

Smart Online Examination Monitoring System

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Abstract

Background: Technology has been integrated into our everyday lives and it has become the most prominent part of our daily activities. The COVID-19 pandemic has made the technology most prominent in daily life like grocery shopping, and health consultations and it also made the schools and colleges encourage online learning. Over the past years, online learning has gained a lot of popularity. But the verification and monitoring of the students have always been the important challenges in online examinations. Furthermore, it has to be ensured that the students have completed all the activities without any inappropriate behavior.

Objectives: Online Learning/Examinations have gained a great demand due to the everyday circumstances we have been facing. But the credibility of the exams has not been guaranteed due to lack of authentication and other reasons.

Methods: To overcome these issues, there is a specific solution based on an automatic proctoring system. This solution consists of the features that help to resolve the primary concerns at hand. The system allows the student to log in and authenticate him/her with the image verification during the examination. It allows the student to take the exam, check the results, and report the problems if any occurred. The main features of the system are the maintenance of logs of window events whenever the user changes tabs or opens a new tab, detection of more than one person in the exam, prevention of the cut, copy, paste, and so on.

Conclusions: The main aim of the system is to offer an authentication identity service for students through continuous monitoring. To avoid the fluctuations, due to the changes in the postures of the student, more models can be introduced as future work.

Keywords: Authentication, Monitoring, Image verification, Log Maintenance, Smart Examination, COVID.

1. Introduction

Online learning has gained popularity over the years and allows educational institutions to manage at a underprice and have larger access to more students. To prevent compromising online authorization, verification should be done regularly or continuously. One of those processes is Online proctoring, which usually refers to monitoring online testing with a webcam.

Online proctoring usually refers to proctor (people) who monitor online testing with a webcam. It involves the process of verifying the person writing the test easily. Insufficient identity verification methods affect the reliability of information and certificates obtained online. To prevent compromising online authorization, verification should be done

regularly or continuously. At the same time, validation should be unobtrusive and non-disruptive and does not interfere with the learning process [12].

In addition to certification of online student identity, the desire for full online education is limited along with the knowledge test. Few are people-based solutions (unlimited) or fully automated (unreliable) [13]. There are also a few scientific methods that develop the concept of combining few of the identified activities. However, there is no complete and reliable solution that combines continuous multiple biometric verification with continuous visual and audio monitoring, and monitoring instrument project to ensure 100% reliable results [14].

Here is a new web-based system that provides continuous ID service for online readers with a consistent biometric recognition system. It can be used to reassure students throughout the exam on a continuous basis [15].

2. Prior Art

In the first [1] study of issue deals between distances resulting from the comparison of the desired student template with the research template, the second is the level of reliability associated with the distance provided by the system. In the case of study for

user verification as [2] the global verification response is computerized by adding the some points from all sub-systems, measured by their reliability measures. In [3] this finally, the global verification response is compared to the admission limit: if it is low, the student continues the study session, otherwise, the system raises access control. In study [4] with the help of AI for authentication an intelligent travel system is often used with the usage of biometrics. Physical recognition is one of the biometric ways to improve this system. Through this framework, the problem of professors and students who are marked even though they are not physically able to be easily solved. The main initial steps used in this type of system are face identification and face detection. In [5] this study reveals about, a device/interaction-agnostic multi-biometric system that is continuously and clearly intended to ensure both presence and collaboration is proposed for student employment. By performing point-level integration of different biometric responses based on the device used and the interaction with which it is performed, the system can verify student identity.

In the usage [6] of block chain with various algorithms used for the biometric recognition of the Viola-Jones facial algorithm, the release of Mel Frequency Cepstral Coefficients (MFCCs) voice, the HMM-based multi-sensor touch method, and the recognition of mouse power in mouse movement, elevating distortion for hardware by clicking the buttons. The system combines five subset biometric systems that detect face, voice, touch, mouse, and key keys respectively. Each of them returns a pair of numbers. In this [7] our daily lives as part of an online safety program user authentication plays an important role in that aspect. Currently, it is guaranteed by a one-time user authorization that is completely unsuitable for protection. In that aspect, one needs to focus on continuous monitoring in order to reach as an official user. The whole process is verified by two different authentication methods. ANGA (the average number of real actions) and ANIA (the average number of fraudulent actions) are two separate factors to achieve secure authentication with machine learning. In [8] study of overall cybersecurity various problems related to authentication can be resolved as a part of familiar primary step of complete monitoring. In the [9], through this framework, the problem of lawyers and students who are marked even though they are not physically able to be easily solved. The main initial steps used in this type of system are face identification and face detection. This study proposes a model for the implementation of an automated presence system for classroom students using face recognition techniques, using Eigen face values. Through the [10] and that continuous monitoring and verification with machine learning algorithms results in a successful test. This two-phase operating system has been implemented and the results are reported in terms of ANGA and ANIA states. As part of the research, it can successfully verify users but sometimes further verification may affect the real user to engage and access the system. One needs to focus on unimaginable values in order to be employed.

