A Synopsis on

Developing AI-Based Comprehensive Framework for Online Assessments

Submitted in partial fulfillment of the requirements
of the degree of
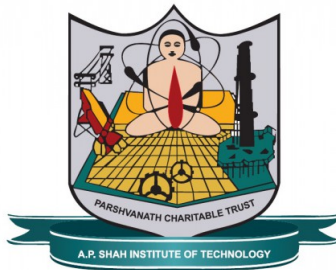
Bachelor of Engineering

in

Information Technology

by

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CERTIFICATE

This is to certify that the project Synopsis entitled **"Developing AI-Based Comprehensive Framework For Online Assessments"** Submitted by **"Swapnil Sapre (18104027),Keval Shetta (18104013),Kunal Shinde (18104012)"** for the partial fulfillment of the requirement for award of a degree **Bachelor of Engineering** in department of **Information Technology** to the University of Mumbai,is a bonafide work carried out during academic year 2021-2022

Prof. Vishal Badgujar
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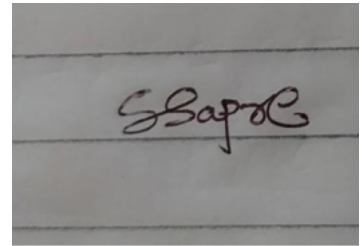
External Examiner(s)

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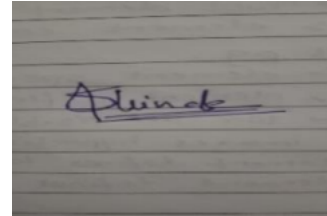
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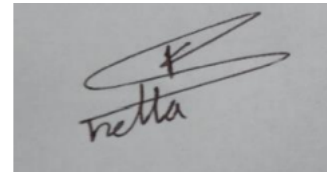Date: 23/10/2021

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Date: 17/10/2021

Abstract

Online examinations are the way of conducting examinations on the user's mobile devices or laptops rather than actual paper. During situations when physical exams cannot be conducted online exams have been the preferred choice. In physical examinations the students doing malpractices reduces by a great amount as there are examiners physically present to monitor every student. The idea of Smart AI-ML based Online Framework is to reduce the malpractices done by the students in the online mode as far as the current platforms in use are concerned. For this, there are some methods used which are based on the machine learning algorithms. The main task during the exam time is the continuous live detection of every candidate and for this facial detection using webcam is necessary. Before this, a proper pose setup and facial illumination needs to be ensured.

With the live detection happening the examiner can track the student from their end as well as get the alerts based on student's illegal conduct. Overall, the system is able to perform the proctoring tasks in a fully automated fashion and thereby requiring very minimum efforts from the examiner in monitoring the candidates. We have arrived at a conclusion that Smart Online Examination platform is a much viable solution to the existing platforms for conduction of the exams and doing the proctoring.

Introduction

The traditional examination system process is long, time-consuming and within the evaluating process whereas the online examination system provides a quick and accurate solution within the specified time frame. We all know that we'd like fewer resources, so check your survey online quickly, reliably, and accurately as compared to the pen-paper test. Students have quick access to online exams, reducing the necessity for faculty and staff. Facilities that need an outsized amount of teaching materials, research materials, seating arrangements, etc. And every one of these is often needed for penetration testing. The online exam process also minimizes the printing of test papers and other materials required for instruction, and therefore the stationery required for a traditional exam like pen-paper, pencil, etc. The resulting process is extremely large and error-prone. The test system provides a fast and accurate solution within the specified time frame, scoring online exams is simpler and saves teacher time. The assessment is quick, reliable, and accurate. In online reviews, the results are more accurate. The online exam provides flexibility and security within the quiz, as each student can receive a random question from an equivalent sample test.

