International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Online Examination Based on Facial Recognition System

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Face recognition is a technique in which images and patterns are analyzed and recognized. Face detection is known as the identification of a face from a video or an image. Many Improved techniques are implemented in face recognition in the past ten years. Some well-known methods in each category are overviewed and then benefits and drawbacks are mentioned and analyzed in this paper, and we used the KNN classification algorithm and trained some images in the database, and if trained images are compared by the user if the user authorized he is aborted to the online examination system.

Keywords: *Facial Recognition, KNN Classification, Online Examination System.*

INTRODUCTION:

As we know from the past, the techniques we compare to the biological properties of human beings having much significance in the identification of individuals where the other techniques like passcodes, OTP Generation and other types of security modes having the possibilities of getting stolen, misused and forged, etc.Hence the biological Properties like identification of face fingerprints, Palm, ear, iris, retina, and signature can be used which are not easily accessed by anyone.

The major purpose of face recognition is to verify and identify. Face recognition applications are playing a significant role inthe following fields like security investigation, Camera surveillanceProcess, General identity verification, criminal case investigation, Database management systems, application based on smart cards**,** And other types of magnetic cards.

Literature Review:

In this section, the study papers have been picked to review the studies showing the usage of facial recognition and techniques in online examination systems for managing the resource optimally.

In [1] Hyunduk Kim, Myoung-KyuSohn, Dong-Ju Kim, and NuriRyu authors presented that facial expression recognition and which was done by using the Active shape model and also based on face normalization and EHMM. The benefits of this technique are fast, simple, accurate, and efficient to extend to 3D. And Limitations for this ASMs are it has shape constraints and over-restrictive. This is because of principal component analysis and this is learned from training data and there is a maximum of 77.0% and 64.7% and these are recognition rates for the CK database and for JAFFE. In [2] HajarChouhayebi, Mohamed AdnaneMahraz, Jamal Riffi author's presented the facial expression Recognition is todetecthumanemotionthroughfacialimages. To tackle this challenge, usedFERalgorithmusinggeometricfeatures. First here facial landmarks are detected and this is done by using input sequence video and by using Dlib library here geometric features are extracted from them, and after that, these feature vectors can be used in support vector machine to classify the facial expressions, and it has a recognition rate of 94.5% accuracy.

In [3] QiuqiRuan, Xiaoli Li, Yue Ming author's presented that facial expression recognition can be done based on the approach of distance and angle features, And actually we can get this from localized facial feature points, and here they used PNN architecture by using this they can classify the facial expressions. And here they have received an average recognition rate of 20%. In [4] Kwee-Bo, Kwang-Eun author's presented the recognition technology that can recognize facial emotions, and this is done by using the Active Appearance Model with FACS. And by combining both the AAM and DBN the proposed methodology can achieve more recognition rate compared to other methods. And is has a result shown on the Bio ID and it has 90% accuracy.

In [5] WU Yaoxin, Chen Wei, LIAO Guangjun Author's presented the recognition that can recognize the gender based on the facial features, and it is a common study on facial features, and they have used the depth gradient and for a distance of facial features and actually this is based on two-dimensional and three-dimensional data and this is trained the gender recognition model based on random forest and they have tested on public facial database and this worked fine and the algorithm has a performance of 89.3%.

In [6] Lei Yang, Zhou Ruan, XuXu author's proposed the facial expressions are powerful and natural for human beings to show their intensions are feelings or emotions. And here they used the novel method that can automatically recognize the facial expressions. And this experiment is done on the three facial expression databases. And the proposed FER method can have a recognition accuracy rate up to 95.85%.

International Journal For Advanced Research In Science & Technology
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ISSN: 2457-0362

In [7] Bo Wu, Chang Huang, Haizhou AI, Yubo Wang author's represented facial expression recognition and this is extracted from the human faces by using expression classifiers. And this system has three modules and they are facial expression recognition, facial feature landmark extraction, and face detection. And this system can automatically recognize the seven human expressions in real-time and they are happiness, neutral, sadness, anger, fear, disgust, and surprise and it has a performance of 92.4%.

In [8] Bao T. Nguyen, Anh Vo author's classified the facial expression recognition that can be applied in many fields like patient monitoring, social robots, neurology, and human-computer Interaction. Actually, expression recognition has been gained so much up to now but it has many challenges to overcome like a blur, Illumination, and so on. And the problem is recognizing between anger and sadness is very difficult. And they used some frameworks using only some places of facial regions. And it has a recognition rate of 97.7%.

