



Review paper on Virtual Invigilator System using Computer Vision Techniques

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Abstract:

In an era marked by the increasing demand for remote education and online assessments, the development of a Virtual Invigilator System project is a timely and essential endeavor. This abstract offers a brief overview of the project's objectives, scope, and anticipated outcomes.

The Virtual Invigilator System project aims to create a robust and reliable platform for monitoring and authenticating test-takers during online examinations and assessments. The project leverages a suite of advanced technologies, including webcams, microphones, facial recognition, and artificial intelligence, to ensure the integrity of remote testing.

The primary objectives of this project encompass the design and implementation of a user-friendly interface for both test-takers and proctors, the integration of advanced monitoring and anti-cheating features, and the development of a secure and scalable infrastructure. Additionally, it focuses on streamlining

the authentication process, minimizing technical disruptions, and ensuring compliance with ethical and legal standards.

The project addresses several critical challenges, such as privacy protection, data security, the prevention of cheating, and the elimination of potential biases. It also aims to optimize the system's accessibility for individuals with diverse needs.

By undertaking this project, we anticipate contributing to the academic community and online education providers. The system will offer numerous benefits, including the preservation of academic integrity, expansion of remote learning opportunities, cost-efficiency, and enhanced convenience for both students and instructors.

As the project progresses, it will undergo rigorous testing and validation to ensure its effectiveness and reliability. The final product will serve as a practical tool for educational institutions and organizations

seeking to maintain the authenticity of online assessments.

The Virtual Invigilator System project aligns with the evolving landscape of education and technology, reflecting a commitment to fostering integrity in online assessments. This abstract provides an overview of the project's vision, underscoring its importance in the current educational environment and its potential to transform remote assessment practices

.Keywords: Automated Proctoring, Computer Vision, Online Education, Academic Integrity, Behavior Analysis, Machine Learning, Exam Security.

Introduction:

In an era where digital learning and remote assessment have become the new norm, the demand for a robust and trustworthy Online Proctoring System has never been more pronounced. The advent of online education offers unparalleled flexibility and accessibility, yet it also raises critical challenges related to academic integrity, cheating, and the verification of test-taker identities. Traditional methods of invigilation are ill-suited to this new paradigm, necessitating innovative solutions. The Virtual Invigilator System project aims to bridge this gap, seeking to design, develop, and implement an advanced system that harnesses state-of-the-art technologies to ensure the authenticity of online assessments. This project's primary objective is to create a comprehensive and secure platform for monitoring and authenticating test-takers, instilling confidence in the academic evaluation process. By

addressing the complexities of this rapidly evolving landscape, the project strives to bolster the integrity of online education and foster a trusted environment for remote assessments. Leveraging computer vision technologies, this system can detect and identify suspicious activities, irregular gaze patterns, and other behaviors that may indicate potential academic dishonesty. The aim is to provide educational institutions and online learning platforms with a scalable, efficient, and non-intrusive solution to uphold academic integrity.

In this paper, we present an in-depth exploration of the Automated Proctoring System, detailing the underlying computer vision algorithms, the methodology employed for behavior analysis, and the machine learning models utilized for anomaly detection. We emphasize the system's capabilities in addressing academic integrity concerns and maintaining a level playing field for all candidates, ultimately contributing to the credibility of online education. The subsequent sections will delve into the technical aspects of the proposed Automated Proctoring System, presenting the design, implementation, and evaluation of the system to validate its effectiveness in monitoring and maintaining the integrity of online examinations. Additionally, ethical considerations regarding data privacy and the minimization of false positives will be discussed to ensure the system's compliance with privacy regulations and ethical standards.

Methodology:

Creating an automated proctoring system using computer vision techniques involves several steps. Here is a general methodology to help you get started:

1. Define Objectives and Requirements:

- Understand the goals of your automated proctoring system. What are you trying to achieve? What specific behaviors or actions are you monitoring?
- Identify the requirements for the system, such as the number of cameras, lighting conditions, and the hardware and software needed.

2. Data Collection:

- Gather a diverse dataset of video and image data that represent different proctoring scenarios (e.g., online exams).
- Annotate the data to indicate ground truth (e.g., where the user's face and screen are, when they are looking away, etc.).

3. Preprocessing:

- Process and clean the collected data. This may include tasks like resizing, denoising, and normalizing the images or videos.

4. Face Detection:

- Utilize computer vision techniques to detect and track the user's face in the video stream.
- You can use popular face detection libraries like OpenCV or deep learning-based approaches with pre-trained models (e.g.,

MTCNN, Haar cascades, or deep learning models).

5. Facial Recognition:

- If needed, implement facial recognition to verify the identity of the test-taker. This could involve comparing the detected face against a database of authorized users.