It is impossible to assign different exam inquiries to different students and there's a risk that exams are going to be leaked when the exam is passed. for various test centers. the good advantage of online tests is that they're available to all students. Computers are often customized to suit people with different disabilities. Students with disabilities have little access to those traditional teaching and assessment methods. As they approach the campus, documenting can get within the way of them. Online quizzes allow you to complement your content by adding videos, images, audio tracks, PDF files, and more to your tests. The simultaneous use of multimedia makes online testing of all kinds of test takers more comprehensive, including better image test takers. Online Quiz features several built-in features designed to stop malpractice, like locking your browser, disabling keys like Print Screen, arrow keys, and ESC. That is, not only can participants not save screenshots of the quiz, they can't. Another important security feature is that the dual watch connection. This connection requires the administrator to log in first before the candidate writes the test, to avoid the case where the scholar has access to the exam malpractice and prepares unfairly

0.1 Facial Recognition and ML

Facial Recognition may be a class of bio-metric software program that maps an individual's facial capabilities and shops the facts as a face print. The software program makes use of deep-going to know algorithms to look at a stay captured photograph to the saved face print to verify one's identity. Image processing and system going to know are the backbones of this technology.

As an example, to perceive whose face is found during a given photograph, a few matters could also be verified as a sample:-

Height and width won't be dependable because the photograph is often rescaled to a smaller face or grid. However, even after rescaling, what stays unchanged are the ratios – the ratio of the height of the face to the width of the face won't change. Width of various components of the face like lips, nose, etc. There is a sample involved – one-of-a-kind faces have one-of-a-kind dimensions a bit like those above. Similar faces have comparable dimensions. Machine Learning

algorithms best recognize numbers so it is pretty challenging. This numerical illustration of a "face" (or a detail inside the schooling set) is named as a function vector. A function vector incorporates various numbers during a particular order.

As an easy example, we'll map a "face" right into a function vector which could incorporate numerous capabilities like:-

1. Height of face (cm)

2. Width of the face (cm)

3. Average color of face (R, G, B)

4. Width of lips (cm)

5. Height of nose (cm)

By combining the machine learning and making it applicable for online examinations has done betterment in this field. They yield a system that is fully automated in conducting examinations, monitoring each candidate without the examiner needing to do it individually, then grading the students and also maintaining the records for future reference

The company of this paper from hereafter is as follows: Section 2 consists of the literature survey finished and Section three gives the objectives of the project. Section four describes the prevailing System architecture, strategies, and the solution to this is proven in the proposed System architecture in Section five. Section 6 incorporates the realization.

Objectives

- To set up proctoring mechanism to stop malpractices in exam and to create a system that validates each user well before the exam using facial recognition and validation.

- To perform object tracking (person tracking) throughout the exam.

- To allow the faculty to alert warnings or end the exam if students found performing malpractices.

- To provide a platform for the faculty to set the questions and also have support for multiple languages and detailed reporting.

- To provide tab locking features to not allow students to navigate away from exam screen.

- To send attendance and mis-activity report details to faculty.

Literature Review

In literature[1] The author has discussed how in this system, the author has used a random linear set of guidelines for query choice, and a clever exam paper grouping set of regulations primarily based on query financial institution shape, exam question shape, and controlling parameters has been constructed and found out.

In literature[2] The author has discussed certain facial recognition techniques in the online examination. The paper contains AI-ML (artificial intelligence and machine learning) techniques based on CNN (common neural networks) that will help for face verification and detection. The system discussed works on training samples formed by taking a large number of face sample data of students obtained from online lectures and previous examinations and with some AI-ML, the author has collected continuous audio and video inputs from the student's live environment.

In literature [3] The author is providing a list of tools and techniques required for proctoring an exam. These include a webcam, microphone, and face detection software. Once the student enters the room and takes his/her seat, face detection will verify that he/she is there.

In literature [4] The author discussed the tab-locking mechanism and how it can be implemented for each question on a quiz or test. The randomizing of question papers would prevent students from malpractice and also give an advantage to those who do not know as much.

