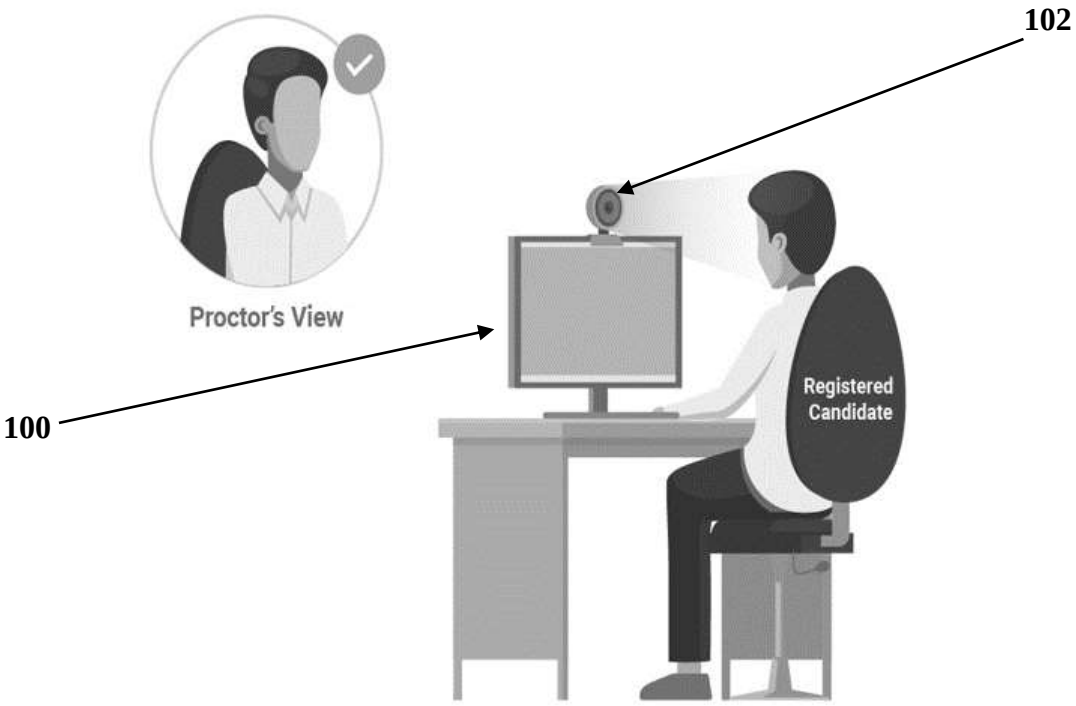


FIG 1

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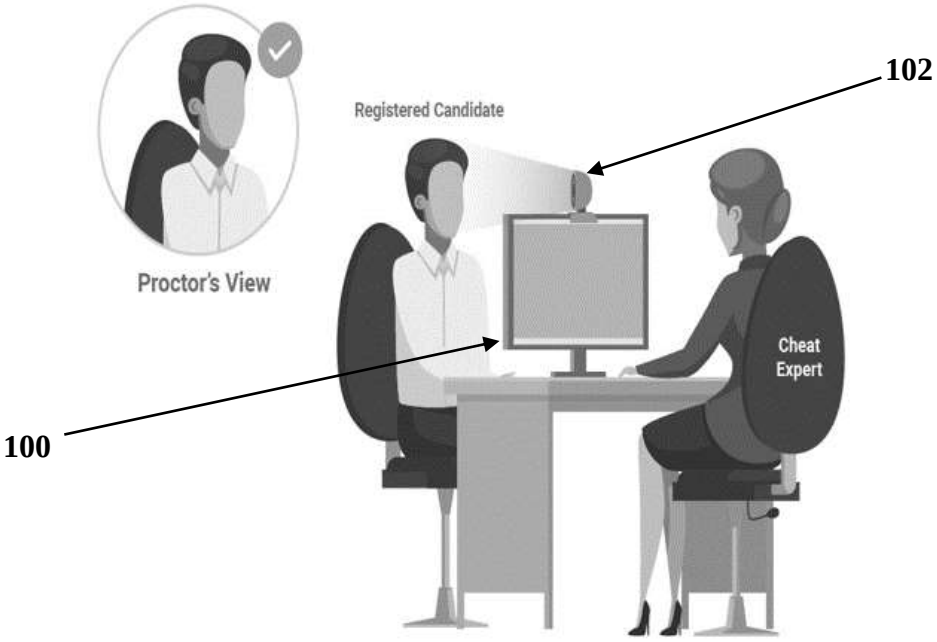