In figure 1, shows the analysis of Literature survey.

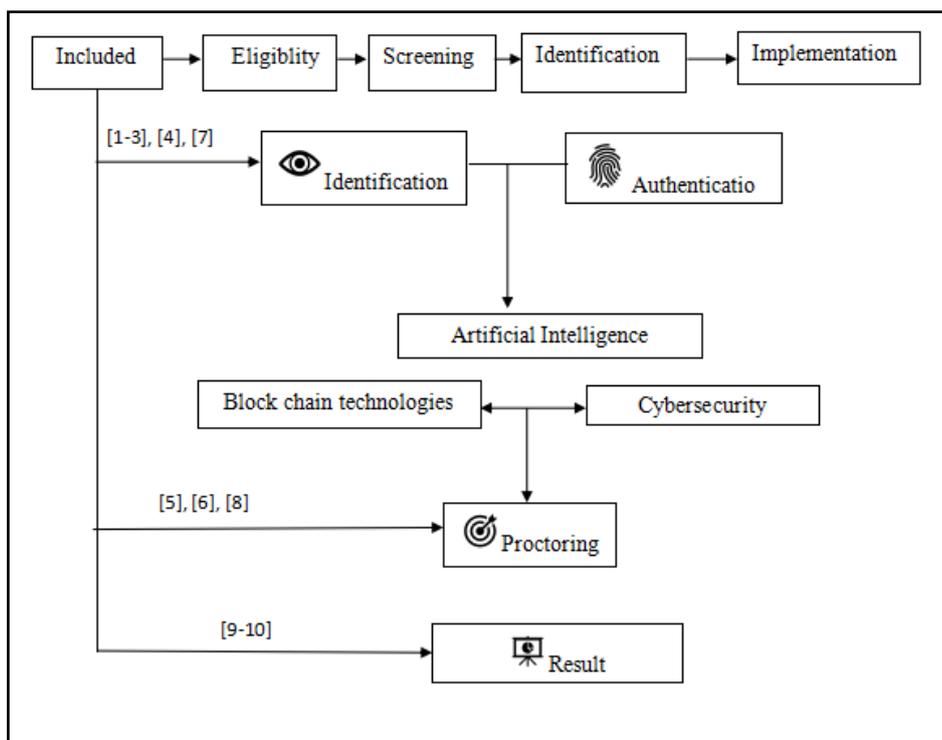


Figure.1 Analysis of Literature survey

3. Proposed Method

System Analysis is the process of collecting and interpreting facts, diagnosing problems, and breaking down the system into several modules for easy use. System analysis is done to study the existing system and its components in order to develop a new system that can overcome previous obstacles. This is very helpful in identifying the objectives of the proposed plan.

- Online Learning/Examinations have gained a great demand due to the everyday circumstances we have been facing. But the credibility of the exams has not been guaranteed due to lack of authentication and other reasons.
- Many systems have come into existence to help in monitoring the students during their exams. But the existing systems failed to prevent the impersonation of the users.
- Through this framework, the problem of professors and students who are marked even though they are not physically able to be easily solved.

In figure 2, shows how the existing system works. Figure 3 represents the process flow for Smart Online Examination system which covers the following:

- The proposed system authenticates the user at the time of login and continues to monitor him/her throughout the examination with the image captured at the time of login and it also prevents the user from using multiple logins.
- Some of the functionalities of the proposed system are:
 - Authentication through Image Verification.
 - Continuous Monitoring
 - Window event detection
 - Prevention of Copy Paste
 - Prevention of Screenshots

