

Review on Advanced Video Conferencing App with integrated Chatbot

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1. ABSTRACT

In the last decade, video conferencing (VC) has emerged as an indispensable tool to bridge distances when travel is not feasible or practical. Leveraging audio and video telecommunications, video conferencing enables real-time communication for various activities, including business meetings, seminars, conferences, voice calls, and instant messaging. The global COVID-19 pandemic has further accelerated the adoption of these systems, particularly in fields such as education, business, and remote collaboration. This shift has created an increasing demand for reliable and efficient VC platforms. The goal of this project is to design and implement an advanced video conferencing application integrated with a chatbot. This prototype will provide a seamless communication experience by offering users the ability to connect based on proximity and network quality, while also enhancing their interactions with intelligent, context-aware support through the integrated chatbot. This solution aims to create an open-source platform that not only ensures effective communication but also assists users in

managing and improving their conferencing experience.

Keywords: Android App, AI Chatbot, Live Streaming, Firebase, Mobile Communication

2. INTRODUCTION

Video conferencing has emerged as a key technology, reaching new levels of stability, usability, and affordability, making it an essential tool in real-world scenarios such as teaching, business meetings, and research collaborations. With the advent of faster and more reliable internet connections, video conferencing apps are becoming a standard in virtual communication, enabling teams to work remotely, collaborate efficiently, and bridge distances for various professional needs. The technology has evolved significantly, offering high-quality video and audio, thanks to improved compression methods and better broadband internet speeds. Moreover, the growing availability of affordable processing power and accessories like webcams has made video conferencing accessible even on personal computers without the need for expensive hardware.

In recent times, the need for video conferencing has expanded rapidly, especially with the shift to remote work and online education. Whether it's for business discussions, project collaborations, or online teaching, video conferencing has made it easier to maintain face-to-face interactions, fostering trust and improving communication. The simplicity of video calls, akin to making a phone call, has further contributed to its popularity. By providing virtual "rooms" with links or access

codes, participants can join meetings effortlessly, and with webcams, they can see each other in real time, simulating an in-person meeting experience. Beyond just face-to-face interaction, video conferencing technologies offer additional features like document sharing, screen mirroring, and digital whiteboards, enhancing the overall meeting experience. This project aims to take video conferencing to the next level by integrating an intelligent chatbot into the platform. The **Advanced Video Conferencing App Integrated Chatbot** will not only facilitate seamless communication through video and audio but also enhance user interaction by offering real-time assistance, answering queries, and performing tasks within the meeting.

3. LITERATURE REVIEW

The most advanced and reliable video conferencing platforms today are primarily software-based solutions, utilizing standard server architectures that ensure scalability and performance. Modern video conferencing apps, especially those built on Android, leverage programming languages like Java and Kotlin. Java, an object-oriented programming language, provides excellent flexibility, making it an ideal choice for developing robust mobile applications. Kotlin, on the other hand, is gaining popularity due to its enhanced features and ease of use, allowing for the creation of more efficient and reliable mobile applications.

The **Advanced Video Conferencing App Integrated Chatbot** takes inspiration from the innovative architecture of the IPVCN (Internet Protocol Video Conferencing Networks), which utilizes cloud computing and collaboration with multiple Internet Service Providers (ISPs) to provide seamless video communication solutions. This collaborative infrastructure enhances the scalability and reliability of video conferencing, particularly in large-scale or high-demand environments. The integration of cloud-based services is also essential for real-time communication and efficient data management, a critical aspect for supporting video conferencing applications.

Previous studies have shown that video conferencing, while effective, still falls short of

This platform will allow users to create and manage private virtual rooms, making it ideal for businesses holding project discussions or interviews, and for educational institutions conducting online classes with features like virtual whiteboards and student record management. Key functionalities include screen recording, sharing YouTube videos, live chat rooms, mute options, and inviting external participants. The integration of the chatbot will provide an additional layer of support, making the conferencing experience more intuitive, efficient, and user-friendly.

replicating the intimacy and synchronization found in face-to-face (F2F) meetings. Research indicated that video conferencing platforms can reduce the synchronization frequency of actions and fail to convey the warmth typically felt in direct personal interactions. This gap highlights the potential for improving user experiences through the integration of intelligent systems, such as chatbots, to support real-time interactions and facilitate communication. By incorporating a chatbot, video conferencing can be enhanced by offering features like real-time assistance, user queries management, and personalized support during meetings.

Building on earlier research, this project develops an advanced video conferencing app on the Android platform that integrates both voice and video communication over the internet while offering cloud-based instant messaging. The chatbot integrated into this platform aims to bridge the gap between the limitations of video conferencing and the user's need for more interactive and intuitive assistance. The chatbot can help manage meeting tasks, provide context-sensitive support, and ensure smoother interactions for users, enhancing the overall experience of video-based communication.