In literature [5] The author has presented different computer vision algorithms for face detection and expression detection. The paper consists of three techniques such as SVM(support vector machine), MLP(multi-layer perception), and CNN(common neural networks). The author has also given a methodology of face cropping, reshaping, feature extraction to carry out the face recognition process.

In literature[6] In this the author contains techniques used biometric technology because it used to identify and analyze the characteristics of the human body such as fingerprints, retina, sound patterns, facial patterns, and other body structures that can be used for system authentication the ultimate aim is to develop a prototype of face-based online exam application.

Problem Definition

There are many tools and software available on the market for taking tests online. However, most of them are hosted inside the system and are not intended for free use. Monitoring is not enabled on other widely used open source evaluation platforms. This allows students to engage in professional illicit activity, such as talking to others or minimizing the screen to find answers while taking the test. The existing system includes the following aspects:

- The system includes the simple username and password combination to log into the exam portal.

- For taking the attendance, the faculty has to supervise the student by calling out their name

- There is no diversity in questions as there are a series of similar questions available in the questionnaire for all the students taking the exam.
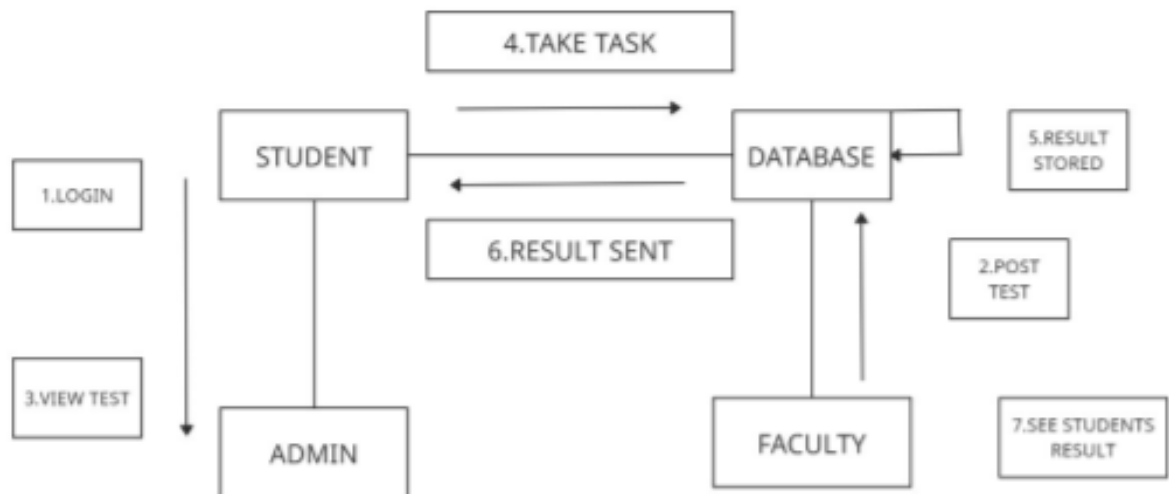
This project aims to solve the limitations of the existing systems and further develop a new system.

Proposed System Architecture/Working

In this paper we have divided the flow of the system into two main aspects: the student end and the examiner end.

0.1.1 Student End Process

Before the candidate begins to attempt the examination they must register and login into the exam portal with their credentials.

