

Android Based SOS Application

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Abstract—Recently there are many emergency cases like kidnaps, assaults reported. In this paper, we propose an android based SOS application which provides an easy way for the user to alert his family members and friends during an emergency. This application uses the GPS and SMS services in android to provide the location along with a customized text. The primary details of the user along with the emergency contacts are stored in the Firebase database. This application also provides facilities like capturing photos, recording audios during the situation. Emergency call will be made to the primary contact using a single button. This application is developed with a simple User Interface, so that all kinds of people can use it.

Index Terms—Android, SOS Application, GPS, SMS, Firebase, Photos, Audios, User Interface

I. INTRODUCTION

In today's World 80% of the population have smart phones. These phones can help people in a lot of ways. There are many applications in these mobile phones which helps people for many activities in their day to day life. One such activity is alerting the user's friends and family when he/she is in emergency situation. Our application provides four options for a person who is in emergency. User can send a customized message with the location to the three emergency contacts. User can capture photos and audios during the incidents. The photos and audios captured are stored in the gallery of the mobile phone. User can also make an audio call to the primary contact.

II. RELATED WORK

A. State of Art Solutions

There are many SOS emergency android applications in the Google play store that are effective and efficient. However, these applications are either packed with massive amount of unnecessary options or have limited features. Some applications like ICE (In case of Emergency) are good and simple but they provide only feature of sending a text message to the registered contacts. There are other applications like SOS panic that takes it to the next level by adding a feature of turning on flash lights to the already present messaging feature. These applications are good, interactive but they only have limited features. There are applications like SOS emergency GPS BodyGuard packed with many unnecessary features. We have to make sure that the user isn't troubled in any manner when they are trying to send a distress call or an SMS. They must not search for options in the time of desperate need and help.

There is an android application named Placestor Pro- SOS SMS sender. The application does a fair job in locating and sending SMS, but the User Interface for this application is not very eye catching and it crashes very often. Some applications are worse; they publish advertisements. We don't need to show advertisements on an emergency application platform. The application must disregard anything that is unnecessary for the user. Our aim of the project was to keep our android application light weighted, very intuitive, powerful, and to keep it as clean as possible with regards to user interface. These applications stated above are good starting points for our project; they have highlighted the basic necessary features to be present, have helped us to think more on how to add more features, and avoid unnecessary features.

B. Competition

Most of the emergency android applications are good. They excel with the features provided in them. No application can be packed with everything, there has to be a trade off. Some applications like ICE and SOS panic provide limited traits whereas some application provides many features. The competition depends on the how the developer is trying to solve the problem and what the user is trying to do with the application.

Applications like React Mobile are excellent they have about 10000 and more downloads to them. It is simple and closely related to the work done in this project. Applications like SOS Emergency App have about 100000 and more active users. Both these applications come in handy for SOS, but these are paid applications. They would require subscription to work. The general idea of our application is no advertisements, should not require any payment to provide service.

C. Risks

The major risks in the mobile applications are service, accuracy, and security. The emergency mobile application in particular should provide these characteristics else these applications are a huge waste. Absolute services to the users should be given; the users shouldn't have an application crash while at the time of need. The application should guarantee a service irrespective of what the situation. The data reception to the end users has to be accurate and precise. The application must ensure that the end users get what is required. Security the data stored in the application has to be secure. The data mustn't be available to the outside world to access. A hack on

the application server; would be disastrous. For instance the data can be used to redirect the end users unnecessarily to a sparse location.

III. INNOVATION DESIGN

A. Use Cases

The major use cases in any android emergency application are location tracking, sending notifications, setting up the initial login, setting up the emergency contact list. When the Location tracking is enabled, it must append the latitude, longitude and possibly the address details to the message prior sending the notification. The application must allow the users to send notifications to the concerned end point on the respective button clicked. The users must be given an initial form to setup the emergency contact list.

B. Applications

Our android application provides the users with simple user interface and some of the powerful features needed when a user is at any kind of emergencies. Having minimal knowledge on how to use the application, the user can still be able to know the functionality by having a glance of the application. The proposed application provides the features of capturing audio and photo and save it to the firebase database, these can later be used by the enquiring department.

C. Key Technical Challenges

Though there are readily available APIs to access a phones SMS, camera, audio, video, and location it was a challenge to integrate all these features into one application. Creating the schema and setting up the firebase database for our android application was a key challenge.