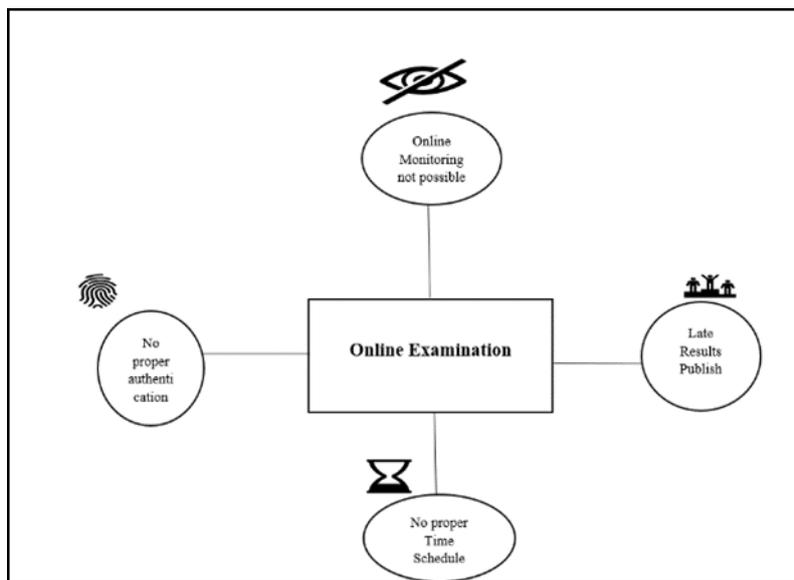


Figure.2 Diagram of Existing System

The proposed system has four modules that help both the professors and students to create and take exams.

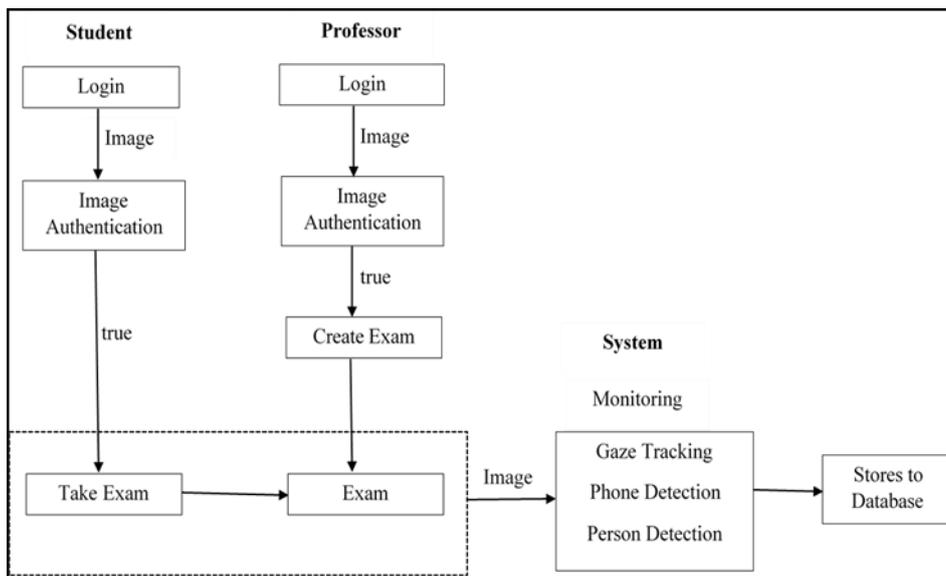


Figure.3 Data Flow Diagram for Smart Online Exam Monitoring System

The modules are

1. **Authentication:** Authenticates the users logging into the system through image verification and also prevents the user from having multiple logins.
2. **Student:** Activities related to students such as taking exams, and checking the history and results come under this module.
3. **Professor:** Activities related to the professor such as creating exams, publishing the results, and monitoring the logs are considered in this module.
4. **Exam:** The exam module has the functionalities of creating new questions, deleting questions, and updating questions.

A. PROBLEM STATEMENT

- The COVID-19 pandemic has made schools and colleges implement online education strategies and consequently the need for safe mechanisms to authenticate and proctor online students.
- But the lack of efficient mechanisms to assure the authentication of the user/ student has always been a problem in online examinations.
- To provide reliable and comprehensive solutions to authenticate and monitor the students during the online examination.

B. PROJECT OBJECTIVES

- Implementing online education strategies using secure methods of verifying and reassuring online students with image authentication during sign-in and during exams.
- Ensuring that online students who complete a test and receive academic credentials are those who have not cheated or misbehaved such as using cell phones, copying and pasting responses, and taking screenshots.
- Conducting online testing in a highly efficient and effective way based on verifying the authenticity of various biometric technologies such as face detection, and tracking.

