Video conferencing tool for mobiles [WA4-16]

Students:
Wong Cheuk Fung Raphael 
Chan Ka Lik Gary 
Lo Lok Kin

Supervisor:
Prof. Albert Wong

Introduction
Video conferencing has been creating numerous opportunities in various industries in the past decade. Its application not only facilitates convenience for long distance communication, but also extends its coverage to multiple network types, including LAN and WiFi networks. However, most video conferencing tools are not supported by mobile devices. Video quality can also vary due to network traffic issues on relaying servers. In this project, we would like to provide an alternative by utilizing the WebRTC API developed by Google, and develop a video conferencing application usable on the mobile platform. An example medical consultation application is developed to illustrate the performance of mobile video conferencing.

Objectives
1. Develop a web-based application and a mobile application using WebRTC API library
2. Enable exchange of media streams by implementing WebRTC signaling mechanism using a real time database server
3. Implement additional features for the purpose of medical consultation

Methodology

**WebRTC Signaling**
To exchange media streams, two users must first perform WebRTC signaling to receive SDP description of the remote user. To implement the mechanism, Firebase is used as the real time database for relaying metadata. The order within the signaling procedure must be strictly followed, otherwise the Session Description Protocol (SDP) will not be set, and media streams will not be transmitted.

**Application Features**
- Basic login & registration mechanism
- Display & update of patient’s medical record
- Doctor search bar & display list
- Interactive handling of video call (e.g. call & hang up)
- Patient waiting mechanism
- Video rendering

![Figure 1 System Block Diagram](image)
![Figure 2 Procedure of Video Call](image)
![Figure 3 WebRTC Signaling Flow](image)

Result
The top three layouts on the left show that users are able to utilize the login and register feature successfully. Using the system, the user is able to log into the system using either their username or email address. Upon submission on the registration page, the user’s window is also redirected to a webpage with a message indicating that data has been pushed to the real time database. Additionally, the bottom four layouts indicate that medical consultations, both as patient and doctor, are conducted successfully. Within the process, SDP-offer, SDP-answer and ICE Candidate are exchanged utilizing the implemented WebRTC signaling mechanism. Interaction with the Firebase database server is also successful in updating and retrieving data from patients’ medical records.

Conclusion
Overall, this project has illustrated the possibility in using WebRTC API for developing video conferencing tools for mobile devices. It has also demonstrated good result as an application for the medical industry. In the future, we believe our project will act as an example for developers to implement video conferencing on a mobile platform. Eventually, we hope it will stimulate even more people to use WebRTC as a platform to further develop innovative and meaningful applications across multiple industries.