QUIZR : A DUAL-ENGINE SYSTEM COMBINING AI-DRIVEN QUIZ GENERATION AND VISUAL PROCTORING

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Abstract: This study presents the design and development of **QuizR**, an AI-powered quiz platform that integrates **computer vision**-based **anti-cheating** mechanisms with **Gemini AI** -based automatic quiz generation. Developed using **MERN** Stack and **TypeScript**, the system facilitates user registration, profile management, quiz creation, and participation, tailored to individual skill levels and subject preferences. Administrators oversee platform operations, manage user roles, and monitor system performance. Teachers can generate quizzes, assign them to students, and evaluate results, while students engage with dynamically created assessments in a secure environment. The application emphasizes a scalable backend architecture, secure data handling, and responsive design to ensure seamless interaction and performance across devices. The goal of the project is to provide a reliable and **user-centric** platform that enhances assessment integrity and personalization through structured workflows and intelligent automation.

Keywords: TypeScript, MERN Stack, MongoDB, React, RESTful APIs, quiz systems, Gemini-1.5-Flash, Computer Vision, Anti Cheating

1. INTRODUCTION

In today's digital learning landscape, maintaining academic integrity and generating quality assessments remain key challenges in online education. Traditional quiz systems often lack proctoring and personalization, leading to compromised evaluations. To address this, we present **QuizR**, a **MERN**-stack-based quiz platform that integrates **computer vision** for real-time proctoring and **Gemini 1.5 Flash** for AI-powered quiz generation. The system supports three user roles—admins, teachers, and students—enabling secure, adaptive, and streamlined quiz experiences. By combining CV-based monitoring, intelligent automation, and responsive design, QuizR aims to enhance transparency, efficiency, and user engagement in modern assessments. The platform ensures real-time face tracking, tab-switch detection, and suspicious activity alerts during exams. Its scalable architecture and **REST API** design make it robust.

2. LITERATURE SURVEY

1. **Peschel, J. M., & Pollock, D. G. - An Online Real-Time Quiz System for Readiness AssessmentTesting**
   This paper presents a real-time online quiz system designed to assess students' readiness before classroom sessions. The system enables immediate feedback and supports instructors in identifying learning gaps efficiently.
2. **Wang, A. I. - The Effect of Using Kahoot! for Learning – A Literature Review**
   This literature review examines the impact of using Kahoot!, a game-based quiz platform, on student engagement and learning outcomes. The findings suggest that Kahoot! increases motivation and participation in educational settings.
3. **Prof. Abhishek Shivhare, Rohan Kumar Saini, Rishabh, Harshit Mahavar, Mukul Sharma- QuizMe: An AI-Powered Quiz Generation System**
   The authors introduce QuizMe, an AI-driven system that automatically generates quizzes from educational content. The paper discusses the system architecture and its effectiveness in creating diverse and relevant assessment questions.
4. **Kapeel Dev, et al. - Design of Online Quiz System for Practice & Assessment During COVID-19**
   This study describes the development of an online quiz platform to facilitate practice and assessment for students during the COVID-19 pandemic. The system emphasizes accessibility, scalability, and user-friendly interfaces.
5. **Nuci, K. P., et al. - Game-Based Digital Quiz as a Tool for Improving Students' Engagement and Learning in OnlineLectures**
   The paper explores the integration of game-based digital quizzes into online lectures to boost student engagement. Results indicate that such tools enhance interactivity and positively influence learning outcomes.
6. **Aerts, K., & Groeneveld, W. - Pro-f-quiz: Increasing the Productivity of Feedback through Activating Quizzes**
   Pro-f-quiz is introduced as a tool that uses activating quizzes to provide more productive feedback to students. The system aims to foster active learning and improve the quality of instructor-student interactions.
7. **Muzaffar, A. W., et al. - A Systematic Review of Online Exams Solutions in E-learning: Techniques, Tools and Global Adoption**
   This systematic review analyzes various online exam solutions, focusing on techniques, tools, and their adoption worldwide. The paper highlights trends, challenges, and best practices in e-learning assessments.
8. **Amin, R. M., et al. - Utilising Interactive Applications as Educational Tools in Higher Education**
   The case study investigates the use of interactive applications, including quiz systems, as educational tools in higher education. Findings show that such applications can enhance student engagement and learning effectiveness.