FIG 2

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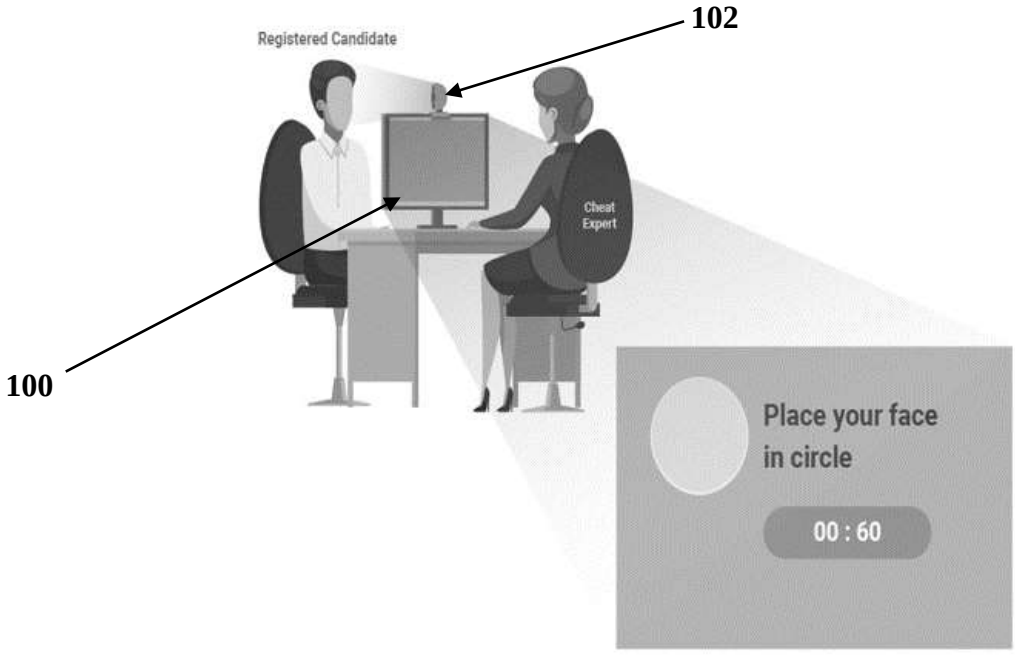


