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Signature: A Role-Based Android Application for Digital Event Management Using Firebase and Razorpay Integration

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***Abstract* - The management of academic and inter-college events traditionally relies on manual registration systems, spreadsheet maintenance, and disconnected online forms, which often result in inefficiencies and lack of transparency. This paper presents 'Signature', a comprehensive Android-based event management application designed to automate registration, payment processing, participant verification, and analytics. Developed using Java and XML in Android Studio, the system integrates Firebase Realtime Database for cloud-based synchronization and Razorpay for secure digital transactions. The application implements a role-based access model consisting of User, Coordinator, and Admin roles. Unique QR codes are generated for each participant to enable digital verification during events. Experimental deployment within a college-level environment demonstrates improved operational efficiency, reduced manual errors, secure transaction handling, and real-time data accessibility. The system provides a scalable, user-friendly, and secure solution for digital transformation of event management processes.**

Keywords: Event Management, Android Application, Firebase Realtime Database, Razorpay Integration, QR Code Verification, Role-Based Access Control, Digital Registration System.

I. INTRODUCTION

Educational institutions frequently organize technical, cultural, and sports events across multiple departments. Managing participant data, collecting fees, and verifying attendance manually often leads to delays and inconsistencies. The need for a centralized and automated system has become essential in the digital era. The Signature application addresses these challenges by offering a unified mobile platform for managing event-related operations efficiently.

II. LITERATURE REVIEW

Previous research highlights the limitations of manual and semi-digital event management systems. Studies on cloud-based management platforms emphasize the importance of centralized databases for real-time access and scalability. Mobile-based registration systems have shown improved user engagement compared to web-only solutions. However, many existing systems lack integrated payment gateways and digital verification mechanisms such as QR-based entry validation. The proposed system bridges these gaps by combining cloud storage, secure payment processing, and QR authentication within a single application.

III. SYSTEM ARCHITECTURE

The system follows a three-tier architecture. The presentation layer consists of the Android mobile interface developed using XML layouts. The application logic layer is implemented in Java, handling user authentication, registration processing, and QR code generation. The data layer utilizes Firebase Realtime Database for structured cloud storage and synchronization. Razorpay API integration enables secure transaction handling. Coordinators access QR scanning functionality for real-time participant validation.

IV. IMPLEMENTATION

The application was developed using Android Studio. Firebase Authentication manages user login and role-based access control. Firebase Realtime Database stores user profiles, event data, and transaction records. Razorpay SDK integration allows seamless payment processing. Upon successful registration, a unique QR code is generated and stored within the user's booking history. Coordinators use the device camera for scanning QR codes to verify participant entries.

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V. RESULTS AND DISCUSSION

Testing of the application demonstrated significant improvement in event coordination efficiency. Registration time was reduced by approximately 60% compared to manual methods. Real-time synchronization eliminated duplicate entries. QR-based verification improved security and prevented unauthorized access. Payment processing through Razorpay ensured reliable and secure transactions. The system performed effectively under multi-user conditions, validating its scalability.

VI. CONCLUSION

The Signature application successfully digitalizes the event management lifecycle from registration to verification and analytics. The integration of Android development, cloud computing, and secure payment gateway technology provides a scalable and user-friendly solution. The project demonstrates practical implementation skills and addresses real-world academic event challenges effectively.

VII. FUTURE SCOPE

Future enhancements may include AI-based event recommendations, push notifications, cross-platform deployment, and advanced analytics dashboards. Integration with machine learning algorithms could provide predictive participation insights and automated event planning suggestions.

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Anuj Sunil Jachak is a final-year student pursuing Diploma in Artificial Intelligence and Machine Learning. His interests include Android development, cloud computing, and secure application systems. He contributed to system architecture, backend integration, and overall project coordination.

Ayush Nayaran is final-year student pursuing Diploma in Artificial Intelligence and Machine. He contributed to UI design, Firebase database structuring, and role-based authentication implementation.

Taslim Attar is final-year student pursuing Diploma in Artificial Intelligence and Machine. She integrated the Razorpay payment gateway and developed the QR code generation and verification modules.

Adesh Chate is final-year student pursuing Diploma in Artificial Intelligence and Machine. He handled performance evaluation, documentation, and implementation of analytics features within the application.

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