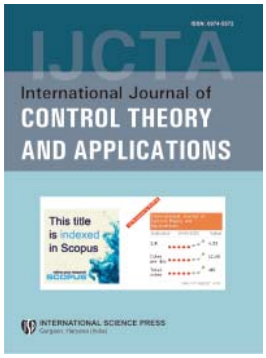

International Journal of Control Theory and Applications

ISSN : 0974–5572

Volume 9 • Number 40 • 2016

Efficient Authentication System using QPSO and PCA for E-learning

S. Selvakumara Samy[a] and Latha Parthiban[b]

[a]*Research scholar St.Peter's University, Avadi*

[b]*Head Incharge, Department of Computer Science, Pondicherry University CC*

Abstract: In this paper, we present a Face recognition based an authentication method for E-learning portal. We use QPSO, and PCA algorithms for the same. E-learning is a new form of educating students which have gain popularity over the years. E-learning uses the computer as a medium of instruction for teaching people of different ages. By and by a-days even corporate associations make their specialists take up online courses to upgrade their aptitude set and data in the field.E-learning licenses its customers to learn courses and also take up tests on that particular subject to know the sum they have learned.E-adjusting in like manner give confirmations on productive completing a particular course and tests on that theme.This is where we use the face recognition-based authentication to authenticate the users who take the tests. Thus makes sure that no sort of manipulation takes place while taking the tests. A variation of PSO is its quantum based version, called QPSO. Every one of the particles in this calculation is accepted to have quantum conduct rather than established Newtonian elements. In this way, the pursuit technique primarily utilizes quantum movement.PCA algorithm helps to recognize the face of users efficiently thus authenticating the users and allowing them to take the tests. The proposed calculation was found to produce brilliant acknowledgment comes about with less chose highlights. Based on our understandings all related concepts has been explained in the paper.

Keywords: *E-learning, QPSO, PCA algorithms, Face Recognition.*

1. INTRODUCTION

A unique property of human perception is our ability to distinguish between different faces even when they look concise similar and recognize hundreds of different individuals with almost no effort. Automated face recognition is an area within Computer Vision inspired by this ability. Facial recognition systems focus on extracting faces from static images and video sequences and deciding whether they belong to a database of known individuals.Machine based face recognition can be divided into two main problems: locating the face in the image and comparing that face with the contents of a database of known individuals to obtain the best match. Before looking at specific methods for performing these processes, however, one must understand the challenges behind automatic recognition of faces.[1]

The difficulty in recognizing or identifying a sample within a class of similar looking objects lies in the small structural variation between objects of the same class. For instance, distinguishing between a car and a human is a simpler problem as it is easier to encode our knowledge about what each of them should look like in our algorithms. However, when we try to identify different cars accurately – or in our case different individuals – the complexity of the problem increases.

To understand the problem of mechanical recognition of faces better, one must look at how a face can be encoded in a computer in a semantically meaningful way. Little variation exists between different faces; so little that changes due to different lighting conditions can be more important than differences between two individuals. Consequently, to successfully distinguish a face from a non-face object, and more importantly to recognize that face, it is critical to extracting these small variations between faces as well as the general face structure. The initial phase in any face acknowledgment framework is the extraction of the element grid. A commonplace element extraction calculation tends to assemble a computational model through some direct or nonlinear change of the information so that the extricated highlight is as agent as could reasonably be expected.

E-learning is the use of information with computer technologies to create learning experiences. Here we usea face-recognition-based authentication system to improve the existing e-learning systems.E-learning portals not only give classes on different courses but also conduct tests on those courses to impart complete learning experience similar to classroom education.

Faces of the students are first captured and trained. These countenances are then changed over to vectors, and the average vector are calculated.The normal vector is then subtracted from the genuine confronts which are in a multidimensional exhibit form.Calculate the covariance lattice. Then drive eigenfaces and eigenvector from the covariance matrix.Therefore, when a student in the *e*-learning system attends a test, his face will be detected and cross-verified against the faces in the database. Once he is rightly identified he can continue taking the test if-else the test will be aborted, and he cannot take the test.