3. PROPOSED SYSTEM

QuizR is a web-based, real-time student quiz platform designed to deliver secure, engaging, and adaptive assessments. Built with modern web technologies, it leverages computer vision for automated proctoring and integrates Gemini Flash for dynamic AI-driven quiz generation. The system supports both educators and students, offering tailored interfaces and robust functionality to streamline the assessment lifecycle, ensure academic integrity, and enhance learning outcomes.

1. User Management Module:
Students and educators can register, log in, and manage their profiles. Role-based authentication and authorization ensure secure access and appropriate permissions for each user type.
Students can view their quiz history and performance analytics, while educators can manage their created quizzes and monitor student participation.

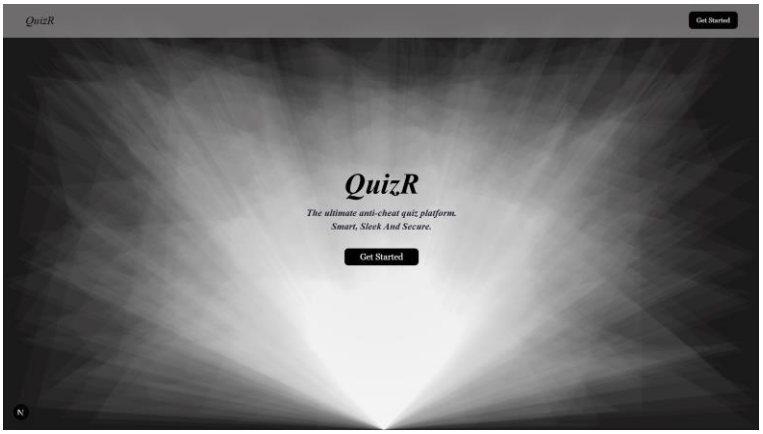
2. Quiz Creation Module:
Educators can manually create, edit, and schedule quizzes, specifying question types, topics, difficulty levels, and time limits. Quizzes can be saved as drafts, published for participation, or archived as needed.

3. Gemini Based Quiz Generation Module:
Educators can generate quizzes automatically using Gemini Flash, which creates relevant and diverse questions based on selected subjects, chapters, or learning objectives. The generated quizzes can be reviewed and customized before publishing.

4. Computer Vision Based Proctoring Module:
During quiz sessions, the system uses computer vision to monitor students via webcam, automatically detecting suspicious behaviors such as multiple faces, device switching, or absence from the screen. Proctoring reports and alerts are generated for educator and admin review.

5. Quiz Anti Cheat UI Module:
The quiz interface incorporates anti-cheating features such as full-screen enforcement, disabling copy-paste and screen capture, randomizing questions and options, and displaying on-screen warnings for detected suspicious activity.

6. Admin Module:
The admin acts as the super user, managing all platform activities including user approvals, content moderation, quiz oversight, and system analytics. Admins can access all user and quiz data, review proctoring alerts, and generate comprehensive usage and performance reports. Admin can control everyone in this centralized system.



Technologies Used:

- **Backend:** Node JS, Mongoose ODM, Express JS.
- **Frontend:** Tailwind CSS, TypeScript, ReactJS, Lucide.
- **Database:** MongoDB NOSQL Database.
- **APIs:** RESTful services for modularity and integration, Google Gemini API for AI, Tensorflow.js API For procturing
- **Deployment:** Can be hosted on a local server or cloud (e.g., AWS, Heroku)

System Advantages:

- Scalable microservice architecture using RESTful API,.
- Clean, user-friendly interface with responsive design powered by React.
- Efficient, Synchronous Quizzing Experience.
- Secure login and role management for different user types.
- Tensorflow.js for accurate procturing using opencv.

Advantages of the Proposed System

- **AI Proctoring:** Ensures exam integrity by monitoring suspicious behavior with computer vision.
- **AI Quiz Generation:** Gemini Flash creates diverse, relevant quizzes quickly, saving educators time.
- **Robust Security:** Anti-cheat UI features prevent cheating and maintain fairness.
- **Scalable Architecture:** Supports large numbers of concurrent users reliably.
- **User-Friendly:** Intuitive interfaces tailored for students and educators.
- **Efficient Management:** Automates quiz creation, proctoring, and result analysis to reduce administrative workload.