Username and password

This combination is one of the most widespread authentication methods used due to its relatively low cost of deployment and convenience to the users. However users can impersonate another person and there would be no means to detect if an online student is really the one he or she claims to be. For this purpose we have implemented a two factor authentication mechanism. During the registration process, the student's mobile number plays a very important role. Every time the student logins for an exam a OTP (one time password) will be sent to the registered mobile number. As a result no other student can take the exam on one's behalf as one student can register only with one mobile number at a time.
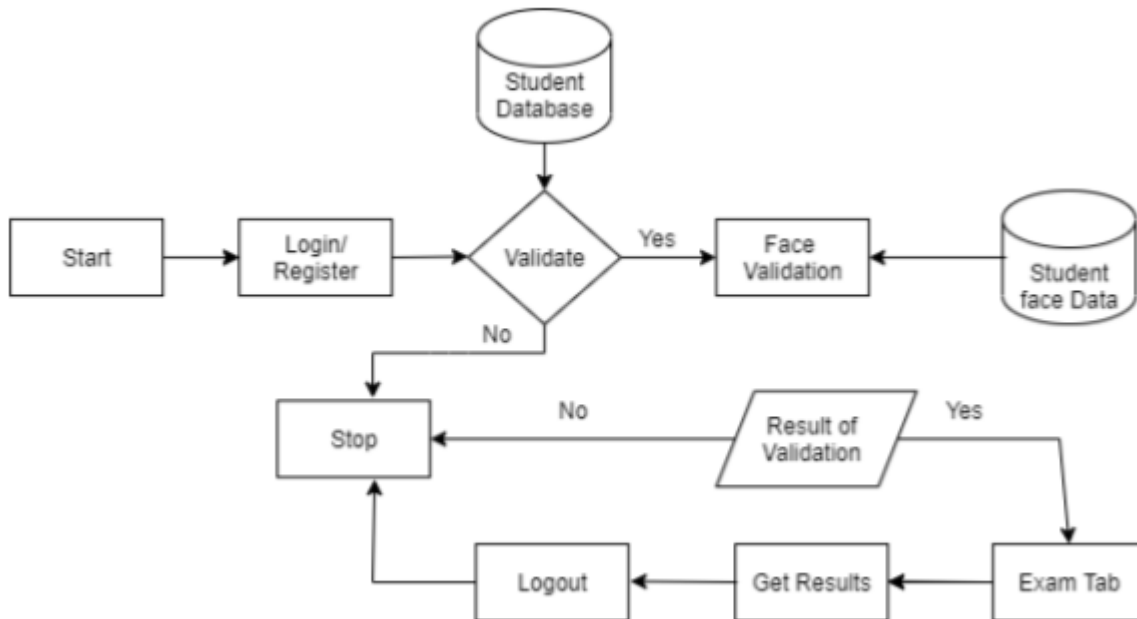

Figure 1: Student's End Process

Figure 2 illustrates the process followed by the system from the candidate's perspective. The student taking up the examination needs to set up a profile in advance. The profile will contain all the personal information along with the pictures of them taken by varying distances

and light variations. For this, the system requires the use of a webcam of the device to take pictures of the user's face. On the day of the examination, the students have to enter their username as they are recognised during the registration process. Upon successful login, they are directed to the facial recognition page. New images of the user are taken and compared against the ones stored in the database to establish if they match within suitable bounds. Once the student is validated by this method, they are allowed to proceed with their examinations. This completes the two factor authentication process as now the students are verified both by mobile number based OTP and face recognition.

0.1.2 Examiner End Process Diagram

Figure 3 illustrates the process followed by the system from the examiner's perspective.
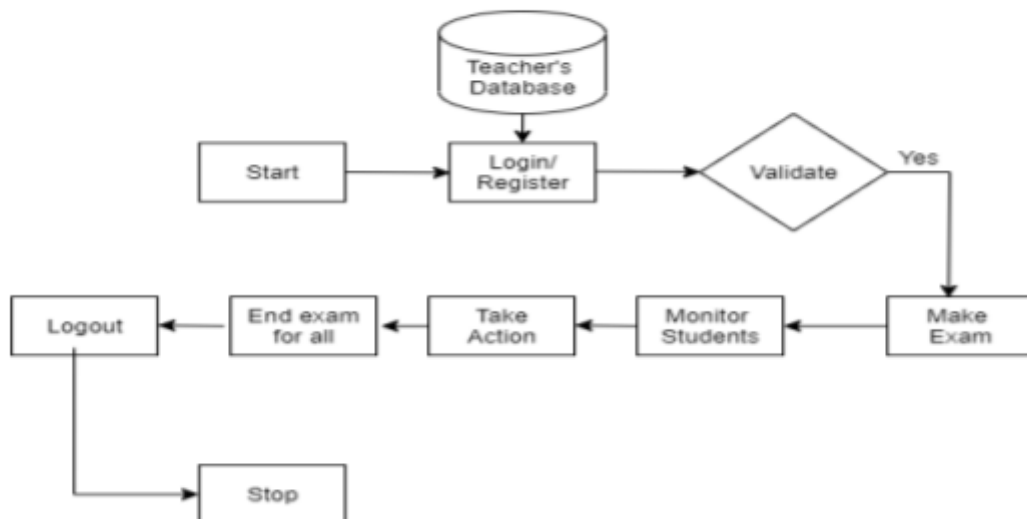
Figure 2: Examiner's End Process