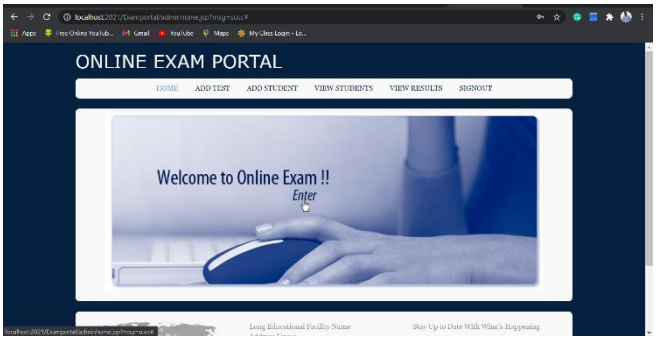
In [9] Mohamed-Yahia and RohithVerma Explained the facial representation and this is actually based on Statistical local features and they are known as local binary patterns. And the simulation results of LBP features are well and effective for recognition. And they have done real-time implementation of this approach and thisapproach has accurately the rate of 4.8 frames per second.In [10] Stan Z.Li and Rui Liao showed automatic face recognition and that is based on multiple facial features. And every facial feature is classified by using a Gabor-based complex vector and this is done by automatic facial featuredetection andthis is a scheme. And the face recognition approaches are TLNN and MNFL, and by using all those things face recognition demonstration can be done.

The author's Mazumder and Syed said that [11] Face identification system has props like Ex: Cost-Effective, more Accurate, legacy data and they have also had a backup mechanism.

The author Dhavalsinh said that [12] this face is a mind index and complex multidimensional structure and it needs good sort of algorithms to recognize properly. By using automatic facial recognition the computers can't recognize various changes in the face or sometimes about lighting matter's a lot and this Eigenface method is used to get out proper facial recognition process [13]. Eigenfaces actually the name was given to the Eigenvectors, during the recognition. And in the terms of Layman's actually, they are the set of standardized face ingredients from the statistical analysis [14].And this Eigenface has actually developed by Sirovich and Kirby and in the year 1987 and it is used by Matthew Turk and Alex Pentland for face classification [15]. And the face dataset should be in proper and dame lighting conditions and should be at proper resolutions as they are performing on new face recognition [16].

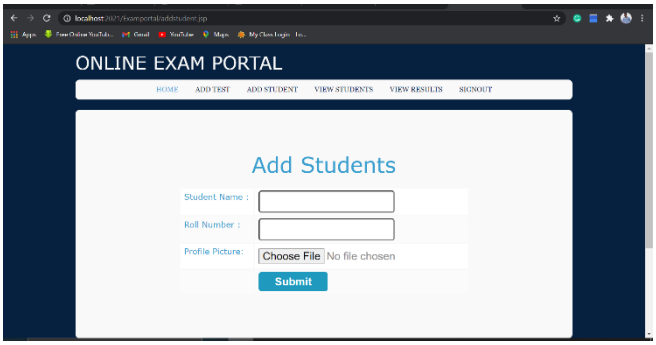
DASHBOARD:

Admin page:



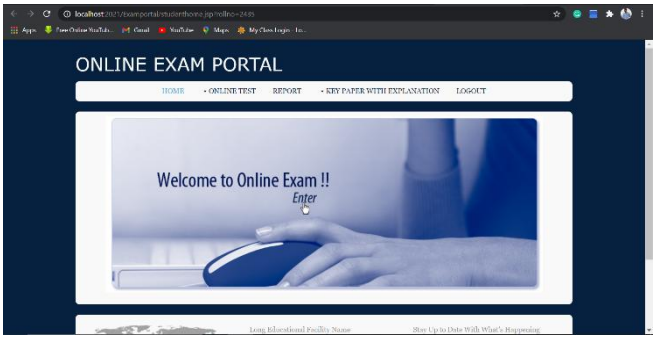
Thisis the Admin page, where only Administrator has authorization for this he or she can add test based on different type of tests, and can add students to the database and can view how many students are there and there total information is viewed, and can view results of students who are attempted the different tests.

Add student:



The Administrator can add students using name, roll number and profile picture, so once saved in the database again at the time of student login it checks the picture with the current student by capturing the image if user is authorized he/she allowed to attempt test.