2. E-LEARNING

In the present period, where innovation is quickly advancing, training has likewise made the support of innovation and now offers advantageous approaches to help build the information, instruction and proficiency status of people.E-learning stage gives anyplace, at whatever time simple access for up degree of learning and abilities. It gives a stage wherein the individual gets a redid bundle identified with the major topical regions, through an independently directed process.e-Learning Courses provide an empowering step by which the experts, and understudies, can overhaul their insight without going for regular classes.

With virtual live classroom preparing, you get excellent preparation from specialists utilizing the consistent over-the-Web network. Virtual live classroom stresses hands-on learning is furnishing each enlisted understudy with selective access to live frameworks all through each course. Taking virtual live classroom preparing conveys a similar top-notch content, coursework, and experience as the physical classroom preparation.

E-learning allows one to:

Train from wherever one pick.

1. Access a live educator for the entire length of the course.
2. Access electronic forms naturally materials which you can alternatively print. No compelling reason to pull or ship cumbersome printed manuals back home after class culmination.
3. Use your own PC for the term of the class.
4. Interact with cohorts from around the nation and the world.[2]

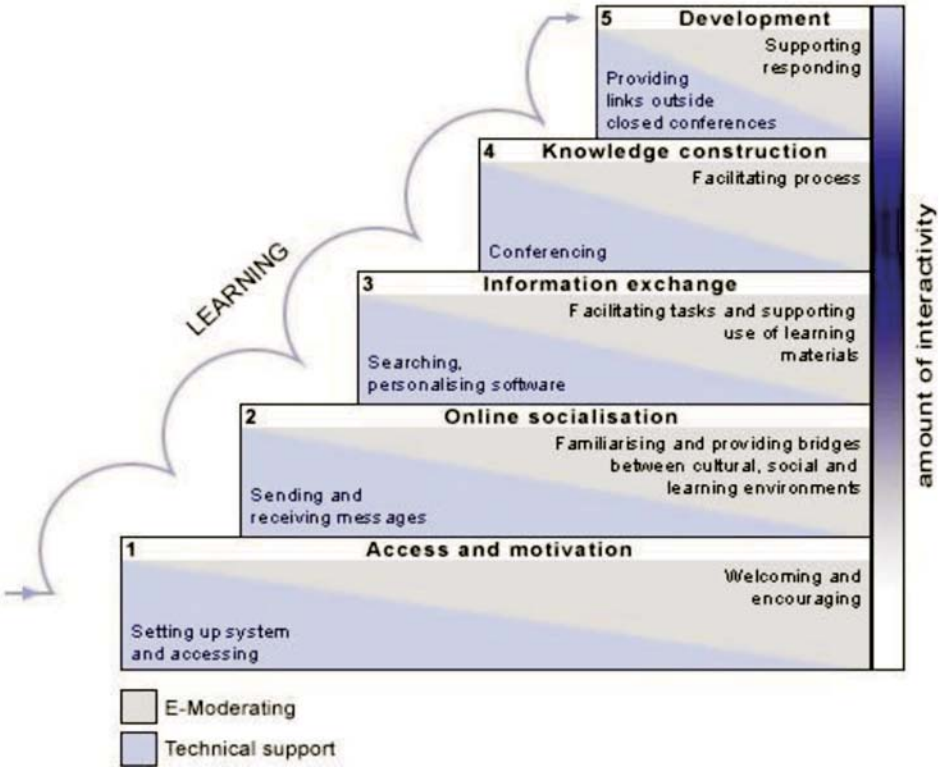

Figure 1: Theory Applied To E-learning

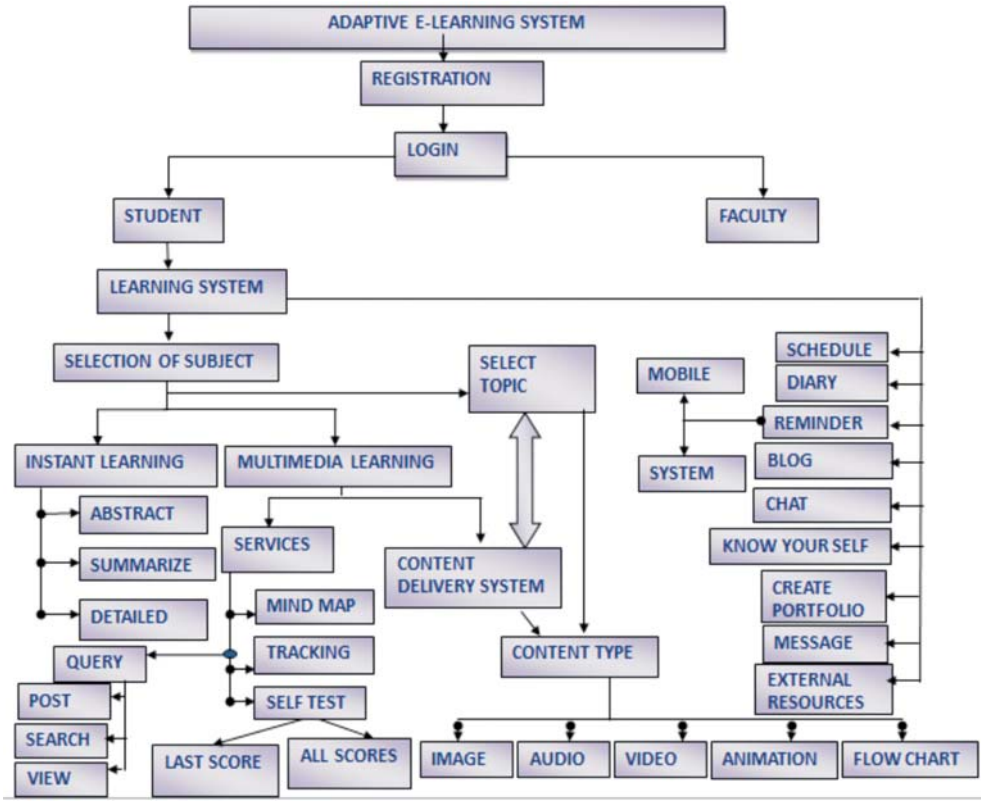

Figure 2: Structure of E-learning