FIG 3

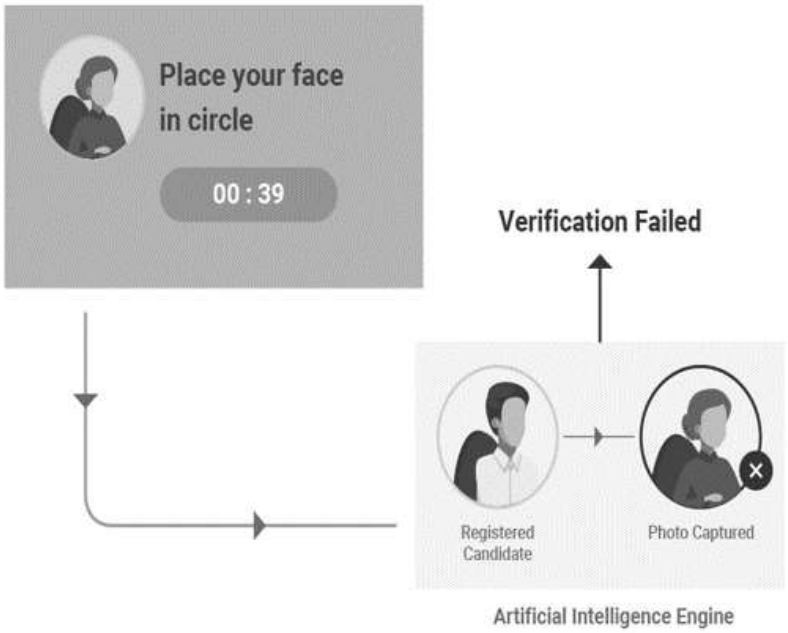


FIG 4

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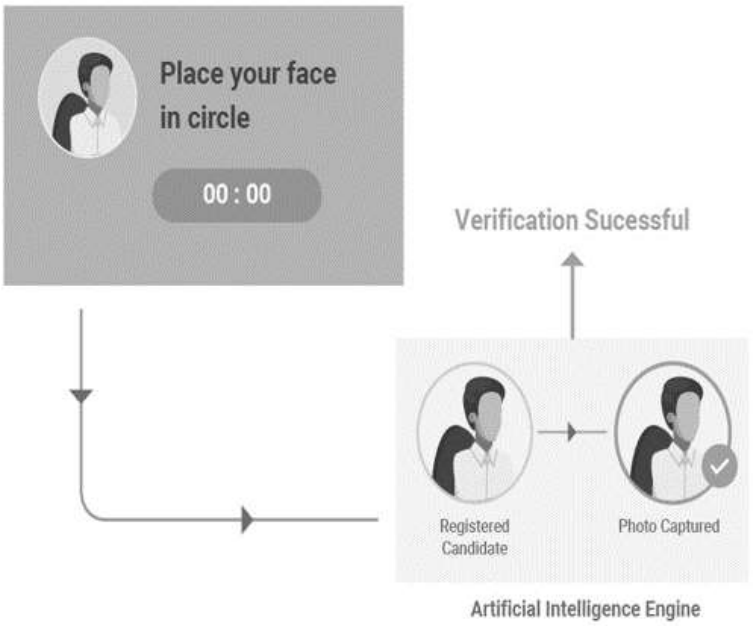


FIG 5

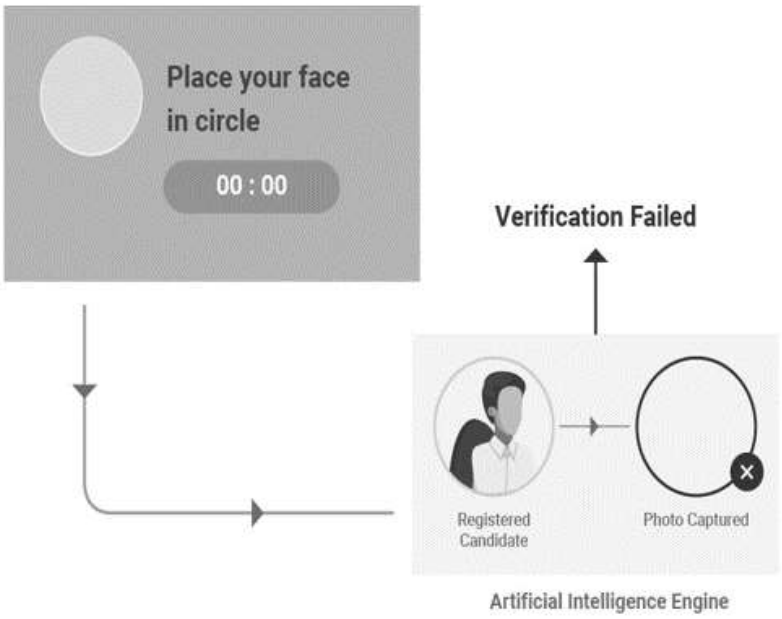


FIG 6

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FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(See Section 10 and Rule 13)

1. TITLE OF THE INVENTION

SYSTEM FOR ONLINE EXAM PROCTORING AND CANDIDATE AUTHENTICATION

2. APPLICANT

a) **GINGER WEBS PRIVATE LIMITED;**
b) A Private Limited Company;
c) Plot No. 48, Block-A, Sector-58, Noida-201301, Uttar Pradesh, India

3. PREAMBLE TO THE DESCRIPTION

The following specification particularly describes the invention and the manner in which it is to be performed.

FIELD OF INVENTION

[001] The present invention generally relates to field of administering and online proctoring of examinations. The present invention particularly relates to a system for online exam proctoring and candidate authentication.

