Security Enabled Acoustic Based Assessment System

S. Arul Jothi, M. Mithun Kumar, S.R. Nandha Kishore, Aswath Raja, C.R. Jeyaganeshan

Abstract—**Security Enabled Acoustic Based Assessment System is a desktop application that establishes a secure evaluation scheme for the benefit of both the institutional organizations and the students. This site is an attempt to remove the existing flaws in the current assessment systems and it would help not only visually challenged people but also physically impaired candidates to attend the test by automatic question dictation feature and the automatic answer recognition feature. Institutes enter on the site the questions they want in the exam. The questions are completely randomized and thus security is maintained. Fernet Key is used for the encryption of the questions that will appear on screen. Face detection is used for the user authentication and then the live monitoring is done until the candidate completes the exam and thus anti-cheating/anti-fraud mechanisms is ensured. Students can take exams and acquire their results as soon as they complete the exams. Online Tests save more time for evaluation. It also saves paper which is an issue in the past few years. The answers entered by the students are then evaluated and their score is calculated and saved. This score then can be accessed by the institutes to determine the passed-out students or to evaluate their performance.**

Index Terms: **acoustic, anti-cheating, face detection**

I. INTRODUCTION

Today's Online Examination System has become a fast-growing examination method because of its speed and accuracy. It is also needed less manpower to execute the examination. Almost all organizations now-a-days, are conducting their objective exams by online examination system, it saves students time in examinations. Organizations can also easily check the performance of the student that they give in an examination. As a result of this, organizations are releasing results in less time. It also helps the environment by saving paper.

S. Arul Jothi working as an Assistant Professor, PSG College of Technology, Coimbatore.
M. Mithun Kumar pursued B.E. Computer Science from PSG College of Technology, Coimbatore.
S.R. Nandha Kishore pursuing B.E. Computer Science from PSG College of Technology, Coimbatore.
Aswath Raja pursuing B.E. Computer Science from PSG College of Technology, Coimbatore.
C.R. Jeyaganeshan pursued B.E. Computer Science from PSG College of Technology, Coimbatore.

In an online examination system examine get their user id and password with his/her admit card. This id is already saved in the examination server. When examine login to the server he/she get his/her profile already register. On the certain time examine gets the message to start the examination. All answers given by examine are saved into the server with his/her profile information. Online examination system also allows to correct the answer if the examine needed to change any answer in the examination time duration, however, after the time duration any change will not allow. This also makes checking the answer easy and error proof as computers are more accurate than man and provide fast results too.

The user will automatically get the updated version by logging using the User ID and Password provided at the time of registration. No need of reprinting, appearance, vigilance and the job is done.

II. METHODOLOGY

Electronic examination has been highly interested and suitable in both educational and pedagogical aspects. Examination is one of the best methods of evaluating the knowledge and ability of an individual. To this end, various methods has been employed in examining the ability of an individual, starting from manual means of using paper and pencil to electronic, from oral to written, practical to theoretical and many others.

The present information technology means of examining students is the use of electronic systems in place of manual or paper method which was characterized by massive examination leakages, impersonations, demand for gratification by teachers, bribe-taking by supervisors and invigilators of examinations.

The employers are conducting aptitude test for their job seekers through electronic means; the universities and other tertiary institutions are registering and conducting electronic examination for their students through the internet and other electronic and networking gadgets , various examination bodies in the country register their students through electronic means, recently electronic examination has been widely adopted by nearly all the UK University for post Unified Tertiary and Matriculation Examination (Post-UTME) otherwise called pre-admission screening. With these aforementioned and many more educational bodies engaging in electronic examination and registration for testing the ability of their candidates, which determine the future of this great country and our dear youth, there is need for serious examination of the system which has great impacts on the populace.

A. *WORKING OF THE SYSTEM:*

Step 1: The Admin of the system creates a cloud SQL instance and stores the   questions in the database after encrypting it.