4. Working Principle

Overall procedure of smart online examination monitoring system works on creating exam and also taking the examination through the complete monitoring and also with the proper step of authentication. Initially student and professor need to create an account with valid image verification and the data which will be stored in database. Image verification is done with the module named deep face. As the professor creates the exam, a unique ID will be generated by the system for each exam which will help the users like student for the identification of exam. In the process of monitoring various kinds of techniques are involved in them. One among them technique is Gaze Tracking it deals about the tracking of pupils of test-takers like students who can looking at the screen. For every single point of time eye movements are captured based on that process of capturing eye movements blinking ratio and position of pupil's are noted down. Other one is Person Counting and mobile phone detection in that process YOLOv3 is involved. It states for You Only Look at Once, which acts as real-time object detector like human based upon its algorithm all kinds of activities can be used to capture with the help of the deep convolutional neural network.

As the process of the authentication and monitoring the user type primarily as of student and professor validated through the image verification and also it can able to prevents the multiple user login the system at a particular point of time. Enormous activities are performed as multiple results took place between the student and professor while taking up an exam and as the process of creating the exam and also the process of the results of module can be declared. Since for every single point of time associated with the professor and student as the logs are considered in the process of the authentication. It replicates about the report problems page of the smart online examination monitoring system. If the professor is facing any issues in his account, he can directly report through this concerned study in the process.

As part of the process of examination, with respective to subjective exam which is written by students will be evaluated by the professor manually. And it is done through insert marks feature of the system. The insert marks feature for the exam will be enabled only after the end time of the exam whole system can evaluated.

Figure 4 shows the implementation details for smart online examination monitoring system.

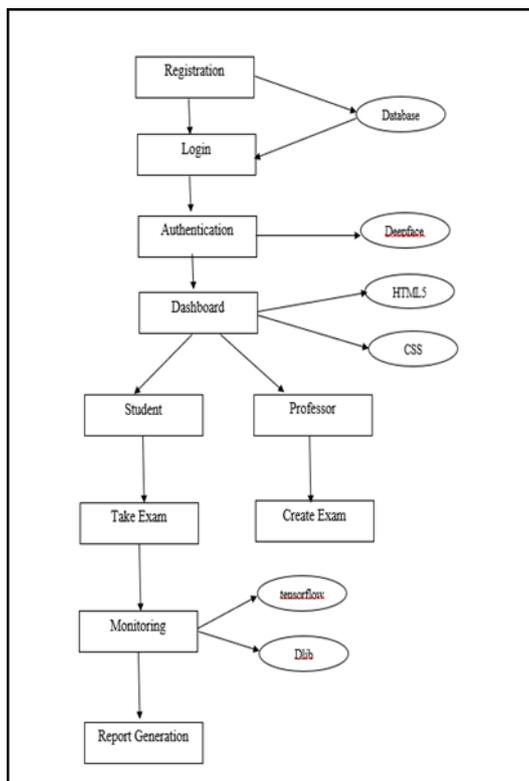


Figure.4 Implementation of Smart Online Examination Monitoring System

A. Tables and Related data

Table.1 Schema for storing student and professor details

Schema for storing student details		Schema for storing Professor details	
Attribute Name	Attribute Type	Attribute Name	Attribute Type
name	varchar	name	varchar
roll	varchar	empid	varchar
gender	varchar	email	varchar
email	varchar	password	varchar
password	varchar	user_image	blob
user_image	blob	user_login	number
user_login	number		

Table 1 shows the schema for storing student and professor details. In which name, roll number, empid, gender, email, etc considered as attributes.

Table 2 shows the schema for storing exam and its status details such as email, prof_id, roll number, test_type, time for start and end, etc considered as attributes.

Table 2 Schema for storing exam and its status details

Schema for storing exam details		Schema for storing exam status details	
Attribute Name	Attribute Type	Attribute Name	Attribute Type
email	varchar	Email	varchar
prof_id	varchar	Roll	varchar
test_id	varchar	test_id	varchar
test_type	varchar	time_left	time
subject	varchar	status	varchar
test_type	varchar		
start_time	timestamp		

In table 3 shows schema for storing objective and subjective questions and answers and in table 4 shows Schema for storing monitoring log and window event details.