Student page:



The student should login into the portal by face recognition system for this we used KNN classifier to recognize the

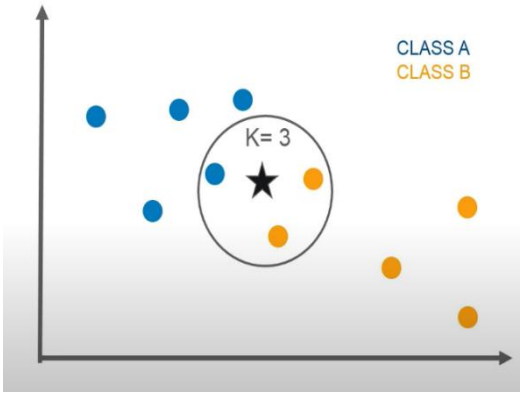
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

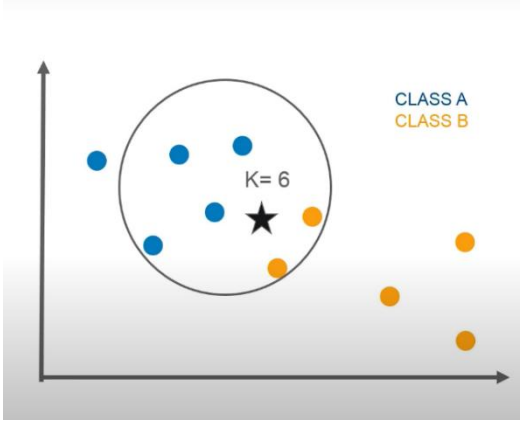
face, so once recognized, the image is compared with the images in the database if user authorized he is allowed to the student page where student can attempt the different type of exams and can view report, so after attempting any exam student can check their key paper with explanationand if user not authorized he is rejected to login into the student page.

PROPOSED METHODOLOGY:

KNN Classifier (K- NEAREST-NEIGHBORS)

KNN is actually a simple and easy algorithm and it is used to store the available cases and used to classify the new data and these are based on a similarity measure, it checks the data if it is similar to the neighbor then it is actually one of them. There is a search that is used to search the similar items which are equal to the data and we call this search a KNN search. And KNN is classified as a Lazy learner because it does not contain any discriminative function compared to the training data. And this can memorize the data and actually it does not contain the learning phase in the model and it happens only when the predictions are requested so for this it is known as Lazy learner. And K denotes that the number of nearest neighbors which are voting classes of the new data or testing data.





Here, we can take one example so when we place an object between some groups of points in the graph, so here if we take K=1 then due to this it gives the same labels as closest points of the training set. If we take k=3 then the points which are close to them are checked as assigned. Similarly, if k=6, the closest 6 points are selected based on the distances by using the Euclidean Distance method or Manhattan distance method.

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Why KNN is used?

Before selecting classifiers, there are several methods introduced to evaluate the classifiers like the Holdout method, Cross-validation, precision and recall, ROC curve. And after that, we actually do cross-validation and this is done by using the k-fold validation technique and this is one of the finest methods to evaluate the KNN classifier.
Hereafter that we are given a dataset and we have to split this into training data and test data and this should be in the ratio of 70:30. We can say that 70% of the data is used to train the model and remaining the 30% is used to check and compare with it. And then by using this we train our model by taking different values of "K" and getting the accuracy of the test data from this, and this trained data is to check and identify the closest neighbors. And by using this we got a 90% on the test data first we are going to test on unseen data so for this we have used cross-validation and in this, we divide the info into 3 rather than 2 and they are training data, cross-validation data, and test data.

Results and Discussions:

By using this method we are still losing 20% of data that we would have otherwise used for training and it's a known fact that more the training data will return a better algorithm. By using the K-fold cross-validation techniquewe still can assign that 20% of cross-validation data.

After splitting the entire data set into training and test dataset, within the ratio of 80:20, we further randomly split the training data into 4 equal parts.