Step 2: The Authority in each institution cooperates with the Admin of the system for registering their students to the examination system.

Step 3: The Authority registers the students by asking them to enter their user ID's and passwords.

Step 4: The data is used to create a user account at the cloud and granting them certain privileges after a valid face of the students are captured.

Step 5: The Students have to login using the user ID as well as the password and   a face authentication is done to verify that they are the right person for that user ID.

Step 6: Once the login has been successful, Students can take up exams in a secured way.

Step 7: The Students are monitored for detecting the malpractice if any during the course of the exam.

Step 8: Results are delivered through voice or displayed for the students.

III. IMPLEMENTATION

A desktop based standalone application was created for the ease of the students. The application was developed using the java swings GUI and python. Python was used for accessing the questions in the database which is hosted in the google cloud. Visually Challenged Students can be easily guided through the voice instructions given by the python voice dictation modules. Face authentication is done for all students and then the entire exam is notices through successive capturing of images of the student who is taking it and then if malpractice has been found then the student's exam session is ended and penalized by the institution.

The Modules in the desktop application are described below:
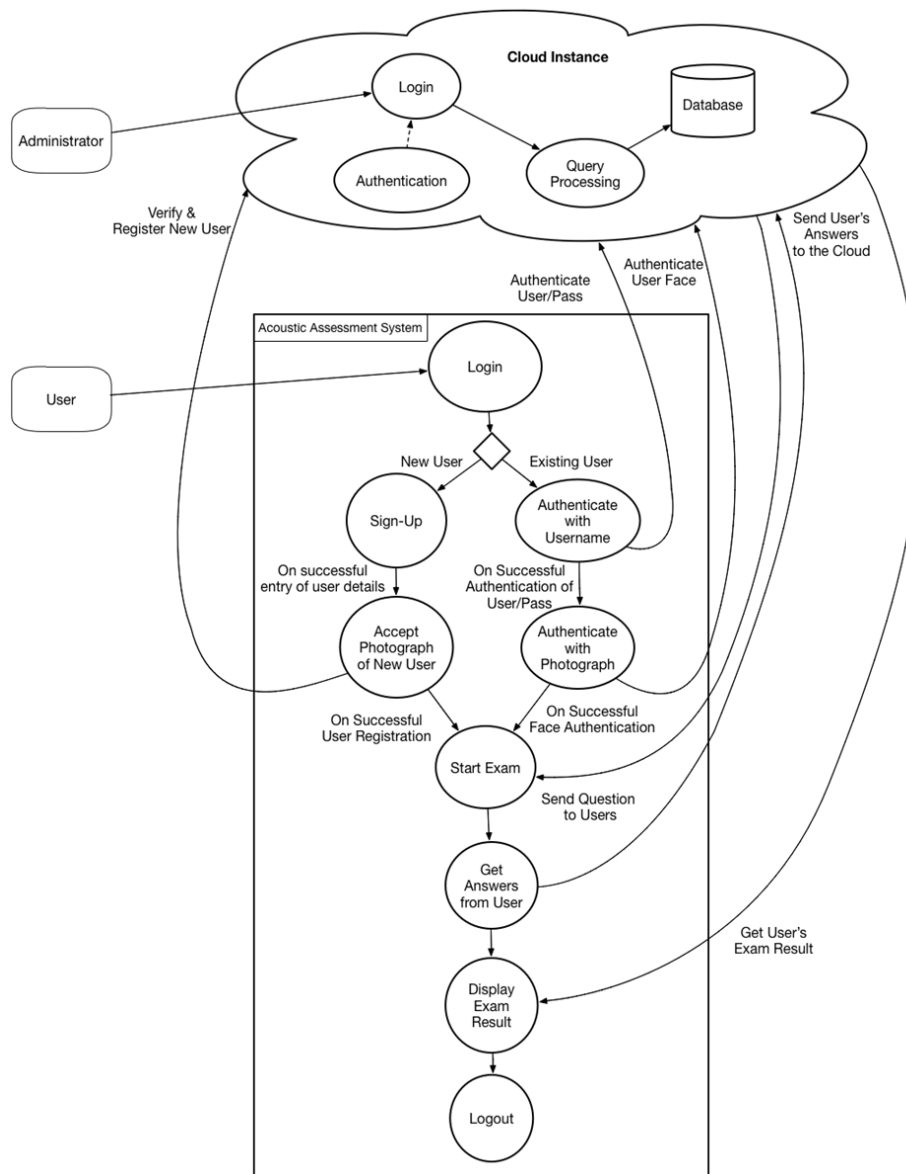
System Architecture