Table 3 Schema for storing objective and subjective questions and answers

Schema for storing objective questions		Schema for storing subjective questions	
Attribute Name	Attribute Type	Attribute Name	Attribute Type
test_id	varchar	test_id	varchar
questionid	number	questionid	number
question	varchar	question	varchar
optionA	varchar	marks	number
optionB	varchar	Schema for storing answers from students	
optionC	varchar	Attribute Name	Attribute Type
optionD	varchar	email	varchar
answer	varchar	test_id	varchar
marks	number	questionid	varchar
prof_id	varchar	answer	varchar
		roll	varchar
		marks	number

Attributes for objective questions and subjective are varies in options and for storing answers from students used test_id, questioned, answer, roll and marks as attributes.

Similarly, for storing monitoring log details and window event used name, email, roll, test_id, user movements, window events, etc as attributes.

Table 4 Schema for storing monitoring log and window event details

Schema for storing monitoring log details		Schema for storing window event details	
Attribute Name	Attribute Type	Attribute Name	Attribute Type
email	varchar	email	varchar
name	varchar	name	varchar
roll	varchar	roll	varchar
test_id	varchar	test_id	varchar
img_log	blob	window_event	number
voice_db	number	created_at	timestamp
user_movements_updown	number		
user_movements_lr	number		
user_movements_eyes	number		
phone_detection	number		
person_status	number		
created_at	timestamp		

5. Results

The following homepage represents the fields regarding the creation of an account Such that user can access them with them with the valid account registration depending upon the user type as of student and professor. The login page resembles about the various fields with respect to the user. Regarding the user can have two different users like student and professor. Depending upon the user type we can create an account with the successful login credentials registered with the account. Figure 5 shows login module.

During the successful login with proper authentication, it can ask for the image verification of users depending upon the security issues related to examination of the user type. After the successful logging into the account depending upon the user type as of student and professor if it is professor user type it mainly consists of 12 fields like create exam, generate questions report problem exam history extra related to the professor dashboard. Figure 6, 7 and 8 shows student, professor and exam modules.

In case of professor dashboard for security reason there is a specific field i.e., that is change password in such case old password is necessary for resetting new password regarding the professor user type. For the better experience for users, in each user type there is particular like Report problems. In this each user type can report can report their issues during the registering their account to the admin and resolves the queries related to the user.

