Rakshak App- An Implementation of a Security System for Emergency

P. Srinivasan[1], M. Roshini[2], T.Sangavi[3], K.Snegha[4]

[1] Professor, Department of Computer Science and Engineering Muthayammal Engineering College, Tamilnadu, India.

[2,3,4] UG Students, Department of Computer Science and Engineering, Muthayammal Engineering College, Tamilnadu, India. Email: mroshini1999@gmail.com[2]

ABSTRACT: Smart phones can be used efficiently for personal safety or various other protection purposes. This paper "Rakshak" presents a personal safety application developed for smart phones of android platform. Further, this paper suggests a new perspective to use technology for people's safety. The authors have felt a need of advanced security system to provide the safety measure in public places and during travelling alone through public transports (school buses, company vehicle etc.). This paper proposed a new model for the security in public places which aims to provide the 100% safe environment.

KEYWORDS: Security, Voice Recognition System, GPS (Global Positioning System), Audio- Video Recording, Code pin, Code word, Auto Sound Receiving, Area Zone Module.

I. INTRODUCTION

This Application is mainly developed for people to provide help in such circumstances where no nearest help will be available. People are not secure nowadays, everywhere. People might belong from any region, any country or from any background, the safety is big issue. There is always insecurity about safety and every individual are conscious about safety. The snoopy eyes are always present in surrounding. To be very cautious in all circumstances, we are developing this application. This Application not only helps the user but also provides the location details to their families and friends. Because problem or accident might be arise for anyone at anywhere, where location might be new or known. The need of this application arises due to the increasing violation, sexual assaults, misbehavior against the people. The smart phone is only the medium via help can access, because Smartphone are definitely and easily involved like a body part in our day-to-day life and it also provide location of victim by using GPS (Global Positioning System).[9]Voice recognition system recognizes the victims code word registered before-hand. This recognition enables the camera which automatically records the surrounding. If anything happened victim is major important. To provide help to victim we are using the android based application, providing security is the main intention of this application. This application brings help wherever you need and whenever you need it.

A. Android

The term "Android" refers to an Operating System which is used on mobile devices like Smartphone's and tablets. Android is an open source software and free to use platform. It provides greater flexibility for the applications by letting Firefox, Opera and chrome to run. Android provides Software Development Kit (SDK) at free of cost for the developers to minimize the development and licensing cost. Android phones come with a variety of built in applications. Android programs are coded using Java language and are executed with the use of Google's "Davlik" virtual machine, which was developed for all mobile devices. End Users can download Android applications with the help of online Android Market eg. PlayStore. The System built using android OS will compile source code, resources used by the app and wrap them in APKs so that the developer can test, release the application, and distribute. The elasticity of the Android Operating system enables the developers to perform custom build configurations without modifying your application's core source files. As Now a day's Smartphone's are used everywhere the intension of the proposed system is to reduce crime against women by providing a user-friendly app to the user. [13]

II. LITERATURE SURVEY

A. Systems Designed As A Mobile App For The Android Mobile

It proposes a crisis circumstance perceiving an application called as IPROB to give women safety even in the circumstance like fear based oppressor assaults or catastrophic event, by simply shaking the versatile over the predefined

limit esteem naturally actuate the framework. If the mobile profile at the receiver is in silent mode then convert it into the General profile to give the voice notification as "YOUR CHILD IS IN TROUBLE PLZHELP...PLZ HELP ..." continuously like a ring tone, until they stop it. If a register contact confirms a PROB then appropriate emergency services are alerted. If a registered contact responds with an audible notification, then it automatically connects and enables the speakerphone at the victim side [4]. This application SCIWARS (Spy Camera Identification and Women Attack Rescue System) comprises of two modules. A first module go about as a shrewd cautions framework which recognizes the infrared beams originating from consistently vision concealed cameras put in evolving room-inns room and furthermore educated the client about perilous place through message. It sends the emergency message containing location to registered contacts. It also records the voice and captures the images of the surrounding for about 45 seconds. This information is also stored in secret location of mobile for future evidences. This app is also able to convert the receiver mobile [15]. It proposes an android application to give security at two distinct circumstances. The First module give security to Women at Emergency Situations, propose a Save Our Souls (SOS) application to give security on a solitary snap of SOS catch for the women going around evening time or alone. The second module proposes an android based home security framework that gives security of house assets and Senior Citizen in the client non-appearance. Since the security of senior resident is dependably a worry with expanding number of thefts [3]. It proposes an android application, in which a solitary snap of SOS communicates something specific containing the area and additionally sound video call to the gatekeeper number. At collector side, touch the area URL in the message to see it in the Google Map. It likewise gives distinctive enable instruments like First-Aid enable, Fake Call To help and video call. [14]