BACKGROUND OF THE INVENTION

[002] Examination or test is inevitable of part of education and various other fields such as competitive exams. Tests are used to determine the ability of a test taker such as a student or prospective practitioner as it pertains to proficiency in a particular subject or skill set. It has become more crucial than ever to keep an eye on how standardized examinations are given, especially in primary and secondary school, as their use has increased. In the recent years lot of examinations has been conducted via online mode. Sometimes candidates or students tries to impersonate camera before start or during the online exam or test.

[003] Thus there is a need of efficient and effective online proctoring methods to check the examinee's authenticity and eliminates suspicious behavior during the online exam or test. Ensuring the security and fairness of exam was the major challenge since the inception of this idea. The security and fairness of the exam was implemented manually in initial phases and enforced by human proctor. Then proctoring process shifted to automation with the time and AI has taken place of human proctors and also the security and fairness of exam started getting controlled by AI. Most of the security and fairness parameter of exam are dependent on the live stream of candidate captured through the camera used in examination. Till now all the analysis for ensuring the exam integrity was on the live or recorded stream only assuming it’s correctly streamed by used camera. With the availability of different type of cameras and ways of their usage, it’s felt not only to consider the live or recorded stream of camera for analysis in ensuring the exam integrity but also need to formulate other parameter ensuring the

correct alignment of camera view with exam screen and genuine interaction of candidate with examination system during the assessment. Any cheating practice done with misalignment of camera view from exam screen will not get detected either in human proctoring or in auto proctoring because the live or recorded stream at proctor end is correct. Therefore a need exist in this field to ensure the correct alignment of camera view with the exam screen and genuine interaction of candidate with system during the examination.

[004] There are several patent applications that provides online proctoring. One such Patent Application is US9984582B2 discloses a computer-implemented method for managing distribution of a data stream from a distributed computing device network includes receiving a data stream into the distributed computing device network. The data stream corresponds to an environment surrounding a user of a first remote computing device during execution of a testing routine for an examination. The aforementioned prior art ensure the fair conduction of exam are based on verification of candidate, surroundings but no attention has been given to correct alignment of camera view with exam screen or genuineness of interaction of candidate with the examination system. Thus not so effective in identifying cheating attempts from test taker such as student or candidate.

[005] US20190197461A1 discloses a system includes one or more server hardware computing devices communicatively coupled to a network. The one or more server hardware computing devices includes one or more processors and memory storing specific computer-executable instructions that, when executed by the one or more processors, cause the system to receive decision data describing usage conditions of an online proctored examination platform, determine, based at least on the decision data, a need for additional proctoring resources on the platform to meet a demand for proctoring resources, and send a request for proctoring services to each of one or more on-demand proctor users agreeing to receive requests to become available on the platform when the additional proctoring resources are needed. The instructions cause

the system to receive a first acceptance message from a first on-demand proctor user of the one or more on-demand proctor users and, responsive to the first acceptance message, cause the first on-demand proctor user to become available as one of the proctoring resources of the platform. The aforementioned prior art talks only about conduction of online examination by implementation of an electronic platform that enables a testing service provider to establish a secure, proctored online testing environment for remote users. Thus unable to detect cheating or impersonation attempts during online examination.

[006] In view of the above problems associated with the state of the art, there is a need a system or method to ensure the correct alignment of camera view with the exam screen and genuine interaction of candidate with the system during online examination.

OBJECTIVES OF THE INVENTION

[007] The primary objective of the present invention is to provide a system to authenticate the exam taker or online user and protect against academic dishonesty.

[008] Another objective of the present invention is to provide a system that identifies misalignment of camera view with respect to exam screen and fake interaction of candidate with examination system in remote proctored assessments.

[009] Another objective of the present invention is to authenticate exam takers such as users or students or candidates to avoid impersonation or cheating attempts in online examinations.

[0010] Yet another objective of the present invention is to conduct fair online examinations and improved online proctoring experience for institutions or exam conducting bodies.

[0011] Other objects and advantages of the present invention will become apparent from the following description taken in connection with the accompanying drawings,

wherein, by way of illustration and example, the aspects of the present invention are disclosed.