The examiner's primary intention of using this system is for exam generation and monitoring the students while they are giving the exam. The next feature the proposed system provides is the ability to issue warnings to the students doing malpractices and eventually ending the exam for those who are repeatedly found doing the same. The exam generation process and the mis activity report details methods are demonstrated in the next subsections.

0.1.3 Exam generation process

The most crucial task that the examiner needs to carry out is the creation of the examination. The system has been developed in order to increase the diversity and avoid all the students getting exactly the same questions and in the same order.
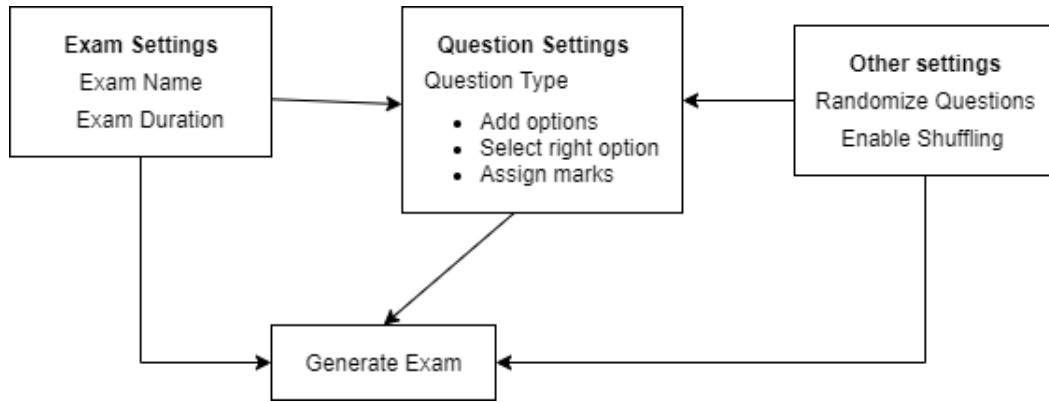
Figure 3: Exam Generation Process

Figure 4 represents the exam generation process. At the time of exam generation the examiner can specify the type of questions as follows:

i) multiple choice with single or multiple correct options

ii) match the following : A process wherein students will have to drag the tiles from one table and match it with the corresponding correct answer in the another table

The proposed system makes all the examiners mandatory to display the questions in the form of the images rather than plain text. This ensures that students do not copy paste the text as it in another tab to get the answers. The system also allows the examiner to create a csv file based question paper and then simply import it in.

0.1.4 Alert generation

Alert is an important feature implemented in this system. Having mentioned earlier the device's webcam and microphone are used to capture the live images and audio from the student's end. The examiner is provided with a dashboard that enables them to see this live data of all student's. However monitoring each individual is not possible in a real time scenario and hence the alert based system generates such alerts. The alerts are displayed to the examiner containing the name of the student and a short description of the misactivity they have performed.

Based on the above report, the examiner can send warnings to the student. After issuing multiple warnings if the student is still found doing malpractices then the examiner can decide to end the exam for that particular student.