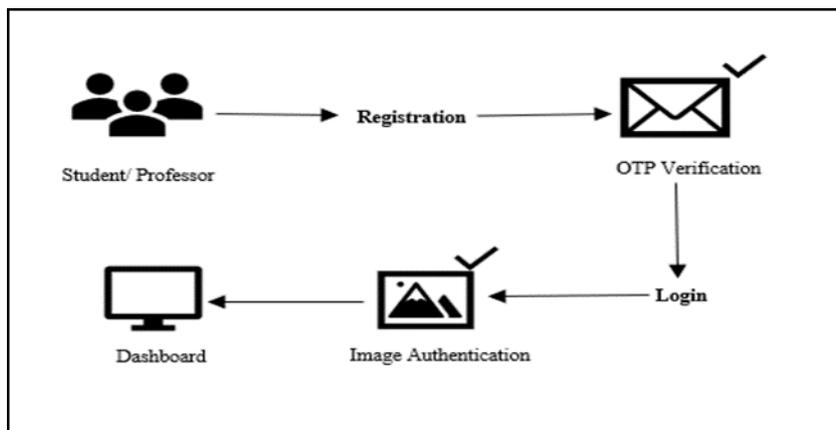


Figure.5 Login module

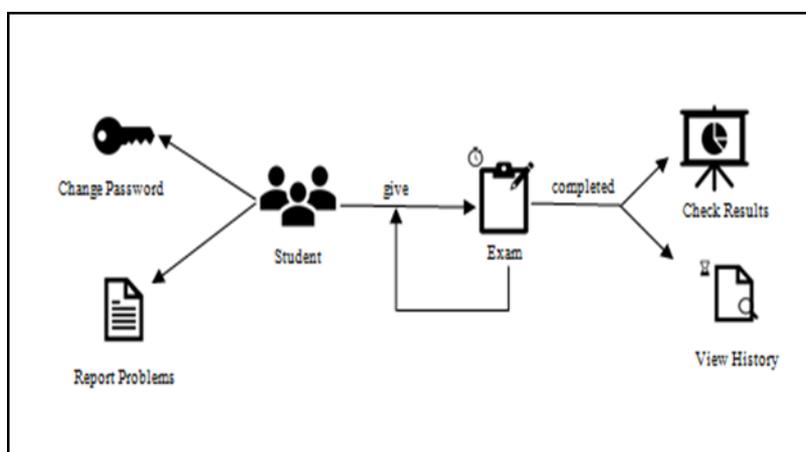


Figure.6 Student module

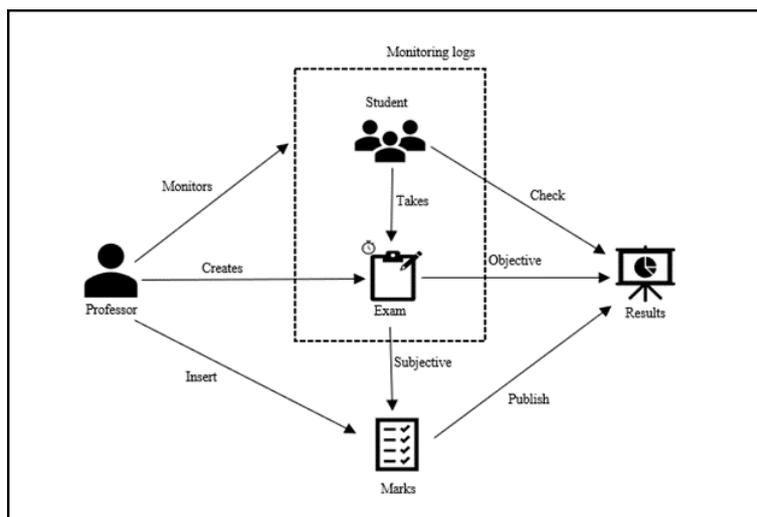


Figure.7 Professor Module

Similarly in case of professor dashboard as there is a filed like generate questions in addition to that update questions in which professor can generate questions and also modify according to the user requirement. As it can be of subjective or objective type of examination regarding the specific examination related to the student user type.