SUMMARY OF THE INVENTION

[0012] The present invention relates to a system for online exam proctoring and candidate authentication. The system comprises of one or more computer proctor computing devices and/or a server, one or more client computing devices, a database, a microphone, camera and a web based portal (i.e. examination portal) with a user interface for interacting with a test taker such as students or candidates over the computers or computing devices. The client computing devices receive an exam session over an interface of a web based portal from the server. The server or one or more proctor computing devices perform verification of the test taker in response to the test taker's request to access the exam session by comparing proctoring data of the test taker with pre-stored images of the test taker into a database. The server randomly initiates an online task over the interface to perform authentication of an exam session, wherein an online task comprising interactive online experience runs over the interface for a predetermine period of time. An AI engine in the server analyze captured images/video of test taker during the online task in order to determine test taker's authenticity by identifying test taker's face and direction of movement within the shapes created by the interactive online experience. When the authenticity indicates that the user falsified said identity, the notification comprises an audible or visual alarm/notification over the interface and terminate the exam session to avoid cheating attempts during online exam.

BRIEF DESCRIPTION OF DRAWINGS

[0013] The present invention will be better understood after reading the following detailed description of the presently preferred aspects thereof with reference to the appended drawings, in which the features, other aspects and advantages of certain

exemplary embodiments of the invention will be more apparent from the accompanying drawing in which:

[0014] Figure 1 illustrates a pictorial view of exam taking registered candidate/student/test taker with correct alignment of camera view.

[0015] Figure 2 illustrates an exemplary pictorial view of a cheating scenario between a registered candidate/student/test taker and a cheat expert or impersonate.

[0016] Figure 3 illustrates an exemplary pictorial view of user interface/examination portal with candidate/student authentication step.

[0017] Figure 4 illustrates an exemplary screen shot of the user interface/examination portal showing the failed authentication of the registered candidate/student.

[0018] Figure 5 illustrates an exemplary screen shot of the user interface/examination portal showing successful verification or authentication of the registered candidate/student.

[0019] Figure 6 illustrates an exemplary screen shot depicting absence of the registered candidate/student during the candidate/student authentication step.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The following description describes various features and functions of the disclosed system with reference to the accompanying figures. In the figures, similar symbols identify similar components, unless context dictates otherwise. The illustrative aspects described herein are not meant to be limiting. It may be readily understood that certain aspects of the disclosed system can be arranged and combined in a wide variety of different configurations, all of which have not been contemplated herein.

[0021] Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope of invention. In addition, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

[0022] Features that are described and/or illustrated with respect to one embodiment may be used in the same way or in a similar way in one or more other embodiments and/or in combination with or instead of the features of the other embodiments.

[0023] The terms and words used in the following description are not limited to the bibliographical meanings, but, are merely used to enable a clear and consistent understanding of the invention. Accordingly, it should be apparent to those skilled in the art that the following description of exemplary embodiments of the present invention are provided for illustrative purpose only and not for the purpose of limiting the invention.

[0024] It is to be understood that the singular forms “a”, “an” and “the” include plural referents unless the context clearly dictates otherwise.

[0025] It should be emphasized that the term “comprises/comprising” when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, steps, components or groups thereof. The equations used in the specification are only for computation purpose.

[0026] The present invention relates to a system for online exam proctoring and user authentication. The present invention particularly relates to the detection of misalignment of webcam/camera view with exam screen. Webcam is must to have in remote proctored exam for monitoring the candidate during assessment. The present

invention is configured to strengthening and completely ensuring the overall security and fairness of remote proctored exam by ensuring the correct alignment of camera/webcam view with exam screen and genuine interaction of exam taker such as candidate or student with examination system.

[0027] A pictorial view of exam taking registered candidate with correct alignment of camera view is illustrated in fig 1. The system comprises of one or more computer computing devices 100, one or more proctor computing devices 106, a server 108, a database, a microphone or Microelectromechanical systems (MEMS) microphone 104, camera 102 and a web based portal (i.e. examination portal)/user platform/user interface/Artificial Intelligence (AI) software module for interacting with exam taker such as students or candidates over their computers or computing devices 100.