Each of these features can be tested individually, but testing the whole integrated application is a key challenge. We had to maintain a test case document and try to test as much as negative cases as possible. These were the key challenges in our application.

D. Application Focus

The application focuses on providing what is necessary to the users and eliminates potentially unnecessary details in the UI part. We were focused to provide only the necessary content to the users. After rigorous testing the application is focused on delivering its tasks to perfection. Our main and only focus after providing a quality application was to ensure that the users are not lost in the application and can easily navigate through every feature when they are in tensed situation.

E. Solution Overview

The application is effective and intuitive to the users. Its simple and the users will find it easy to navigate between the features. There is no fancy user interface, the application is not paid, and it doesn't give any sort of advertisements. The application is packed with powerful features and those who install the application can make maximum benefit out of it.

The audio feature works well and these features are new to emergency applications. This can be used by the enquiring department to have access to more details. We have thus built an application which doesn't have any unnecessary features.

F. Innovation Overview

The major innovation in our application is as stated above, we wanted the application to be as simple as possible but it must also have the capability to achieve the tasks. The audio and the photo feature in our application is very unique, though there are some applications that have the photo feature, they are all having unnecessary interface making it difficult for users to navigate. Our innovation was to integrate the necessary features.

IV. TECHNICAL DISCUSSION AND R&D

A. Background

We have developed an Android Application in Android Studio and checked the output using Android Emulator. We have developed activity files using Java Program file and XML for designing the layouts. Constraint and Relative Layout is designed for the User Interface. The Figure 1 represents the design flow.

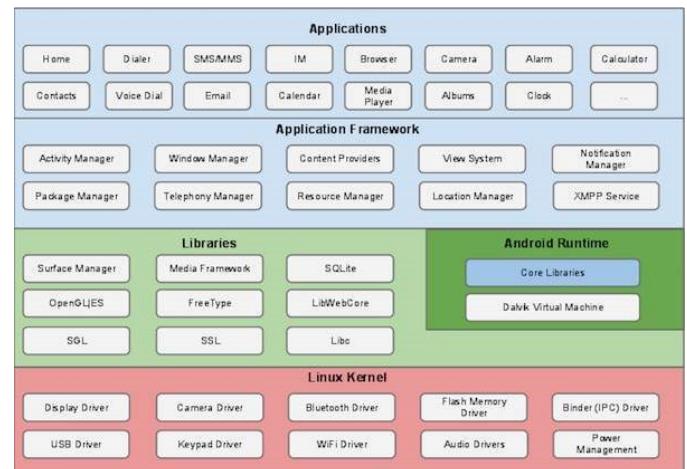


Fig. 1: Design Flow.

B. System Architecture

This is the architecture behind our application in which our application has features of SMS, MMS, Camera, Voice Dial, Media Player which makes use of Application Framework like Activity Manager, Package Manager, Location Manager, Notification Manager and we have used NoSQL database i.e Firebase Database. Android RunTime is responsible for the Virtual Machine which actually executes the application. Linux Kernel is the core part having all the drivers necessary for the application.

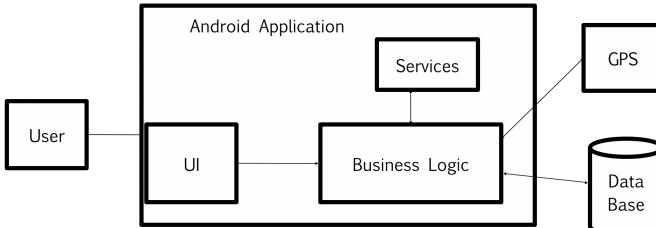


Fig. 2: System Architecture.

V. IMPLEMENTATION

A. Tools Used

The tools used in this application are Android Studio and the Google Firebase.

Android application is created using Android Studio IDE. A project is created in the IDE for this application. For every feature in this application, an activity is created. Every activity consists of a java file and an xml file. Java file has a program which is used to establish the functionality. xml file is used to design the layout and UI of a specific page. When this application is executed in the IDE and the output can be seen either in the emulator or an android connected using an USB.

An account is created in firebase using a gmail account. A project is created exclusively for our project. The package in the android studio project is connected to this firebase project. Every detail entered by the user in the application is saved in this firebase project. The authentication required for logging in is also done using the authentication feature of the firebase. Two children are created in the database. One child is used to store the details of the user creating the account and the other child is used to store the emergency contacts entered by the user. These details are retrieved from this database when these are needed for any activity in the android project.