3. QPSO ALGORITHM

A variety of PSO is its quantum based rendition, called QPSO[3]. Every one of the particles in this calculation is accepted to have quantum conduct rather than established Newtonian flow. Along these lines, the pursuit method fundamentally utilizes quantum movement. Contrasted with all the traditional PSO systems, when tried against a rundown of benchmarking capacities, QPSO had a prevalent execution. In the testing cases, the populace considered was huge. Along these lines, this calculation can without much of a stretch be utilized with the end goal of e-realizing where the rundown of subjects or courses is expensive. The recognizing highlight of this particular calculation is that it required not very many parameters.

1. A choice of a suitable potential well needs to be done. They can be delta- well, harmonic oscillator, etc.
2. Then, the Schrödinger Equation needs to be solved.

$$j\hbar\frac{\partial}{\partial t}\Psi(r,t) = \hat{h}(r)\,\Psi(r,t)$$

Here, $\hat{H}$ Time –Independent hamiltonian operator

$$\hat{H}\ (r) = \frac{\hbar}{2m}\Delta^2 + V(r)$$

3. Additionally, we have to discover the likelihood thickness capacity of the position of the molecule. Here, every single course is a different molecule.
4. The wave work should be caved in into the coveted district utilizing appropriate estimation techniques. This coveted area is figured using the information gave by the hopeful. This report incorporates insights about the particular applicant.
5. Apply a pseudo-code for this particular operation.

The psychological parameter ($c1$) and the standard parameter ($c2$) don't show up in the utilization of QPSO.