B. Systems designed as a device with the help of Microcontroller

It proposes an automated highly reliable women security device. It consists of advanced sensors, GSM and ATMEGA8 microcontroller with ARDUINO tool which keep user under observation at all the time. It monitors the heartbeat-rate, temperature and vibration in body through sensors to check for any uneasy situation. In such situation it will activate the GPS and wireless camera to capture the images that is sent to the control room of the receiver through GSM modules to take necessary actions. At the same time processor activate the microphone unit with amplifier which strengthens the voice of the women to scream or shout above the threshold limit [7]. It is a portable device as a belt which is automatically activated based on the pressure difference crosses over the threshold in an unsafe situation. A GPS module track the location and sends the emergency messages to three emergency contacts for every two minutes with updated location through GSM. The system also activates the screaming alarm that uses a siren, to call out for help and generates an electric shock to harm the attacker for self-defense which may help the victim to escape. The device mainly consists of micro controller on the ATMega328 board which is programmed using the ARDUINO programming language [5]. It is a women security device which is an easy to operate device. This device can be activated through-voice command, Press a switch key and shock. In emergency it will send the message including instant location to the police, via the transmitter module and registered numbers via a GSM module. Currently the work is under process to embed it in jewelries, mobile or another carrier like belt, watch etc. It can play a major role in the proposed projects where all the police stations are connected and share the criminal records, crime investigating cases [6]. It is an extended vehicle tracking system to track the vehicle based on GPS with that it also provides the safety through an emergency button kept under the vehicle seat using GSM. As the increasing economic growth rate of a country, many companies are establishing their setup in the nearby region of the cities. Since, the security of women employees inside the private transportation is the company's responsibility [1]. In this paper, when a women or child wearing this "watch me" is exposed to sexual or vulnerable attack, the sensor present in it detects the heart beat rate of a person which will be high at the moment by the secretion of epinephrine hormone from axis and gets activated, also through GPS/GSM it will detect the nearby police station and make ring there, so it will be helpful for police to arrive soon at the spot by tracking the GPS , such a system will lead to safer and better environment [2]. It proposes the propelled programmed method to foresee the risky circumstance in view of the female feeling as dread, outrage and so on. The framework takes after the means offered beneath to decide the disordered circumstance under the reconnaissance locale to recognize the brutality circumstances [12].

III. METHODOLOGY

A. Introduction

The proposed system aims to eliminate the disadvantages of the existing systems. This application helps the people in an emergency situation by sending the alert messages to registered contacts. The main theme of the proposed system is that the user can be protected in many of the scenarios and also helps to catch and or trace the culprit so that the number of crimes can be reduced eventually. This system makes use of GPS technique. The System uses the Global Positioning System technology to trace the location of the user and uses the system service to send the message. Voice recognition system triggers the camera for auto audio-video recording. The most advantage of the proposed system is that it helps to save the victim from the physical attack and also helps to trace/catch the culprit.

B. Firebase

The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON format and synchronized in real time to every connected client. When you build an app, all your clients share one Realtime Database instance and automatically receive updates with the newest data even when the app works offline. The Firebase Realtime Database allows you to build rich, collaborative applications by allowing secure access to the database directly from client-side code. Data is persisted locally, even while offline, real time events continue to fire, giving the end user a responsive experience. When the device regains connection, the Realtime Database synchronizes the data changes made during offline with the remote updates that occurred, merging any conflicts automatically. The Realtime Database provides a flexible, expression-based rules language, called Firebase Realtime Database Security Rules, to define how data should be structured and when data can be read from or written to (permitting/ denying third-party access). When integrated with Firebase Authentication, developers can define who has access to what data, and how they can access it.