2.OUTPUT SCREENS

Fig 4.1: Student Login

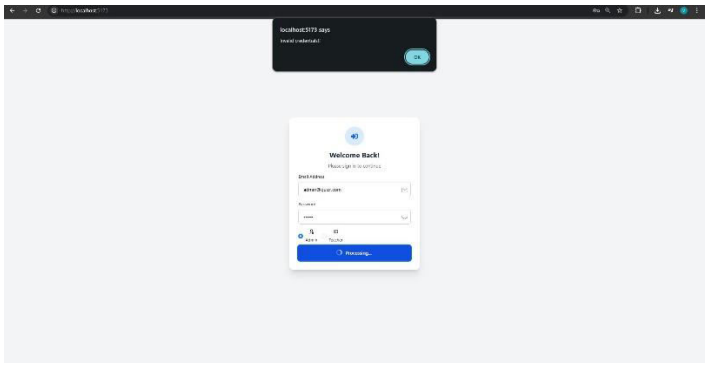


Fig 4.2:Admin/ Teacher

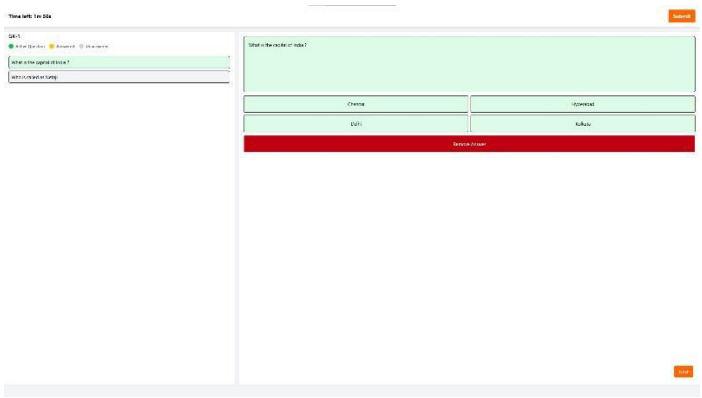


Fig 4.3: QuizR UI

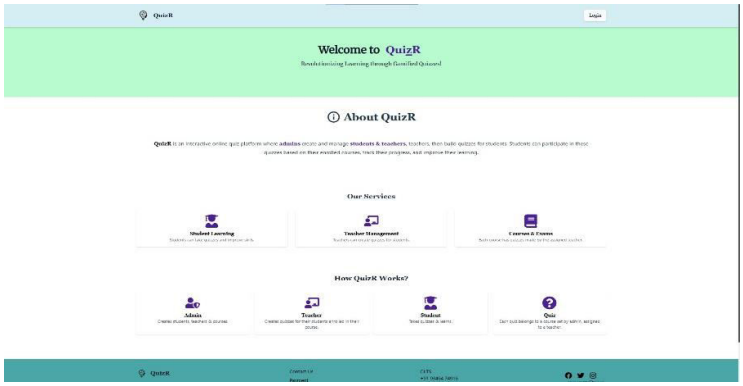


Fig 4.4: QuizR Landing Page

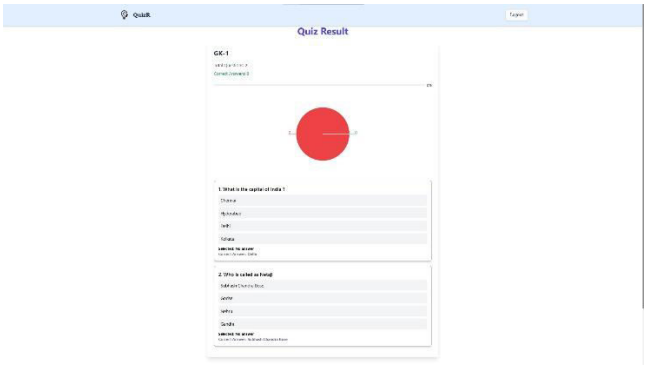


Fig 4.5 : Quiz Results

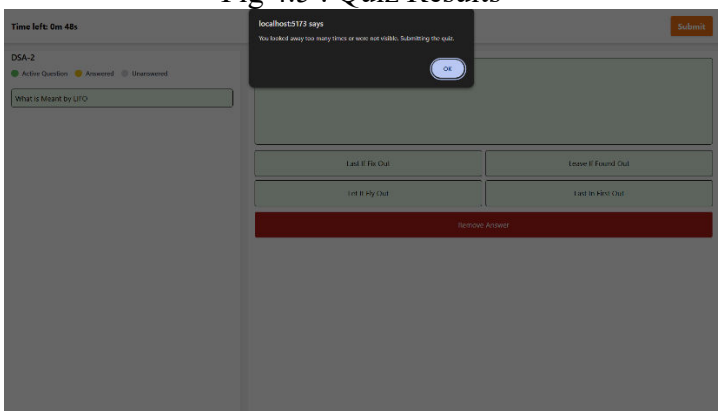


Fig 4.6 : Anti Cheating

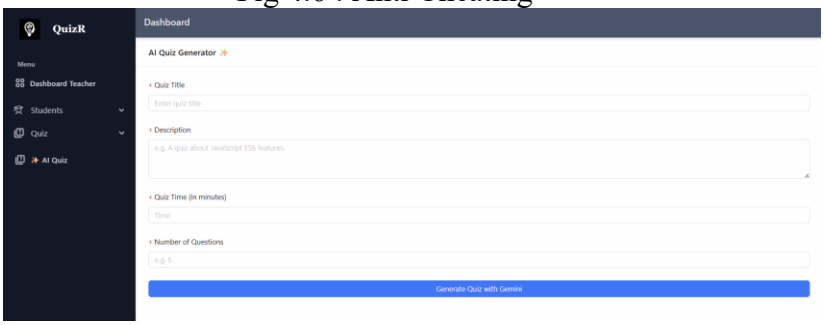


Fig 4.7 : AI Quiz Generation

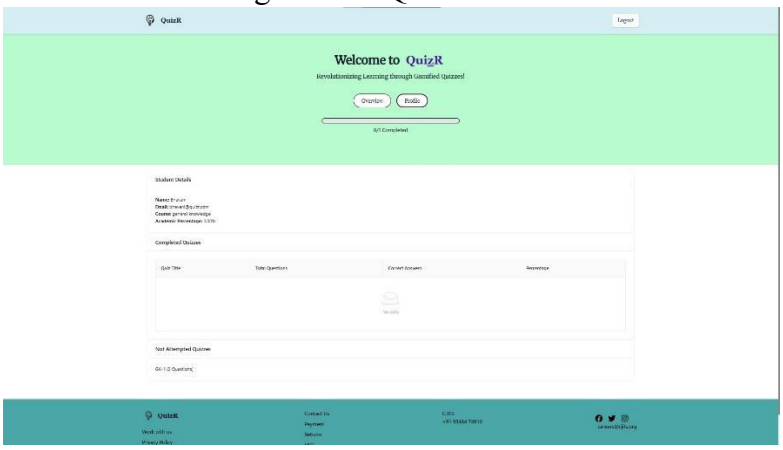


Fig 4.8 :Student Profile

5. CONCLUSION

The proposed QuizR system delivers a secure, intelligent, and user-friendly platform for real-time student assessments. By leveraging computer vision-based AI proctoring and Gemini-powered quiz generation, QuizR ensures both academic integrity and dynamic content delivery. The platform offers essential features such as user management, customizable quiz creation, automated proctoring, and a robust anti-cheat interface, all within a modular and scalable architecture. With intuitive interfaces tailored for students, educators, and administrators, QuizR streamlines the entire assessment process-from quiz generation to result analysis-while maintaining high standards of security and reliability. By addressing the limitations of traditional online assessments, such as manual question creation and ineffective proctoring, QuizR fosters a more engaging, fair, and efficient evaluation environment for modern educational needs.

6. FURTHER ENHANCEMENT

QuizR holds significant potential for future enhancements to further enrich its intelligence, usability, and scalability. Integrating adaptive learning algorithms can enable personalized quiz delivery based on each student's performance and learning trajectory. Expanding the proctoring module with advanced behavioral analytics and audio monitoring will strengthen exam security. Developing a mobile application for Android and iOS will increase accessibility and convenience for students and educators alike. Incorporating gamification elements, such as leaderboards and achievement badges, can boost student engagement and motivation. Additionally, integrating with popular Learning Management Systems (LMS) and providing multilingual and accessibility support will broaden QuizR's reach and inclusivity. Finally, introducing detailed analytics dashboards for educators and administrators will facilitate data-driven decision-making and continuous improvement of the assessment process.

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