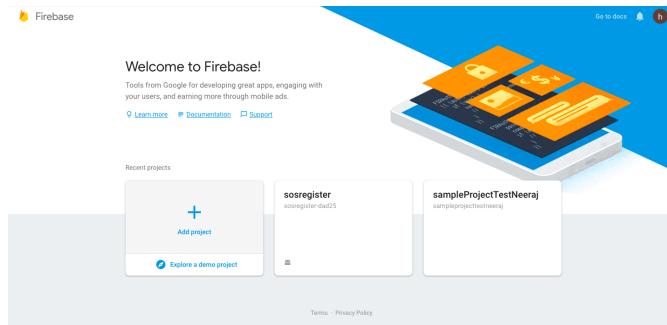


Fig. 3: Project in Firebase

B. Implementation

The first page displayed when an user opens this application is the Login page. So, login is created as the Main Activity. User can trigger the Register Activity from the login page. The authentication of the details given by the user is done by using Firebase authentication. User opens the register form from login page if he is new to the application and creates a account by entering his details. After registering, again login

Authentication					
User	Identifier	Providers	Created	Signed In	User ID
deepu17@gmail.com	✉		Dec 15, 2018	Dec 15, 2018	6pf7cmB7gb0causdw0Hfljx1
deepu@gmail.com	✉		Dec 15, 2018	Dec 15, 2018	7yvTQXtChfntnM9Y9M4WPh0t2
tammy@gmail.com	✉		Dec 16, 2018	Dec 16, 2018	FT0MaM7JpaCwCtgRqEzQeC2
bhr25@gmail.com	✉		Dec 15, 2018	Dec 15, 2018	GPQcfgFfAbel-0qfC9aWVWysp2
fa@gmail.com	✉		Nov 20, 2018	Nov 20, 2018	YQ8mgfTGZ0auDfHsUVMaMw...
h@gmail.com	✉		Dec 14, 2018	Dec 15, 2018	gWRQspJ4TKD3aaPh9shNPb0L2
vashup@gmail.com	✉		Dec 2, 2018	Dec 2, 2018	gEsfG0Oo-0j3zH9yP8ctT7ZfJfN2
neeraj03@gmail.com	✉		Dec 2, 2018	Dec 2, 2018	grJnH7R73Tjhzb0qgRvqJgjEM2
herika101@gmail.com	✉		Dec 2, 2018	Dec 2, 2018	gP9f9mngMgMwVn1LgkXwMjU...
v2b@gmail.com	✉		Dec 2, 2018	Dec 2, 2018	pk1d8VNM8R8B2dpjLnfcA4eqJ2
l@gmail.com	✉		Dec 1, 2018	Dec 1, 2018	grWcYn2IswgwDQgtsF57Jp0C1
h12@gmail.com	✉		Dec 2, 2018	Dec 2, 2018	qj4kS4Sp0sDmcKAW0Q4C9u1

Fig. 4: Authentication in Firebase

Database					
<pre>-7yV3K7Hs5Nm9Yuf0fSMxWPx02 + EmergencyContacts + UserProfile</pre>					
	- FT0MaM7JpaCwCtgRqEzQeC2				
	+ EmergencyContacts				
	+ UserProfile				
<pre>- T2vDf0mCycfzHl214uLfpwz2 + EmergencyContacts + UserProfile</pre>					
	- gWRQspJ4TKD3aaPh9shNPb0L2				
	+ EmergencyContacts				
	+ UserProfile				
<pre>- grJnH7R73Tjhzb0qgRvqJgjEM2 + EmergencyContacts + UserProfile</pre>					
	- pPNVW9yTMxMeV01eLXhxFWMUm1	+ x			
	+ EmergencyContacts				
	+ UserProfile				
<pre>- rywEJn7pC2UDmMky3Y8UDPGt1 + EmergencyContacts + UserProfile</pre>					
	- contact1: [REDACTED]				
	- contact2: [REDACTED]				
	- contact3: [REDACTED]				
	+ UserProfile:				
	- address: "san jose"				
	- city: "California"				
	- email: "neeraj03@gmail.com"				
	- lastName: "neeraj03"				
	- mobile: [REDACTED]				
	+ EmergencyContacts				
	+ UserProfile				

Fig. 5: Database in Firebase

page is displayed. The user has to verify his details. The login page triggers the Buttons activity when "LOGIN" button is clicked.