[0028] Components of the present invention are explained as follows:

A. **One or more proctor computing devices:** In an embodiment one or more proctor computing devices 106 are connected with one or more client computing devices 100 via communication networks. Communication network may be any type of network known in the art supporting data communications. The communication network may be a local area network and/or the Internet. The computing devices (100, 106) are selected from but not limited to a server, computer or super computer, tablet, and laptop. In an embodiment, a proctor computing device 106 is a server. In an alternative embodiment, one or more proctor computing device 106 is a computer, tablet, or laptop operated by a human proctor to perform online proctoring. In one case, the proctor computing devices may be connected with the client computing devices 100 via remote connection tool or software in order to receive the proctoring data of the test taker so that human operator can perform monitoring and verification of the test taker.

B. One or more client computing devices 100: The client computing devices 100 are in connection with the one or more proctor computing devices 106 over a network to exchange information or data. The client computing devices 100 are selected from but not limited to laptop, Personal Computer (PC) or computer, smartphone and tablet. The client computing device 100 is operated by a test taker such as student or candidate. In an embodiment each client computing device 100 is employed with a microphone 104, a speaker, a camera 102 or webcam 102, keyboard and mouse.

C. Microphone or Microelectromechanical systems (MEMS) microphone 104: The client computing devices 100 include one or more audio input devices, such as microphone 104 or Microelectromechanical systems (MEMS) microphone 104, which may be integrated into the camera 102 or webcam as a subassembly. The microphone 104 is utilized to record audio data of the exam taker such as student or candidate. The camera 102 and microphone 104 associated with the client computing device(s) 100 capture and record proctoring data of a test taker. The proctoring data may include audio data, video data or images of the test taker.

D. Camera or Webcam 102: In an embodiment, the camera 102 or webcam 102 is functionally connected with the client computing device 100 to record or capture video/images of the exam taker. The camera 102 or webcam is preferably mounted on the client computing device 100 and connected with the computing device 100 via wired or wireless medium.

E. Web Portal or Examination Portal: A web portal is configured by the server 108. In an exemplary embodiment, the server 108 provides an interactive web based portal (i.e. web portal)/interface such as one or more web pages of a website to the client computing device 100 for interacting with the exam taker

such as student or candidate. It should be noted that a webcam is associated with computer.

[0029] According to an embodiment, the server 108 enables two-way audiovisual communication between the client computing devices 100 and the server 108 by utilizing the webcams or camera 102 and microphone 104 to perform automated remote proctoring. In another embodiment, the server 108 is configured to establish two-way audiovisual communication between the client computing devices 100 and proctor's computing devices 106 by utilizing the webcams and microphone 104 to perform human based proctoring. In a preferred embodiment, the interface of the web based portal may rely on the use of the test-taker's camera 102, microphone 104, keyboard, and mouse to collect behavioral input of the tests taker during an exam session. The test taker interface is preferably a graphical user interface (GUI). The server 108 and/or the proctor computing device(s) 106 can perform verification of the test taker in response to the test taker's request to access the exam session by comparing proctoring data (such as image of the test taker) of the test taker with pre-stored images of the test taker stored into a database of the server 108.

[0030] At first, the student utilizes the client computing device 100 such as computer to communicate with the server 108 to access the web portal or examination portal by providing login credentials over the web portal. The server 108 initiates an exam session over the interface of the web based portal and transmit to the one or more client computing devices 100. The web based portal provides a student with a schedule of available time periods by date and time during which an exam is capable of being proctored utilizing the system of the server 108. It is to be noted that, test takers has to register themselves over the web portal prior to online examination. Thus, information of registered candidates/tests takers is stored in the database. The database may be stored in storage means of server 108 or a cloud based storage. The database include information about registered candidates/test takers, the database comprises of name,

age, email id, phone number, photo, name of institution, login credentials such as user ID and password. In one case, test taker/candidate login to the web portal using his/her credentials shared to him via the server 108.

[0031] When the candidate login into the system for exam, the photo of candidate is fetched from the database. The test taker access the web based portal by entering login credentials shared by the server 108 over the interface.

