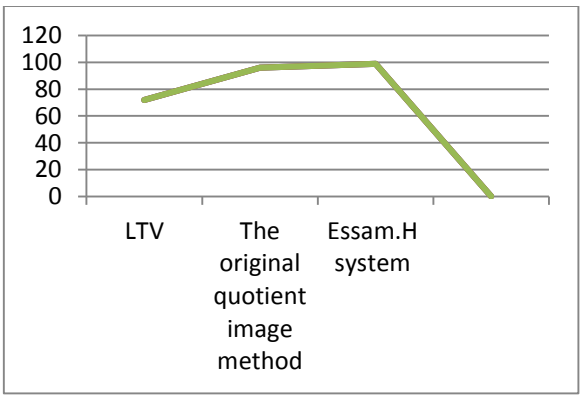
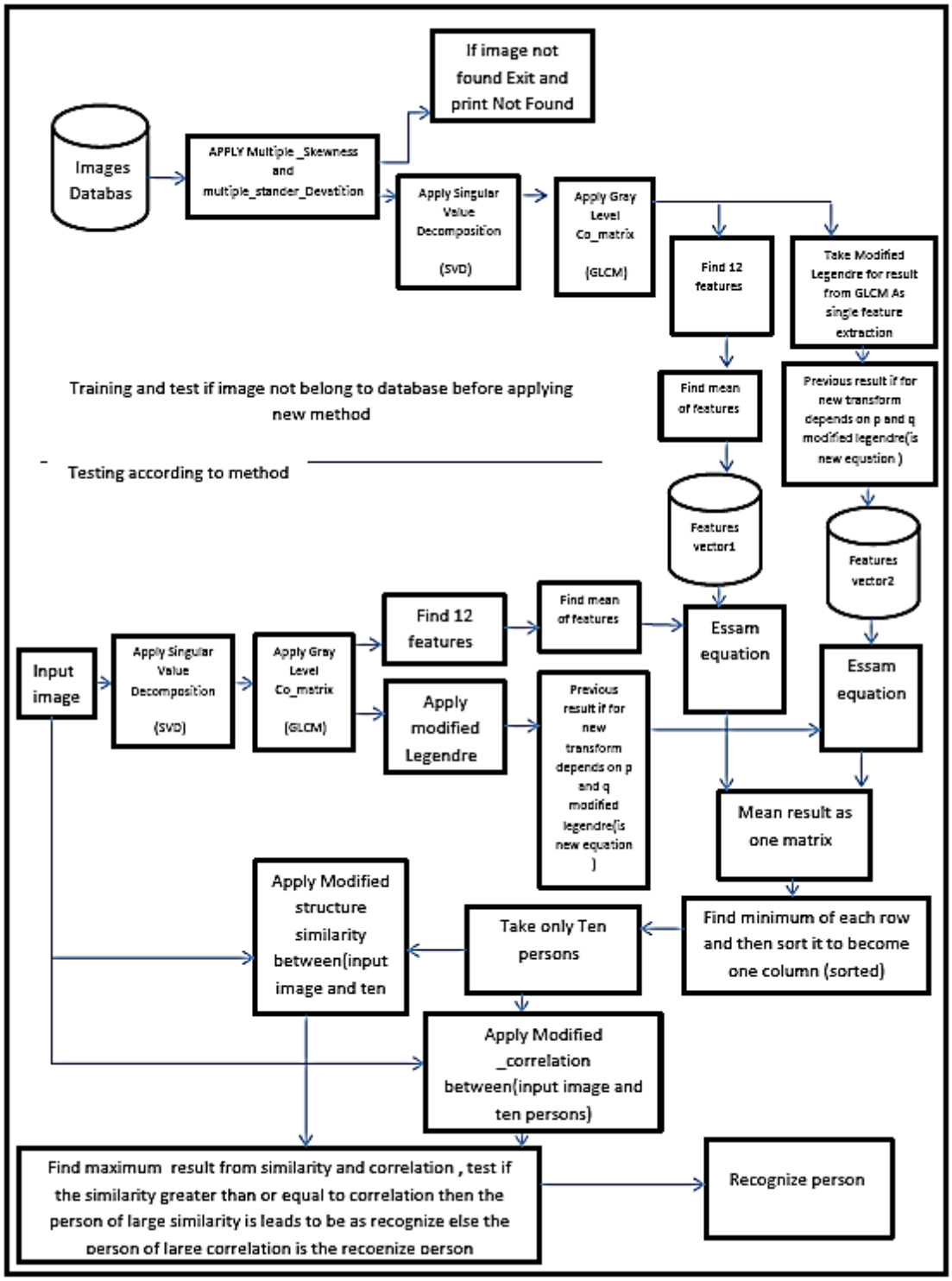



**Figure 1:** Curve of perform

**The diagram of Essam.H system below:**



## CONCLUSION

Infer from the system to be effective in high degree of discrimination. Due to the success of the system returns to the correct merge proposal and algorithms which incorporated some new classification and so the proportion of very excellent discrimination. in relation to discrimination depends primarily on choosing Properties and then rated this great system proposal. Supports it. Discrimination by the proposed system 99%.

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