The buttons page has a menu button on the top. When user selects "Refresh", the page will be refreshed. When user selects "Profile", the Profile Activity is triggered. This page displays the details of the user in a list and shows two buttons "EDIT" and "CHANGE PASSWORD". "EDIT" enables the user to update his details in the database. New details entered by the user are updated using the uid as reference. "CHANGE PASSWORD" enables the user to change his password and updates it in the authentication folder of firebase.

There are five buttons page and each button triggers the specific activity created in the android studio. "ONE PUSH NOTIFICATION" triggers the opActivity. This activity enables the user to send a customized message along with the current location of the user as a text message to contacts retrieved from the firebase database. "EMERGENCY CALL" triggers the callActivity. This activity enables the user to give a voice call to the primary contact ie the first contact from the emergency contacts list. "CAPTURE PHOTO" triggers CameraActivity. This activity enables the application to open the camera by asking appropriate permissions. User can capture photos during the incident.

"CAPTURE AUDIO" triggers the audioActivity. This activity enables the user to record the voices during the incident. This activity displays four buttons. "RECORD" button to record the voices. "STOP" to stop recording the voices.

"PLAY" button to play the recorded voices and the "STOP PLAYING RECORDING" to stop the playing of audio. "ADD/EDIT CONTACTSLIST" button triggers the AddContactsActivity. This activity displays a form which has three text fields prompting for the emergency contacts. User can enter the emergency contact mobile numbers in this form. The contacts from this form are stored in the "Emergency Contacts" child in the firebase database. User can logout of our application anytime. "LOGOUT" option is provided on the title bar.

VI. RESULTS AND EVALUATION

This application can be created in Android Studio IDE. Execution can be checked in any android mobile by connecting it using USB to the computer. This application primarily focus on four features. They are One Push Notification, Capturing Photos, Capturing Audio, Emergency Call. User can trigger these features from the application using buttons. This application can be evaluated by checking the working of all these features. The results of the application are pasted in the form of screen shots and every figure is explained to show the working.

Figure 6 shows the login page of the application. User can enter the email ID and his password to open the application. Authentication is done by the firebase authentication feature. User can make five attempts in entering the details. After these five attempts are completed, the login button will be displayed. User should go to register page, if he is registering for the first time. Figure 8 shows the menu in the application. This menu has options of refreshing the page and viewing the profile details. Figure 9 shows the profile details of the user. User can edit his details and change his password anytime by opening the profile page.

Figure 10 shows the buttons page which is considered as a list of features in the application. User can use any feature by just clicking the appropriate buttons. Figure 11 shows the form to save the emergency contacts. User can enter this page by clicking the "ADD/EDIT CONTACTSLIST" button. The first contact user enters is considered as a primary contact. The details of the user along with these contacts are stored in the firebase database. Figure 13 shows the text messages sent to the emergency contacts and the message format. "ONE PUSH NOTIFICATION" button enables the application to send a customized text message and the location of the user to the emergency contacts.

Figure 14 shows the "CALL ON EMERGENCY" button and calling the primary contact. "EMERGENCY CALL" button enables a call from the user mobile to the primary contact. Figure 15 shows the inbuilt camera opened and the photo captured. "CAPTURE PHOTO" button enables the application to open the inbuilt android camera and the user can capture the photo and this photo is saved to the phone's gallery. Figure 12 shows the options provided while recording the audio. "CAPTURE AUDIO" opens the audio recording page. "RECORD" enables the user to record the audio and "STOP" button is clicked to stop the recording. "PLAY" button is used to play the recorded audio and "STOP PLAYING THE RECORD" button is clicked to stop the audio play.