[0032] In an embodiment, the web portal is configured to assign the virtual exam room/exam session to the test taker such as student or candidate over the computing device(s) and the proctor/server 108. At the start of the examination, the candidate/test taker is asked to capture his/her live photo by the interface and the web portal further send the captured photo of the test taker to the assigned proctor or the server 108 for approval or verification.

[0033] At proctor side, the proctor can see the live captured photo of the test taker and the registered photo retrieved from the database to make a decision regarding approval or disapproval. If photo of test taker mismatched with respect to the registered photo, then the server 108 or proctor disapproves the test taker and thereafter the web portal terminate the examination and the test taker unable to attend the online examination. If the photo of test taker matches with the registered photo then the server 108 or human proctor allow the test taker to attend the online examination over the web portal.

[0034] The web portal is configured to provide a test-taker interface to the student or candidate. In a preferred embodiment, the web portal is configured to generate or produce an alert sound during the online exam by transmitting instructions to the client device 100 (i.e. student’s computer) to get the intention of the candidate. The web portal may rely on the use of the test-taker's camera 102, microphone 104, keyboard, and mouse to collect behavioral input during the exam session.

[0035] Referring to fig 3, the test taker interface of the web portal is configured ask the student/candidate to authenticate themselves via an online task over the interface. The server 108 initiates the online task over the interface to perform authentication of the exam session, wherein an online task comprising interactive online experience runs over the interface for a predetermine period of time. The interactive online experience comprises generation of random shape/shapes at random location/locations over the interface in order to allow the test taker to align his face in the shape/shapes or move face in direction as left to right or vice versa in the generated shapes. For example, test taker has to align its face in a way such that the test taker's face should be captured into the random shape generated over interface by the camera in order to prove their authenticity.

[0036] The web portal provide instructions related to online task to the student over the interface. The web portal is configured to initiate online task such that an interactive online experience runs for a predetermined period of time. The online experience is selected from but not limited to, creation of a circle or boundary over the interface to allow the student/test taker to perform self-authentication process. In an embodiment, the online task ask the candidates (as shown in fig 3) to place or move his/her face in any part/direction of the screen (i.e. within the circle or any random shape).

[0037] Further, the camera 102 associated with the computing device 100 captures a set of images of the user's face during the predetermined duration of the online task. The images of the user's face are then transmitted to the server 108. The server 108 is installed with an artificial Intelligence (AI) engine. The AI engine is configured to analyze captured images and motion during the online task in order to determine test taker's authenticity by identifying test taker's face within a shape and direction of movement created by the interactive online experience. The AI engine may be configured using facial recognition and motion tracking software module.

[0038] If a person has placed the face at asked location or moved in the right direction on the screen during the online task and submitted it for verification then the AI engine automatically detect if it's the authorized candidate or not by determining whether face of the candidate is captured within the created circle matched with registered candidate and movement is done as per instructions or not. The AI engine already has the data (Picture) for registered candidate from the starting of the exam. When the candidate is asked to place his/her face in random shape during the online task at random location over the interface, then pictures/video of that period is sent to the AI engine. The AI engine check if there is face in the pic if yes then the AI engine matches face of the test taker with registered candidate's picture and come up with the result i.e. authorized candidate or unauthorized candidate. The AI engine is configured using facial recognition and motion tracking software module. The AI engine transmits a notification indicating results of test taker's authenticity to the server 108 and interface, wherein when said authenticity indicates that the user did not falsify identity, said notification enables the test taker to continue with the exam session. When the authenticity indicates that the user falsified said identity, the notification comprises an audible or visual alarm/notification over the interface and terminate the exam session.

[0039] If the verification of the student or candidate is negative (as shown in fig 4) then the required measures can be taken for fair conduction of the examination by the web portal. The required measures may include termination of the online exam upon failure of performing online task in the given time or unsuccessful verification of the candidate/test taker.

[0040] If the authorized student or candidate has placed the face at asked location on the screen with right movement if asked and submitted it for verification then the AI engine automatically detect if it's the authorized candidate or not. If the verification of the student or candidate is positive (as shown in fig 5) then the exam gets resumed for

the candidate after the defined time of verification by the web portal. Thus the present invention is capable of identifying fake interaction of candidate during the examination session by identifying unauthorized candidates or misalignment of camera view. The misalignment of the camera view is explained as follows: suppose that during the online exam, candidate has rotated the camera 102 to backside or opposite side of the exam screen and himself/herself too sat opposite to the exam screen (as shown in fig 2). In such condition, the camera 102 is facing the registered candidate so the pictures as well as video stream from candidate side is having the registered candidate, so no cheating gets detected neither by AI nor by human proctor.