6. Screen Monitoring:

- Use screen capture techniques to monitor the content on the user's screen.
- Compare the screen content with authorized exam materials to detect cheating or unauthorized resource usage.

7. Monitoring and Reporting:

- Continuously monitor the system's performance and generate reports on proctoring results and incidents.

Remember that the development of an automated proctoring system is a complex task and may require expertise in computer vision, machine learning, and software engineering. Additionally, ethical considerations and privacy concerns should be addressed throughout the development and deployment process.

Literature Survey

Simon Wenig et al.: In this paper, a simulation framework for MMC-based multi terminal HVDC systems is presented. The selected modeling concept offers insight into global arm quantities, considered as

essential parameters to investigate transient system controllability. Besides the feature to handle unbalanced voltage conditions in one of the interfaced ac networks, this control approach facilitates active regulation strategies of all converter arm energies to keep the system within a predefined operating area during and subsequent to dynamic events.

Aiman A Turani et al: In this work, In this paper, we have focused on the limitations and concerns regarding the online proctoring. The two main concerns were test integrity and student performance. Avoiding frauds and cheating attempts within online proctoring sessions without affecting test-taker's performance is considered to be very challenging. We suggested using the 360-degree security camera over the webcam for improving the proctoring process.

AsepHadianSudrajatGanidisastra et al: The evaluation results have shows us that incremental training has a better performance compared to batch training in speed and dataset size. The decrease of training speed and dataset size is not giving a negative influence on the accuracy rate, on the contrary, the proposed method will result in smaller storage space, smaller memory usage, and faster training speed. On the other hand, the face detection method can result in better face recognition accuracy.

Renuka Devi et al.: This paper deals with designing an approach wherein it tries to detect any abnormal behaviors present in the videos. The system first works by detecting all students present in the video. After detecting all the students, it tracks the detected students throughout the course of the video. The features of the tracked students are calculated using HoG feature descriptor and then sent to the K-Nearest

Neighbor classifier. The classifier is pre-trained to detect normal or abnormal actions. System is made to be adaptable to lots of different conditions as in, a user can choose the behaviors that they want the system to detect and train the system specifically for that.

Jay Mayekar et al:In this paper,In this paper, we have proposed and implemented an automated proctoring system using computer vision techniques. The system helps in conducting examinations by fair means and hence, maintains its integrity. This study demonstrates how to avoid cheating in online examinations by employing semi-automated proctoring based on vision and audio capabilities, as well as monitoring several students.

SarthakManiar et al:In this paper, we have proposed and implemented an automated proctoring system using computer vision techniques. The system helps in conducting examinations by fair means and hence, maintains its integrity. This study demonstrates how to avoid cheating in online examinations by employing semi-automated proctoring based on vision and audio capabilities, as well as monitoring several students at once. However, if there is a person sitting behind the laptop, the student can communicate with that person by reading the question. This can be catered by having a 360 degree camera monitoring the whole room of the student.

Yousef Atoum et al.:This paper presents a multimedia analytics system for online exam proctoring, which aims to maintain academic integrity in e-learning. The system is affordable and convenient

touse from the text taker's perspective, since it only requires having two inexpensive cameras and a microphone. With the captured videos and audio, we extract low-level features from six basic components: user verification, text detection, speech detection, active window detection, gaze estimation, and phone detection.

YusepRosmansyah et al.: In this paper, online learning or e-learning has become increasingly popular and evolved. Many academic institutions use the Learning Management System (LMS) as a medium for delivering e-learning. A vital feature in such a system is the electronic examination (e-exam), where verifying student's authentic competence is a challenge. This paper aims to present countermeasures for impersonation attacks. This research was a more focused effort and a continuation of previously owned one and many others found in works of literature. The method of protection is presented in the form of an attack-defense tree model.

Aditya Nigam et al.: In this paper, online testing is the next wave of adoption after online learning which has seen a significant rise in demand due to the problems posed by the ongoing COVID-19 Pandemic. OPS do not claim to be completely fool proof but are rapidly changing the adoption of online testing from home, a scenario that previously would have been thought to be preposterous amongst the masses.

TejaswiPotluri et al.: The main objective of this paper is to develop a well-rounded automation system that is capable of helping the proctor to monitor the students attending an online examination. Out of the several proposed features of the system, our paper has

developed the ability to do multiple person detection, face spoofing, and head pose estimation.

Conclusion:

In this paper, we have suggested and put into practise a computer vision-based automated proctoring system. The system supports the fair administration of exams, upholding the integrity of the process. This study shows how semi-automated proctoring based on vision and audio capabilities, as well as simultaneously monitoring many students, may prevent cheating in online exams. However, if someone is seated behind the laptop, the student can speak with them by reading the question to them. A 360-degree camera that monitors the student's whole room can address this.

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