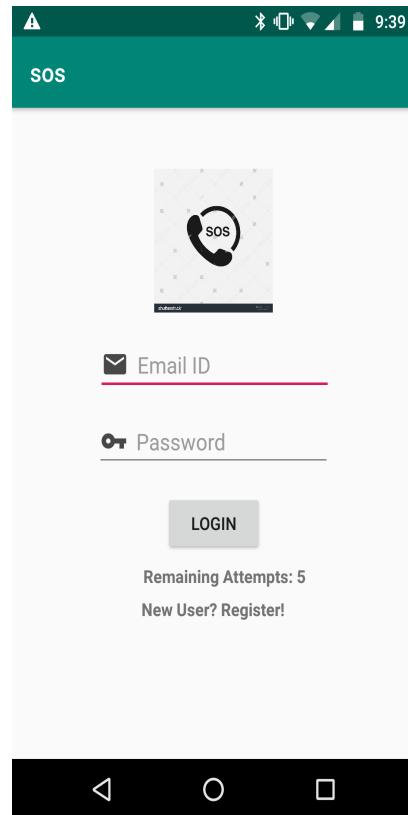


Fig. 6: Login Page.

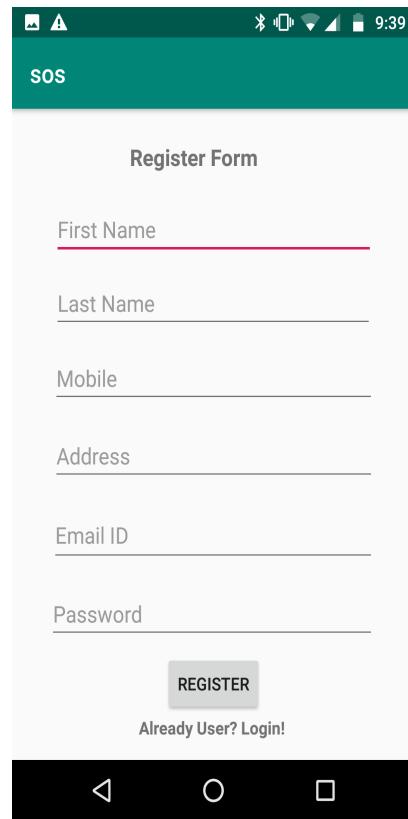


Fig. 7: Register Page.

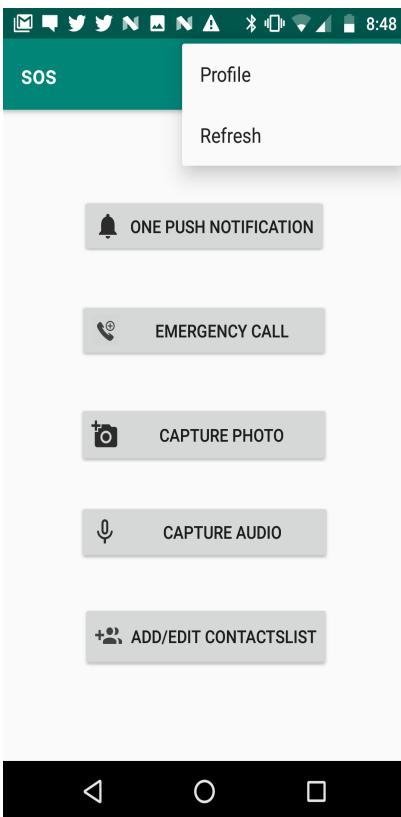


Fig. 8: Menu.

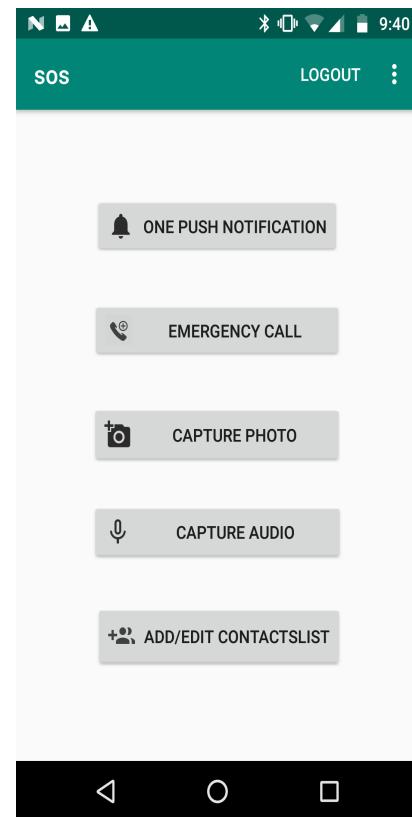


Fig. 10: Buttons Page.