[0041] In the present invention, the interface of web portal ask the candidate to place or move his face in random place or direction created during the online task on the exam screen in a predefined time. In such scenario, the exam screen is not visible to registered candidate because he/she is sitting opposite or not in front of exam screen, so he/she can not see the where to place or move the face. The AI engine track the candidate/test taker side activity for that particular time period for any anomalies based on proctoring data. The registered candidate cannot place or move the face in exact location on screen for this cheating scenario, and thus the present invention understands about misalignment of camera view.

[0042] The advantages of the present invention are discussed herein:

- The present invention provides effective automated online remote proctoring.
- The present invention helps to avoid unauthorized attempts or cheating attempts or impersonation attempts in online examination and help to conduct fair examinations.
- The present invention provides an effective way to identify camera misalignment with respect to the screen of the computing device.

[0043] While this invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the scope of the appended claims.

WE CLAIM:

1. A system for online exam proctoring and candidate authentication, comprising of:

a) one or more client computing devices 100 operated by a test taker, receive an exam session over an interface of a web based portal, initiated by a server 108;

b) a camera 102 and a microphone 104 installed with the client computing device(s) 100 capture and record proctoring data of the test taker; and

c) one or more proctor computing devices 106 connected with the client computing devices 100 over a communication network to receive the proctoring data of the test taker;

wherein,

i. the server 108 and/or proctor computing device(s) 106 perform verification of the test taker in response to the test taker's request to access the exam session by comparing the proctoring data of the test taker with pre-stored images of the test taker that are stored into a database;

ii. the server 108 configured to initiates an online task over the interface to perform authentication of the exam session, wherein an online task comprising interactive online experience runs over the interface for a predetermine period of time;

iii. the camera 102 continuously captures set of images/video of the test taker within the predetermined period and transmit the captured images/video to the server 108;

iv. an artificial intelligence (AI) engine installed in the server 108 is configured to analyze captured images/video during the online task in order to determine test taker's authenticity by identifying test taker's face or movement within a shape created by the interactive online experience; and

v. the AI engine transmits a notification indicating results of test taker's authenticity to the server 108 and interface, wherein when said authenticity

indicates that the user did not falsify identity, said notification enables the test taker to continue with the exam session.

2. The system as claimed in claim 1, wherein when the authenticity indicates that the user falsified said identity, said notification comprises an audible or visual alarm/notification over the interface and terminate the exam session.

3. The system as claimed in claim 1, wherein the interactive online experience comprises generation of random shape/shapes at random location/locations over the interface in order to allow the test taker to align his face in the shape/shapes or move face in direction as left to right or vice versa in the generated shapes.

4. The system as claimed in claim 1, wherein the test taker access the web based portal by entering login credentials shared by the server 108 over the interface.

5. The system as claimed in claim 1, wherein the one or more proctoring device(s) 106 is operated by a human proctor to perform manual online proctoring.

Dated this 15th day of September, 2023



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GINGER WEBS PRIVATE LIMITED

ABSTRACT

SYSTEM FOR ONLINE EXAM PROCTORING AND CANDIDATE AUTHENTICATION

The present invention relates to a system for online exam proctoring and candidate authentication. The system comprises of one or more computer proctor computing devices 106 or a server 108, one or more client computing devices 100, a database, a microphone 104, camera 102 and a web based portal with a user interface for interacting with a test taker over the computing devices 100. The computing devices 100 receive an exam session over an interface of a web based portal from the server 108. The server 108 initiates an online task over the interface to perform authentication of an exam session, wherein an online task comprising interactive online experience runs over the interface for a predetermine period of time. An AI engine in the server 108 analyze captured images/video of test taker during the online task in order to determine test taker's authenticity by identifying test taker's face within a shape created by the interactive online experience.

Figure 1 and 2