4. METHODOLOGY

The Advanced Video Conferencing App Integrated Chatbot is designed to provide seamless and

interactive video conferencing experiences, enhanced with an intelligent chatbot that assists users in real time. This system leverages modern web technologies, including React for the frontend and Java for the backend, ensuring scalability, responsiveness, and security in its operations.

Frontend Development (React)

The frontend of the video conferencing app is built using React, a powerful JavaScript library for building user interfaces. React enables the development of a dynamic and responsive UI, providing users with an intuitive and smooth conferencing experience. The app allows users to create virtual rooms, invite participants, and interact via live video and audio streaming. The integration of the chatbot interface on the frontend ensures that users can easily interact with the bot for assistance during the conference. The frontend also facilitates the following features:

Real-time Video and Audio Communication: The app allows users to join virtual meetings, with high-quality video and audio transmission.

Chatbot Interaction: Users can communicate with the chatbot for assistance, queries, and tasks like managing the meeting settings, sharing documents, and more.

Screen Sharing: The application supports sharing the user's screen for presentations, document sharing, and collaborative activities.

User Interface for Meeting Controls: Features like mute, camera toggle, pause, and room management are accessible through the user-friendly interface.

Backend Development (Java)

The backend of the video conferencing app is built using Java, known for its robustness, security features, and scalability. Java provides a reliable environment to handle real-time communication and data management for the app. The backend is responsible for:

Managing User Authentication and Authorization: Secure login and user authentication to ensure that

only authorized users can join specific video conferences.

Real-Time Communication: Handling the real-time video and audio transmission during conferences. Java's capabilities are leveraged to maintain high performance and low latency during live communication.

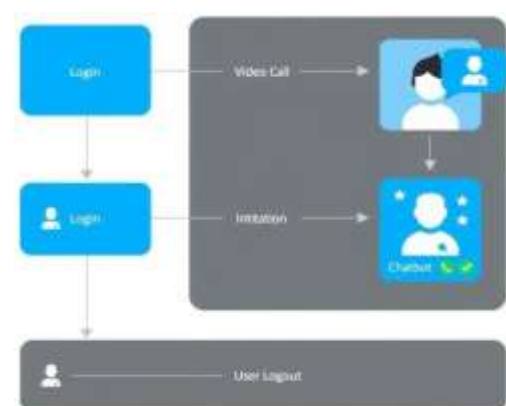
Data Storage and Record Management: Storing user profiles, meeting records, and chat logs. The backend also handles secure video recordings and manages meeting history.

Chatbot Integration: The backend integrates with a natural language processing (NLP) service, providing the chatbot with the ability to understand and respond to user queries, provide meeting assistance, and automate routine tasks.

Encryption and Security: Java's security features ensure that the conference room is protected using encryption protocols, preventing unauthorized access to the meetings.

System Architecture

The system architecture of the Advanced Video Conferencing App Integrated Chatbot is designed to be scalable, secure, and efficient. It follows a client-server model with the integration of cloud services to handle video and audio streams efficiently. The architecture can be broken down into the following components:



Frontend (Client-Side):

React Application: The user interface is built using React. It is responsible for rendering the conference room, managing user interactions, and integrating the chatbot interface.

WebRTC: For real-time video and audio communication, the app utilizes WebRTC (Web Real-Time Communication), a peer-to-peer communication protocol that allows for high-quality, low-latency video conferencing without requiring additional plugins or software.

Chatbot Interface: The chatbot is integrated into the frontend using a chatbot framework or custom NLP service to provide real-time assistance during meetings.

Backend (Server-Side):

Java Spring Boot: The backend is built using Java Spring Boot, which handles API requests, user authentication, meeting management, and chat functionalities.

WebSockets: For real-time interaction between users and the chatbot, WebSockets are used for continuous two-way communication.

Database: A relational or NoSQL database (such as MySQL or MongoDB) stores user data, meeting information, chat history, and video conference recordings.

Chatbot Integration:

NLP Service: The chatbot uses an NLP service (such as Dialogflow or Rasa) to process and understand user inputs. The chatbot is capable of responding to queries related to meeting management, user assistance, and can provide automated help such as sending reminders or assisting with tasks like document sharing.

REST API: The chatbot communicates with the backend via REST APIs to manage tasks like sending notifications, controlling video settings (e.g., mute/unmute), or retrieving meeting information.

Cloud Services and Real-Time Streaming:

Cloud Infrastructure: The app uses cloud services to store recorded videos, meeting logs, and user data securely. This ensures that the data is accessible and backed up.