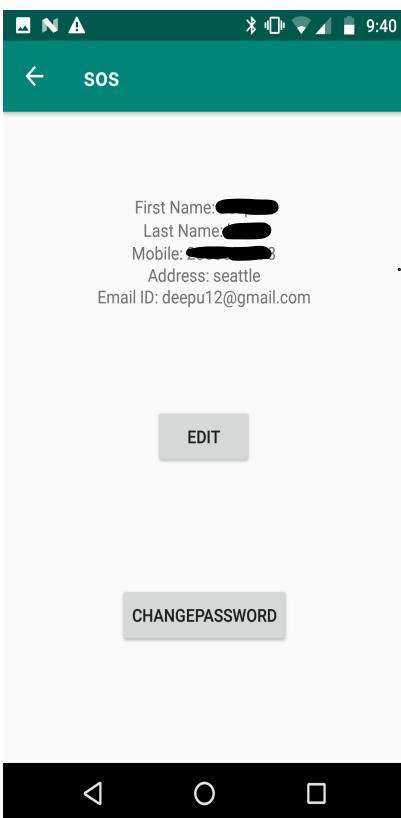


Fig. 9: Profile Page.

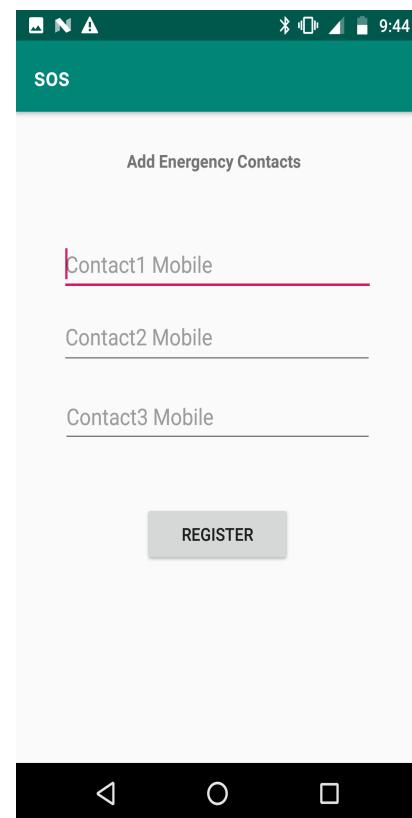
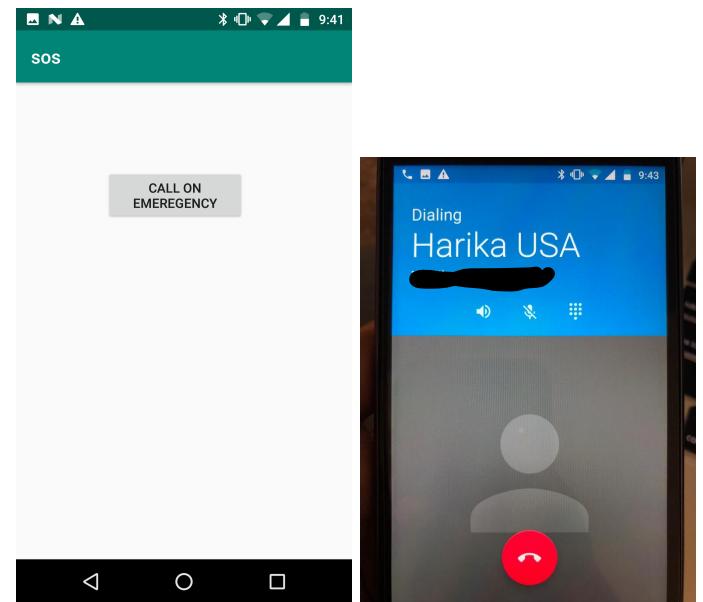
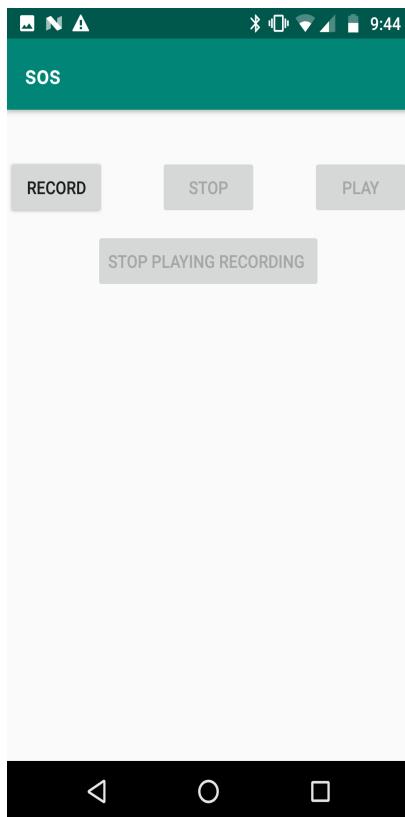


Fig. 11: Add Contacts.