A. Login Module

Students have to login to authenticate themselves each time to attend the exam. Normal students can enter the user name and password and if valid an image is taken to compare with the image taken during the sign in phase. Structural Similarity is measured between images and if it is greater than 0.5 a pass is given to enter the exam else the authentication failed and the user is asked again to enter the credentials. In case of the visually challenged students, on click on the user interface, the user is asked to spell out the user id and the password is auto filled and on the right click of the mouse, the user is triggering the submit event to occur, then face authentication takes place. If the face is authenticated, then the user is passed and then the start page of the exam appears.

B. Exam Module

Once the start page appears on the screen, Normal students can click the start button to start the exam. Once he clicked the start button a random set of five questions is fetched from the cloud sql database and then the questions appear on the screen one in a page at a time. Once the user is chosen an option, he can navigate to the next question. A timer runs on the frame. Once the timer is reached to zero, the user's session is ended and he is taken to the results page where he could get the marks secured. The user can never skip a question and can neither go to the previous question once clicked the next button. This is a way to avoid changing of correct options and hence avoids malpractices. The frame is fitted to the screen so that the user can only focus on the question not on the background clues. This is another way for preventing the malpractice. The user when tried switching tabs or opening a process to the foreground will be immediately checked and taken back to the questions page. If he repeats this for more than three times, the users test session is ended and then he is taken to the results stating an attempt to the malpractice. An optimum time is provided to take up the exam. The students are verified if the user is the authenticated one who is taking the exam by taking picture frequently and comparing with the one which is taken previously. If the face mismatches, a chance of three is given in case of the error if not if the complete face mismatches, the user is taken to the results page with a result of 0 shown on the user interface.

In case of the Visually Challenged students, Instructions are spoken out by the machine for the students and on the left click the user is taken to the question page. The timer is increased by some appropriate minutes since upon demand the question is repeated. The mouse actions are used for navigation and option choosing. If the left click is made once option a is chosen, if it is done twice option b is clicked. Else if the Right click is made once then option c is clicked if that action was made twice then option d is clicked. Mouse scroll down leads to repeat the question. Mouse scroll of up moves to the next question only if any option is selected. This avoids skipping of the question. Rest all the features and security measures are same for both the normal and visually challenged students. On either the user clicked submit after answering all the questions or when the timer fires out or when the user is accounted due to malpractice, then the user is taken to the results page with the result displayed on the frame. In case of visually challenged students the result is spoken out by the machine.

C. Voice Module

The pyttsx module is used for the speech dictation in the examination system. Pyttsx stands for the python text-to-speech cross platform. The best feature is that it works offline. The various analysis has taken to find the volume appropriate for the dictation and then the rate at which the speech should be dictated has also been identified. Speech recognition module has been used for the speech to text analysis which is used for the analyzing of the voice when the visually challenged students speaks out the user id. The one drawback of this is it is online and then it needs good internet connection to analyze appropriately and timely. Google speech recognition is used for analyzing and is quite great in recognizing various speeches and tone differences.