By and large, these variables are thought to be equivalent. Estimations of $c1$ and $c2$ have been utilized as a part of many cases, yet they have yielded poor performance. A pseudo-code appears for QPSO calculation. The competitor arrangements here are the courses.

4. PCA ALGORITHM

PCA is a measurable approach utilized for diminishing the quantity of factors in face recognition[4].In PCA, each picture in the preparation set is spoken to as a straight blend of weighted eigenvectors called eigen faces. These eigenvectors are gotten from the covariance framework of a preparation picture set. The weights are discovered in the wake of choosing an arrangement of most pertinent Eigen faces. Acknowledgment is performed by anticipating a test picture onto the subspace spread over by the eigen faces and after that arrangement is finished by measuring least Euclidean separation.

A standout amongst the best PCA approaches utilized as a part of the face acknowledgment framework is the purported eigen confront approach.This approach changes faces into a little arrangement of basic qualities, eigen confronts, which are the primary segments of the underlying arrangement of learning pictures (preparing set). Acknowledgment is finished by anticipating another picture in the eigen confront subspace, after which the individual is grouped by contrasting its position in eigen confront space with the position of known people [5]. The upside of this approach over other face acknowledgment frameworks is in its

Straightforwardness, speed, and cold-heartedness to little or steady changes on the face. The issue is constrained to documents that can be utilized to perceive the face. To be specific, the pictures must be vertical frontal perspectives of human countenances.The whole recognition process involves two steps:

1. Initialisation process
2. Recognition process

The Initialisation procedure incorporates the accompanying operations:

1. Gain the underlying arrangement of face pictures called as the preparation set.
2. Compute the Eigen faces from the preparation set, keeping just the most elevated eigenvalues. These A pictures characterize the face space. As new faces are encountered, the eigen countenances can be refreshed or recalculated.
3. Figure dissemination in this A-dimensional space for each known individual by anticipating his or her face pictures onto this face-space.

Having introduced the framework, the following procedure includes the means:

1. Compute an arrangement of weights in view of the info picture and the An eigen confronts by anticipating the information picture onto each of the Eigen faces.
2. Decide whether the picture is a face by any means (known or obscure) by verifying whether the picture is adequately near a "free space".
3. In the event that it is a face, then group the weight design as either a referred to individual or as obscure.
4. Refresh the eigenfaces or weights as either a known or obscure, if a similar obscure individual face is seen a few times then figure the trademark weight design and fuse into known appearances. The last stride is not generally a prerequisite of each framework, and thus the means are left discretionary and can be actualized as when the there is a necessity.

Steps involved in the Eigen face based PCA approach[6] :

Step 1: Prepare the training faces.

Step 2: Prepare the facial database.

Each face image must be transformed into a vector and placed in the database

Step 3: Compute the average face vector

The average face vector is calculated using the formula-

$$\Psi = \frac{1}{M}\sum_{n=1}^{N}\Gamma_n$$

Step 4: Subtract the average face vector

The average face vector Φ_i Ψ is subtracted from the original faces and the result stored in the variable

$$\Gamma_i\Phi_i = \Gamma_i - \Psi$$

Step 5: Calculate the covariance matrix

We obtain the covariance matrix C in the following manner,

$$C = \frac{1}{M}\sum_{m=1}^{M}\Phi_n\Phi_n^T$$

Step 6: Calculate the eigenvectors and eigenvalues of the covariance matrix

$$L = A^TA$$

Step 6.1: Consider the matrix (M x M Matrix)

Step 6.2: Compute eigen vectors of L

$$A^T V v_i = \mu_i v_i$$

Step 7: Keep only K eigenvectors (corresponding to the K largest eigen values

Eigen faces with low eigenvalues can be omitted, as they explain only a small part of Characteristic features of the faces