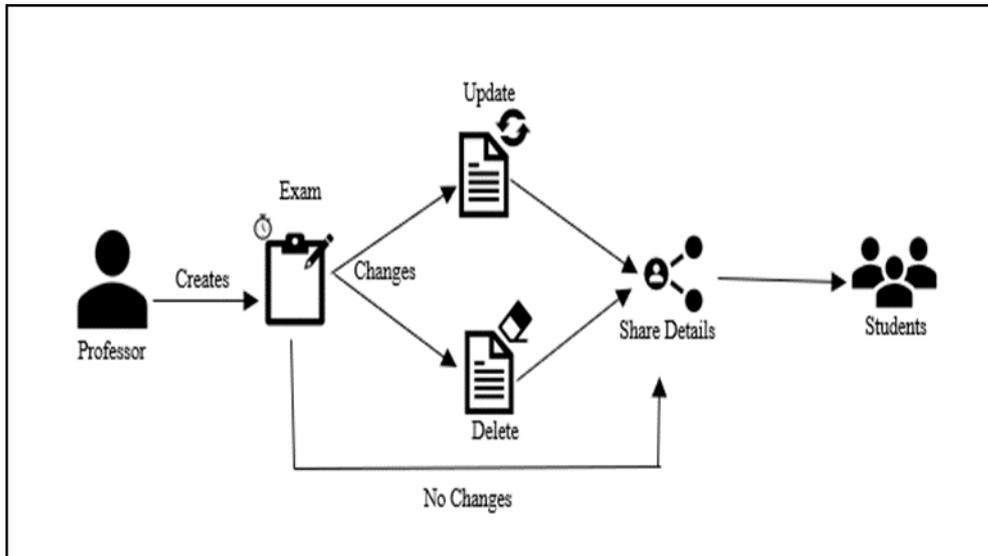


Figure.8 Exam module

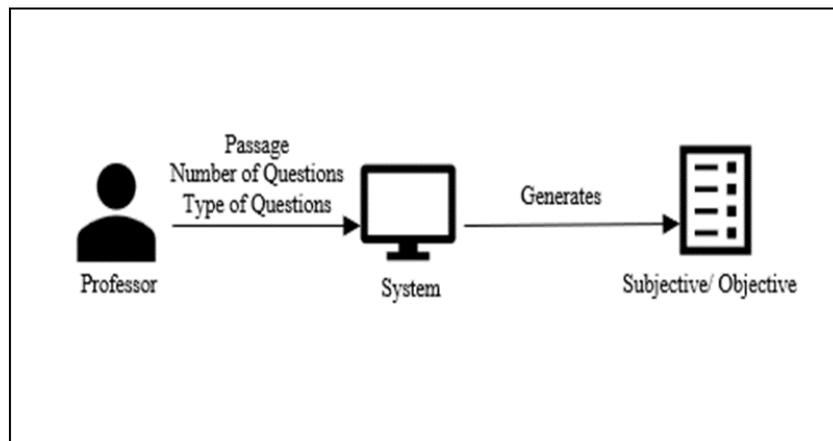


Figure.9 Generate Questions

Finally in the part of professor dashboard, 12 fields are coming to the part of monitoring of an exam. Professor need to publish results for exam’s taken by students depending upon their log history each user of the student. And it closely monitors overall proctoring of the student during the process of online examination. Figure 9 shows process for generating of subjective and objective questions.

Figure 10 represents the home page of the Student dashboard. The user has to register into the system with their image before logging into the system. Figure 11 represents the registration page of the smart online examination monitoring system. The user has to register into the system by providing his image and type (student/ professor).

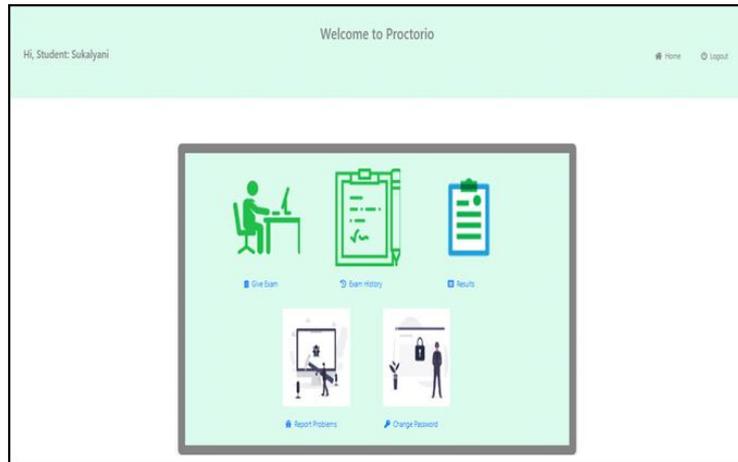


Figure.10 Login page for users

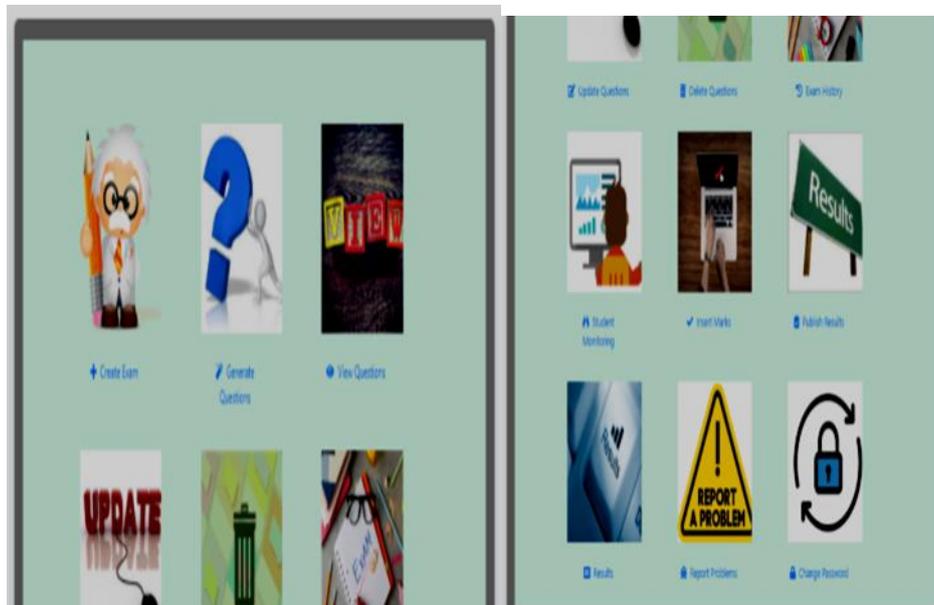


Figure.11 Registration page for Account creation

6. Conclusion

The proposed system helps in preventing the students from following inappropriate behavior and thus provides the credibility of the examination. It helps in verifying the students who are taking the examination through the image verification and thus reducing the possibility of impersonation of the students. Authentication and continuous monitoring of the students throughout the examination reduce the possibility of cheating.