D. Image Comparison Technique

Images are captured using the webcam and are compared. The images which are in rgb format is converted to the grayscale images and then compared. There are two measures for comparing the images. One is Structural Similarity Index (SSIM) and the other is the Mean Squared Error (MSE). SSIM values are in the range of -1 to 1. The value of 1 is highly similar. The value of -1 tells that the images are completely dissimilar. Any value between these gives the similarity measure. Mean Squared Error is another measure which is used to find the error between the images. This also denotes how similar the images are. The structural similarity (SSIM) index is a technique or method for predicting the similarity measure and actual quality of still pictures, as well as the motion pictures. The SSIM index is the measurement of image quality based on an initial lossless or distortion-free reference image. SSIM is designed to improve on previous methods for comparing images such as peak signal to-noise ratio (PSNR) and mean squared error (MSE). The formula to calculate the similarity of two images x & y is,

$$SSIM\ (x, y) = (2\mu x \mu y + c1)\ (2\sigma xy + c2)/\ (\mu x^2 + \mu y^2 + c1)$$
$$(\sigma x2 + \sigma y2 + c2) \tag{1}$$

where
μx: Average of x,
μy: Average of y,
$\sigma x2$: Variance of x,
$\sigma y2$: Variance of y,
σxy: Covariance of x and y,
$c1 = (k1L)2$, $c2 = (k2L)2$: Two variables to stabilize the division with a weak denominator,
L: The dynamic range of the pixel values,
$k1 = 0.01$, $k2 = 0.03$ by default.

The Modules in the Web application include:
- Login Module
- Question Generation Module
- Result Evaluation Module

A. Login Module

The Login Module authenticates the user with their

corresponding username and password combination. The username has to be unique for each user. The new users can register onto the system by filling up a simple form accessible from the login module. The differently abled users can call the examiner for assistance signing up as a new user on our system. The admin will verify the new user and the user may start using the examination systems once the admin has verified the new user. The existing user's login with their respective username and password is checked.

B. Question Generation Module

On successful user authentication, the user is prompted to select the test he would like take. The question generation module selects the questions from that subject according to the user selection in the previous page. The order of the questions is randomized each time the user starts a new exam. This ensures the questions are unique for each user each time. Each User can take the exam only once. Measures taken to prevent the user from cheating and modifying his/her answers including preventing the user from navigating back to previous questions during the exam, real time video monitoring to prevent the user looking to the other users taking the exam or any other device or source for answers giving an unfair advantage over the other users. The user is disqualified if he/she cheats during the exam by also switching between the examination and other applications or tabs on the web browser.

C. Result Evaluation Module

Once the user finishes the exam or the timer expires, the user is redirected to the next page to evaluate and display the user's results for the corresponding exam. The result evaluation module sends the users' answers for the questions to the server and verifies the answers with the correct answers in the database and returns the number of the correct answers and wrong answers and the number of unanswered questions for the respective test taken by the user.

IV. CONCLUSION

The project proposes a security enabled assessment system that helps in monitoring students while taking exams. Students are fairly allotted time and thus they can easily experience the taste of exams without any delay in the loading of questions. They don't need to worry about the hard and fast rules of the system. The aim of the system is to enable the secure way of taking up exams to avoid malpractice. They can easily view their results as soon as they complete the exam. Visually Challenged people are given an easy to follow voice instructions and they can clearly interact with their exam assistant. This work can be further extended by taking into account various issues. The questions are loaded by the admin which are prone to error and are time consuming. Hence machine learning can be implemented in the system to make the system to frame the question by itself so that questions are safe and sound. Complete automation can be done by deciding whether the person is a normal candidate or visually challenged person and providing the appropriate environment so that the students can just take up exams instead of time consuming interactions.

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AUTHORS PROFILE

S. Arul Jothi working as an Assistant Professor, PSG College of Technology, Coimbatore.

M. Mithun Kumar pursued B.E. Computer Science from PSG College of Technology, Coimbatore.

S.R. Nandha Kishore pursuing B.E. Computer Science from PSG College of Technology, Coimbatore.

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