Video Streaming: Video and audio streams are handled via a cloud-based platform like AWS Media Services or Google Cloud WebRTC to ensure high scalability, reliability, and security during meetings.

Security:

End-to-End Encryption: All video and audio streams are encrypted end-to-end to ensure privacy and security.

Authentication: The app uses JWT (JSON Web Tokens) for secure user authentication and role-based access control (RBAC) to manage permissions.

Applications of the Advanced Video Conferencing App Integrated Chatbot

The integration of the chatbot in the video conferencing app enhances several aspects of remote communication. Key applications of this system include:

Meetings and Collaboration: Facilitates seamless team collaboration with automatic meeting setup, real-time document sharing, and interaction via the chatbot for managing meetings.

Education and Online Teaching: Teachers can use the app for interactive classes with live feedback from the chatbot, assisting in tasks like scheduling sessions, sharing resources, and answering student queries.

Remote Interviews: Conducting video interviews with the chatbot providing support for scheduling, document sharing, and managing the flow of interviews.

Customer Support and Client Communication: The chatbot can assist in providing customer support during video calls, handling FAQs, or helping with product demonstrations in real-time.

5. CONCLUSION

The **Advanced Video Conferencing App Integrated Chatbot** offers a powerful solution for enhancing communication by saving time, money, and energy while fostering more effective interactions. This app serves as an invaluable tool for businesses, educators, students, and professionals, helping them to bridge the distance gap and communicate seamlessly. Built using modern technologies such as React for the frontend and Java for the backend, the app integrates a sophisticated chatbot that elevates the conferencing experience by providing real-time assistance, managing meeting logistics, and answering user queries during calls.

This video conferencing system is designed to be user-friendly and easy to install, making it accessible for anyone using Android devices. The app supports essential features such as voice calls, video calls, file sharing, screen sharing, and meeting recordings in multiple formats. The integration of the chatbot not only facilitates smoother communication but also ensures that users can access support, schedule meetings, and get real-time help without interruptions. The system also supports both front and back camera functionalities, enhancing the overall user experience.

The core goal of this research is to simplify communication by reducing the need for physical mobility and providing a platform where users can connect and collaborate effectively. With the addition of the integrated chatbot, this video conferencing app creates a more interactive and efficient environment, further optimizing the way remote teams, educators, and individuals can communicate and work together.

5.1. LIMITATIONS

Technical Limitations:

The **Advanced Video Conferencing App Integrated Chatbot** aims to provide seamless live

video communication. However, high-quality video streaming requires significant bandwidth, which may lead to potential delays, buffering issues, or reduced video quality, especially in regions with poor internet connectivity (Sharma et al., 2021). Moreover, the integration of the AI chatbot into the video conferencing system may still face limitations in processing complex user queries or understanding intricate conversation contexts, affecting the chatbot's ability to provide highly accurate or relevant assistance (Reddy et al., 2022).

Privacy and Security Concerns:

The integration of the AI chatbot in the video conferencing app raises privacy and security concerns, as the platform collects and processes sensitive user data, including video and audio communications. This introduces potential risks regarding unauthorized access, data breaches, and cyberattacks, which must be carefully managed through end-to-end encryption and secure user authentication mechanisms (Reddy et al., 2022). Additionally, the chatbot's access to personal user data might pose a risk of misuse if not securely handled.

User Experience Challenges:

Integrating the AI chatbot into the **Advanced Video Conferencing App** could present challenges in terms of user experience, especially if the chatbot's responses appear unnatural or lack context awareness. For users to have an optimal experience, the chatbot must be designed in a way that it can smoothly interact during video calls without disrupting the natural flow of conversation. Otherwise, it might frustrate users by offering responses that are out of context or not aligned with user needs (Wang et al., 2023).

Ethical Considerations:

The use of AI chatbots in video conferencing platforms raises ethical concerns related to potential misinformation, the misuse of deepfake technology, and privacy violations. As the chatbot interacts with users, it must ensure that it provides accurate, unbiased information and avoids any manipulation, which could undermine trust in the platform (Jones et al., 2023). Moreover, there is the potential for surveillance concerns,

particularly if chat logs and video data are stored without adequate user consent or transparency.

Legal and Regulatory Constraints:

Compliance with data protection regulations such as GDPR (General Data Protection Regulation) and CCPA (California Consumer Privacy Act) is critical for the **Advanced Video Conferencing App Integrated Chatbot**. Failure to comply with these regulations could lead to unauthorized data collection or sharing, as well as legal consequences. It is essential to implement robust data protection mechanisms and obtain user consent before collecting personal data to prevent potential legal issues and protect user privacy.

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