References

- [1]. G. Fenu, M.Marras, and L. Barratto, "A multi-biometric system for continuous student authentication in e-learning platforms," *Pattern Recognit. Lett.*, vol. 113, pp. 83-92, Oct. 2019.
- [2]. L. Li, X. Mu, S. Li, and H. Peng, "A review of face recognition technology," *IEEE Access*, vol. 8, pp. 139110–139120, 2020.

- [3]. A. Ullah, H. Xiao, and T. Barker, "A dynamic profile questions approach to mitigate impersonation in online examinations," *J. Grid Comput.*, vol. 17, no. 2, pp. 209–223, Jun. 2019, doi: 10.1007/s10723-018
- [4]. S. Sawhney, K. Kacker, S. Jain, S. N. Singh, and R. Garg, "Real-time smart attendance system using face recognition techniques," in *Proc. 9th Int. Conf. Cloud Comput., Data Sci. Eng. (Confluence)*, Jan. 2019, pp. 522–525.
- [5]. A.T.Kiyani, A.Lasebae, K.Ali, M.U.Rehman, and B.Haq, "Continuous user authentication featuring keystroke dynamics based on robust recurrent confidence model and ensemble learning approach," *IEEE Access*, vol. 8, pp. 156177–156189, 2020.
- [6]. Aditya Nigam, Rhitvik Pasricha, Tarishi Singh, "A Systematic Review on AI-based Proctoring Systems" Churi2 Received: 24 March 2021 / Accepted: 19 May 2021 © The Author(s), under exclusive to Springer Science, Business Media, LLC, part of Springer Nature 2021
- [7]. A.Alshbtat, N.Zanoon, and M.Alfraheed, "An ovel secure fingerprint based authentication system for student's examination system," *Int.J.Adv.Comput.Sci.Appl.*, vol.10,no.9,pp.515-519,2019.[Online].Available:<https://thesai.org/Publications/ViewPaper?Volume=10&Issue=9&Code=IJACSA&SerialNo=68>
- [8]. L.Slusky, "Cyber security of online proctoring systems," *J.Int.Technol. Inf.Manage*, vol.29, no.3, pp.56–83,2020.
- [9]. H.S.G.Asep and Y.Bandung, "A design of continuous user verification for online exam proctoring on M-learning," in *Proc.Int.Conf.Electr.Eng.Informat. (ICEEI)*, Jul.2019, pp.284–289.
- [10]. L. Unzueta, W. Pimenta, J. Goenexea, L. P. Santos, and F. Dornaika, "Efficient generic face model fitting to images and videos," *Image Vis. Comput.*, vol. 32, no. 5, pp. 321–334, May 2019
- [11]. Mikel Labayen, Ricardo Veá, Julian Florez, Naiara Aginako, Basilio Sierra, "Online Student Authentication and Proctoring System Based on Multimodal Biometrics Technology," *IEEE.*, vol. 9, May. 2021.
- [12]. P. Bhasha, Dr. T. Pavan Kumar, Dr. K. K. Baseer. "A Simple and Effective Electronic Stick to Detect Obstacles for Visually Impaired People through Sensor Technology". *Jour of Adv Research in Dynamical & Control Systems*, Vol. 12, Issue-06, 2020, pp. 18-25, DOI: 10.5373/JARDCS/V12I6/S20201003.
- [13]. K.K. Baseer, Neerugatti, V. ., M. Jahir Pasha, & V. D. Satish Kumar. (2020). Internet of Things: A Product Development Cycle for the Entrepreneurs. *Helix - The Scientific Explorer | Peer Reviewed Bimonthly International Journal*, 10(02), 155-160. Retrieved from <https://helixscientific.pub/index.php/home/article/view/126>.
- [14]. K. K. Baseer, M. Jahir Pasha, D. William Albert and V. Sujatha, "Navigation And Obstacle Detection For Visually Impaired People," 2021 Fourth International Conference on Microelectronics, Signals & Systems (ICMSS), 2021, pp. 1-3, doi: 10.1109/ICMSS53060.2021.9673618.
- [15]. Silpa C, RamPrakash Reddy Arava , Dr K.K. Baseer "Agri Farm: Crop and Fertilizer Recommendation System for high yield Farming using Machine Learning algorithms " *International Journal of Early Childhood Special Education (INT-JECSE)* DOI: 10.9756/INT-JECSE/V14I2.740 ISSN: 1308-5581 Vol 14, Issue 02 2022 6468.