(a) Figure 1

(b) Figure 2

Fig. 14: Emergency Call: (a) Emergency Call Button; (b) Call to Primary Contact.



Fig. 12: Capture Audio.

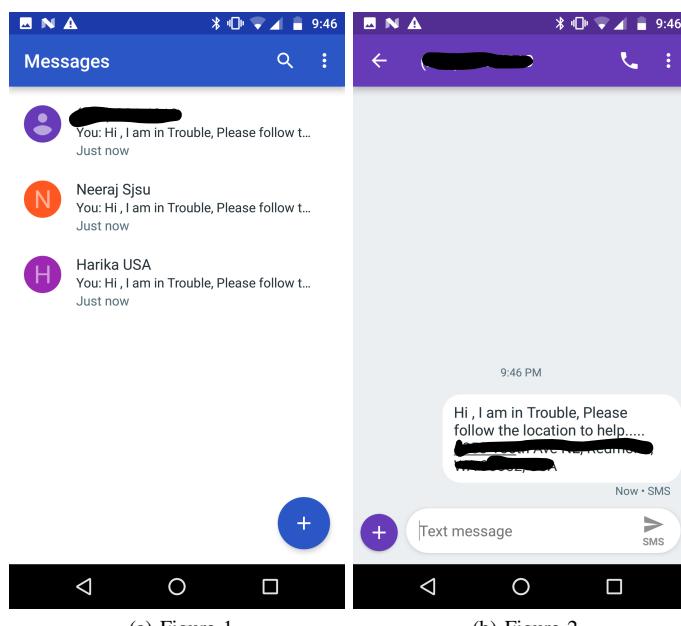
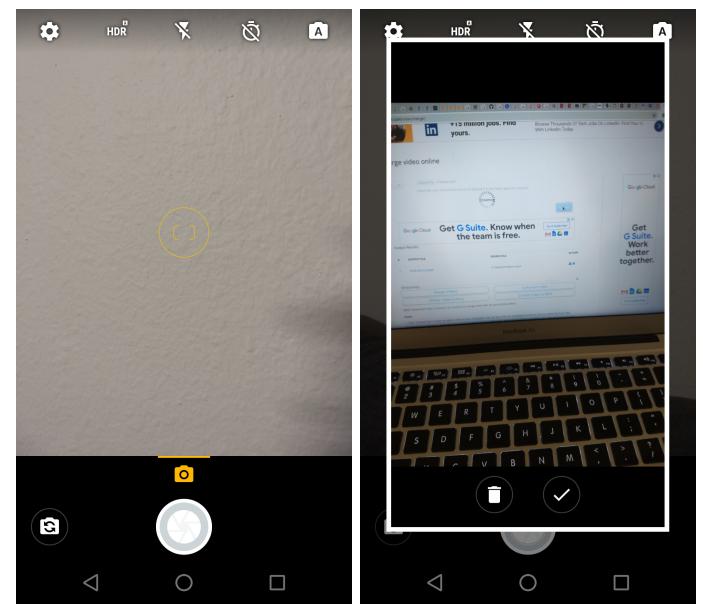


Fig. 13: One Push Notification: (a) Three Contacts; (b) Message with Location.



(a) Figure 1

(b) Figure 2

Fig. 15: Capture Photo: (a) Camera; (b) Photo Captured.

VII. CONCLUSION

The android based SOS emergency application is one of the essential applications required to be present in our mobiles. We are not sure when things go bad. The application would allow the users to pass on the information to their family members as soon as possible. Features like capture photo and capture audio would allow the users to get hold of more evidence and this data would be present in database. No application is perfect in any sense, as the time goes on, many innovative features should be added to make the application to the existing model.

This is our first android project, it has given us good amount of exposure in developing a android application, using google inbuilt API's, and using firebase database.

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