The next section discusses about some of the method used to detect the face, video and audio of the candidates

0.1.5 Object tracking and face recognition

Dlib is a c++ based library consisting of machine learning algorithms and trained data sets that are capable of performing face recognition. To detect any object a unique ID has to be assigned to it and then track it in subsequent frames. This requires every object to be associated with

a unique ID which will take up memory and is not a feasible solution.For this reason we are adopting correlation tracking method which is as follows:

i) detect the object once or in specific time intervals

ii) Apply the algorithm to track the object in subsequent frames.

The machine learning algorithm makes use of predefined data sets to track the object. In order for the dlib tracker to track the same object we need to define the boundary around our target specified in four coordinates (top,right,bottom,left) which are passed to a pre defined function 'rectangle' as shown below.

rect = dlib.rectangle(startX, startY, endX, endY)

The sample input is passed to the dlib object tracker which tracks it in further frames. The updating process of the tracker is performed at the back end. The process will be looped throughout the examination process to track the students.

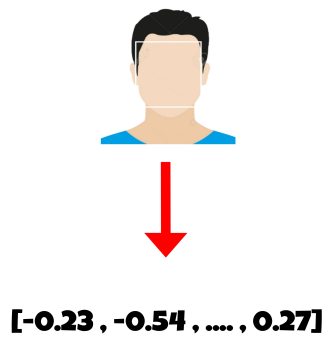**[-0.23 , -0.54 , ... , 0.27]**

Figure 4: Generating 128-d real number per face

The candidate will be allowed to give the examination only when they are verified by using face recognition and validation. This section will discuss the face recognition technique using the openCV library of python. It is capable of processing the images and videos to identify the faces and objects that appear in the samples. The face recognition module method used generates a 128-d real valued number feature vector per face. This is like assigning unique codes to each face.

Figure 5 shows how the sample picture has been associated with the 128-d values. Once this has been accomplished, the encoded value and corresponding name from the database is assigned to it. In the actual process of examination, the images of candidates are detected and then applying a box around the face of the person (as marked by a white rectangle in the image above) based on the four coordinates and then convert this into the 128-d number value.

We attempt to match each face in the input image to our encoding in the database. This will return a Boolean value in either True or False

i) If the distance is below some threshold value then it returns True indicating the faces match

ii) If the distance is above some threshold then it returns False as the faces do not match.

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0.1.6 Tab locking

The last thing the system prevents the students from doing is accessing other windows to fetch the answers. For this we will be detecting if any student has tried to minimize the current exam window. If such a scenario happens then an alert will be sent to the examiner's dashboard specifying that the student attempted to minimize the window or open other tabs.

Summary

In this project we will be creating two sides: the Student side and the Admin side.On the student side, it will allow the students to login and register once getting validated using facial recognition and take an online exam where all malicious activity can be blocked like opening a new tab whereas the front camera will scan the candidate's face and audio with audio detection mechanism simultaneously.On the admin panel allows the examiner to view the question paper and the list of students appearing in the test. If a student is caught doing malpractice, it will be displayed on the list.

References

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[5] Radhika C. Damale and Bazeshree. V Pathak. Face Recognition Based Attendance System Using Machine Learning Algorithms. 2018. doi: 10.1109/ICCONS.2018.8662938.

[6] Arief Agus Sukmandhani and Indrajani Sutedja. Face Recognition Method for Online Exams. 2019. doi: 10.1109/ICIMTech. 2019.8843831

Publications

Submitted in below conferences and waiting for their acceptance

- 3rd International Conference on Advances in Distributed Computing and Machine Learning (ICADCML)-2022

- 3rd International Conference on Deep Learning, Artificial Intelligence and Robotics,(ICDLAIR) 2021

- International Conference On Big Data, Machine Learning and Applications

- 2nd International Conference on Ubiquitous Computing and Intelligent Information Systems.

- 4th International Conference on Computer Networks, Big Data and IoT ICCBI 2021.