5. EXPERIMENTAL RESULTS

5.1. Experimental Result-1(having the same pose)

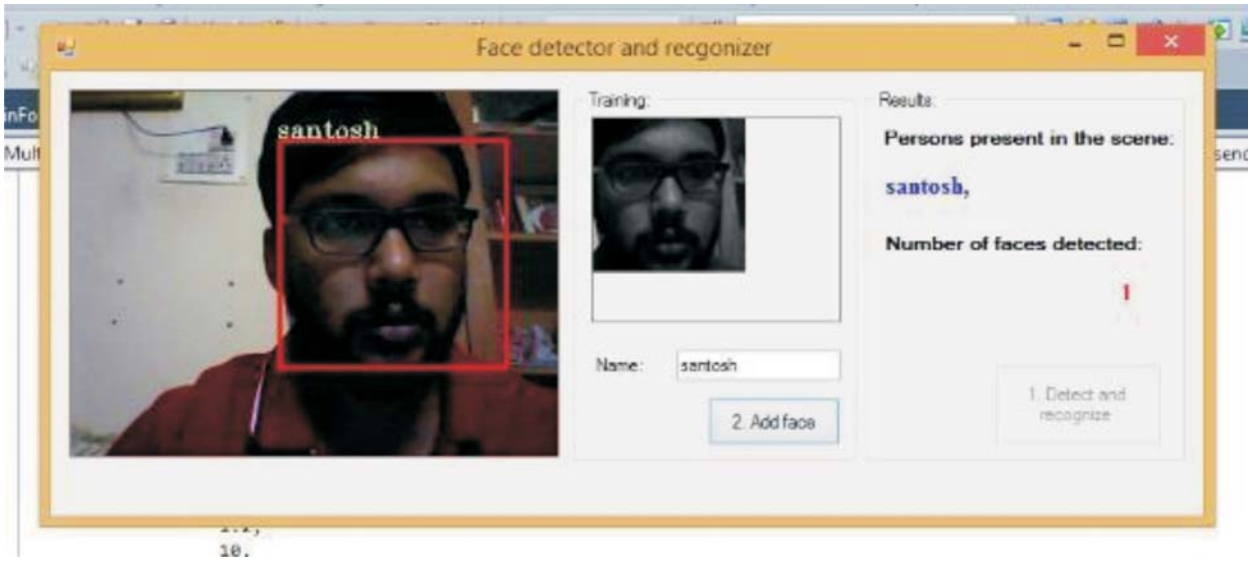

Figure 1

5.2. Experimental Result-2 (having pose variation)

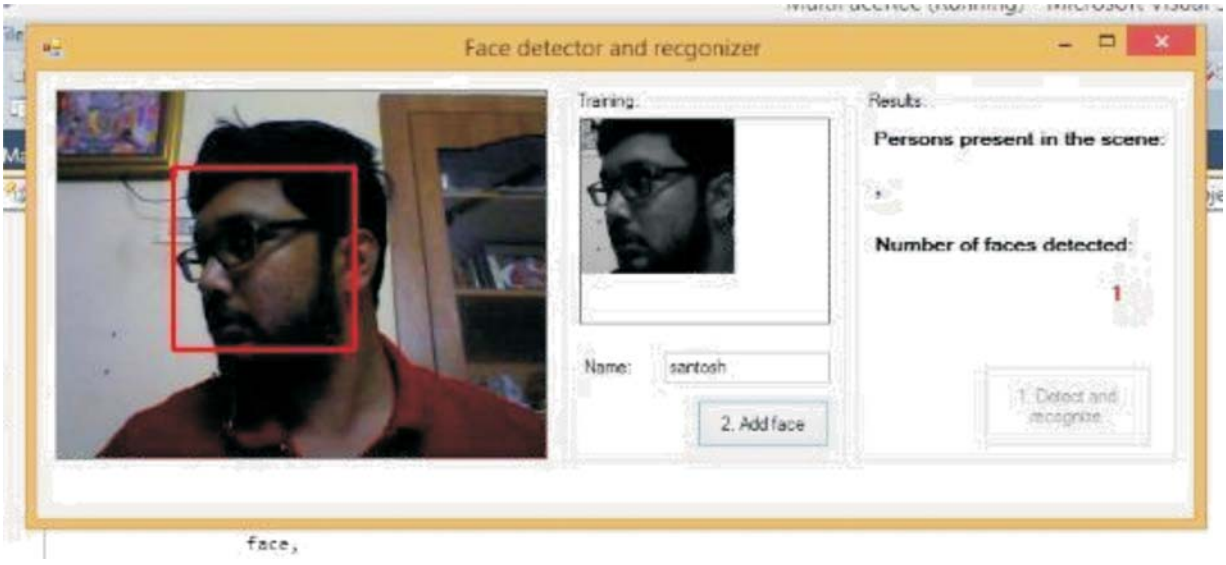

Figure 2

5.3. Experimental Result-3 (having pose variation)

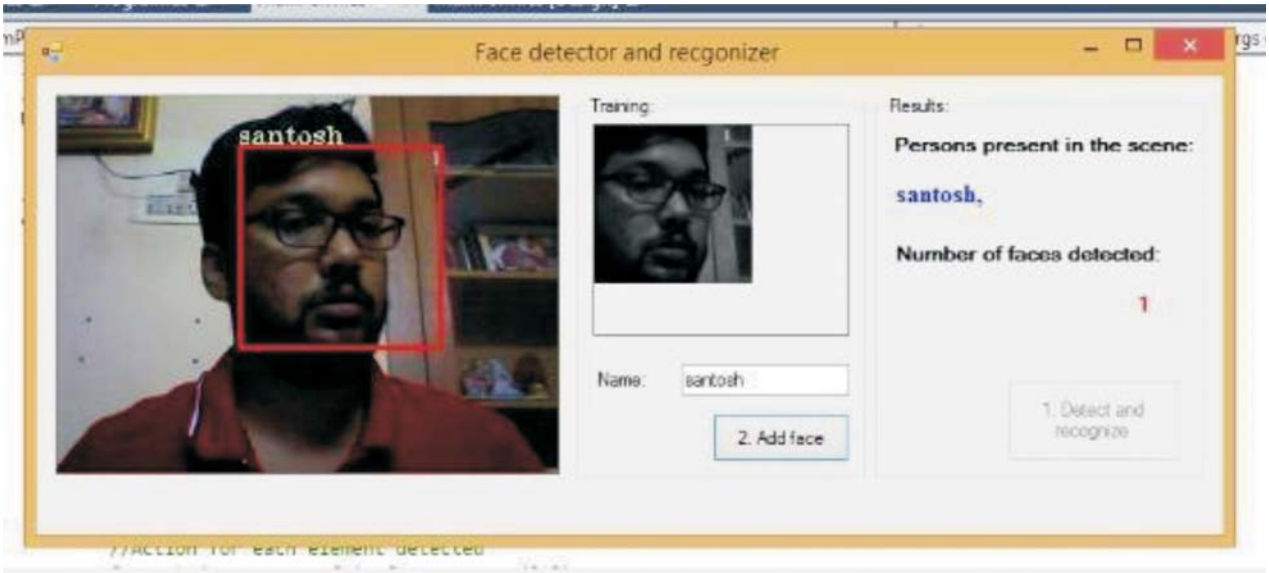

Figure 3

6. CONCLUSION

Today Face Recognition System is used in different sectors from attendance system to security systems.Here, we present an idea to use face recognition system in E-learning system to authenticate users while taking tests related to the courses they study in the E-learning portal.E-learning has changed the entire perspective of education as it allows users to attend classes from wherever he/she is, making it different from classroom learning.So E-learning has gained popularity over the years.By adding a Face recognition system in E-learning system we can improve the learning experience altogether and ensure better results from the courses provided in it.Students as well as employees who take up the courses will be benefitted from this as no sort of manipulation will take place as tests can only be attended after the user's faces are authenticated by the face recognition system.

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