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ISSN: 2457-0362

And here we can take D1, D2, D3 and D4 are the randomly divided 4 equal parts and we can see this stepwise:

Value of K	Training Data	Cross Validation	Accuracy
K=1	D1, D2, D3	D4	A4
K=1	D1, D2, D4	D3	A3
K=1	D1, D3, D4	D2	A2
K=1	D2, D3, D4	D1	A1
K=2	D1, D2, D3	D4	A4
K=2	D1, D2, D4	D3	A3
K=2	D1, D3, D4	D2	A2
K=2	D2, D3, D4	D1	A1

STEP-1:

Here we are going to take K=1, and D1, D2, D3 as our training data and D4 as cross-validation, and by this we can find the closest neighbors and by using this we can calculate the accuracy.

STEP-2:

Again we are going to take K=1, and D1, D2, D4 as our training data and D3 as cross-validation, and by this, we can find the closest neighbors and by using this we can calculate the accuracy. And after this, we repeat the process by D2 and D1 as our cross-validation, and from this, we are going to calculate the accuracy after we are done with this process and then we can assign those accuracies to the final when k=1.

After this, we are going to follow the above steps for K=2 and with this, we find the mean accuracy for K=2.

From this we have to compute the accuracy of k for 4 times this is because we divided it into 4 equal parts, for example, if we divide the data into 5 equal parts then we have to compute for 5 times for 5 different accuracies values and we can take their mean.
And then we are going to use 80% of the output data to compare and compute the closest neighbors.

After considering all the outcomes from the evaluation method, we selected KNN. KNN is completely verified that it provides required desirable outputs and also the most advantageous classifier to use in this face recognition module.

Why K-NN is Useful?

- **K-NN is simple and intuitive:**

  This algorithm is very simple to understand and it can be implemented very easily, and to implement the new data points the algorithm reads the complete dataset and by using this dataset we can find out the k nearest neighbor.

- **K-NN does not have any assumptions**:

  This algorithm is different from parametric models because this is a non-parametric model that has some standards to implement the KNN algorithm, and parametric models have more assumptions with having fewer predictions.

- **No Training step needed**:

  Actually, this algorithm does not build any model and it just takes the new information that is entered and which is supported learning from the historical data and this new data is tagged within a bulk class within the nearest neighbor.

- **Constantly evolves:**

  This is instance-based learning and this can be a memory-based approach, this classifier saves the new training data immediately and this algorithm allows to replay very fast during real-time usage.

- **Simple to implement for the multi-class problem:**

  By using KNN it is easy to maintain the multi-class problems and other classifier algorithms are easy to maintain the binary problems and it is very difficult to maintain the multi-class problems.

- **Are often used both for Classification and Regression:**

  And there are the most important advantages of using KNN because it is used for both classification and regression problems.

- **One Hyper Parameter:**

  This can take some time when processing and selecting the primary hyper parameters and the remainder parameter are aligned.

- **Sort of distance criteria to settle on from:**

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ISSN: 2457-0362

This algorithm takes less distance to find the nearest neighbors while we are making the KNN model.

Role of K-NN in the project:

In this project, the KNN classifier is used at the face recognition module which occurs when the image is captured. Image of individual roll number is stored in the database, at the time of login image is captured from the webcam and then that image is cut down into pixels and search for the nearest data for training. Each pixel is compared with the picture in the database. The pixel distances on the face are different for every individual. So, if the picture is matched with the data in the database then the person is authorized. And this KNN stores the entire training dataset and is used for representation. Actually, it does not learn any model and mostly makes the predictions.

Test Case: Test Cases for Login Form

S.no	Test case	Input test data	Expected results
1	Test if the user is able to log in successfully.	Correct roll number and valid Face JPE file.	The user must successfully log in to the application.
2	Test if a user entered invalid login credentials.	Incorrect roll number.	The proper error must be displayed such as login fail.
3	Test if admin entered with valid roll number and empty Face JPE file.	A valid username and empty Face JPE file.	A proper error must be displayed and prompt to upload an image.
4	Test if admin entered with empty roll number and valid Face JPE such that attempt must get failed.	Empty roll number and valid Face JPE.	The proper error must be displayed and prompt to enter the roll number.

CONCLUSION:

In this research paper we have concluded and carried out about the existence of examination is carried out by using online system which has more flexibility of time and space in the implementation and classification of face recognition methods and expected in the updating the algorithms which gives us more accuracy compared to this algorithm which can be done without proper lighting and can have more distance and can easily recognize the faces.
And this online examination system is very easy and convenient to operate and use. And we have used KNN to capture the image of user and to do cross-validation from the database, so if user is authenticated he or she allowed to attempt the examination.

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