C. Data Structure

All Firebase Realtime Database data is stored as JSON objects. Like a SQL database, there are no tables or records. When you add data to the JSON tree, it becomes a node in the existing JSON structure with an associated key. JSON Tree Model is inspired from JSON (JavaScript Object Notation) used to represent the JSON document which generally consists of key-value pairs in memory.

```
{
  "users": {
    "alovelace": {
      "name": "Ada Lovelace",
      "contacts": { "ghopper": true },
    },
    "ghopper": { ... },
    "eclarke": { ... }
  }
}
```

Fig.1 Firebase Authentication

Firebase Authentication provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate specific users to your app. It supports authentication using passwords, phone numbers, popular federated identity providers like Google, Facebook and Twitter, email and more.

1) Get the instance:

```
private FirebaseAuth mAuth;
// Initialize Firebase Auth
mAuth = FirebaseAuth.getInstance();
```

2) Create new account:

```
mAuth.createUserWithEmailAndPassword(email, password)

.addOnCompleteListener(this, new OnCompleteListener<AuthResult>() {
  @Override
```

```
        public void onComplete(@NonNull Task<AuthResult> task) {
            if (task.isSuccessful()) {
                // Sign in success, update UI with the signed-in user's information
                FirebaseUser user = mAuth.getCurrentUser();
                updateUI(user);
            } else {
                // If sign in fails, display a message to the user.
                updateUI(null);
            }
        }
    });
```

D. Read and Write Data

To read or write data from the database, you need an instance of DatabaseReference.

```
private DatabaseReference mDatabase;
mDatabase=FirebaseDatabase.getInstance().getReference();
```

E. Write Operation

An object class or a map can be used to insert new data into JSON tree. Once the object is created, navigate the Firebase reference to the position where a child can be added. If a list is created and does not have a specific names for each child, the push() method can be used before the setValue() is called.[16]

```
mDatabase.child("users").child(userId).child("username").setValue(name);
```

F. Read Operation

Use the onDataChange() method to read a static snapshot of the contents at a given path, as they existed at the time of the event. In Fig.3.1 triggered once when the listener is attached and again every time the data, including children, changes. The event callback passed a snapshot containing all data at that location, including child data. If there is no data, the snapshot will return false when you call exists() and null when you call getValue() on it.[16]

```
ValueEventListener postListener = new ValueEventListener() {
    @Override
    public void onDataChange(DataSnapshot dataSnapshot) {
        // Get Post object and use the values to update the UI
        Post post = dataSnapshot.getValue(Post.class);
        // ...
    }

    @Override
    public void onCancelled(DatabaseError databaseError) {
        // Getting Post failed, log a message
        Log.w(TAG, "loadPost:onCancelled", databaseError.toException());
        // ...
    }
};
mPostReference.addValueEventListener(postListener);
```

Fig.3 Retrieving value from the database

G. Algorithm

Step-1:

First of all, create authentication using email, phone number, popular federated identity providers like Google, Facebook, Twitter, etc. This authentication helps to know the identity of each user to save their own data in a secure a

```
private FirebaseAuth mAuth;
        // Initialize Firebase Auth
        mAuth = FirebaseAuth.getInstance();
        mAuth.createUserWithEmailAndPassword(email, password)
                .addOnCompleteListener(this,new OnCompleteListener<AuthResult>() {
                 @Override
```

```
public void onComplete(@NonNull Task<AuthResult> task) {
    if (task.isSuccessful()) {
// Sign in success, update UI with the signed-in user's information
        FirebaseUser user = mAuth.getCurrentUser();
        updateUI(user);
    } else {
        // If sign in fails, display a message to the user.
       updateUI(null);
```

Step-2:

Verify your email address by clicking the given link.

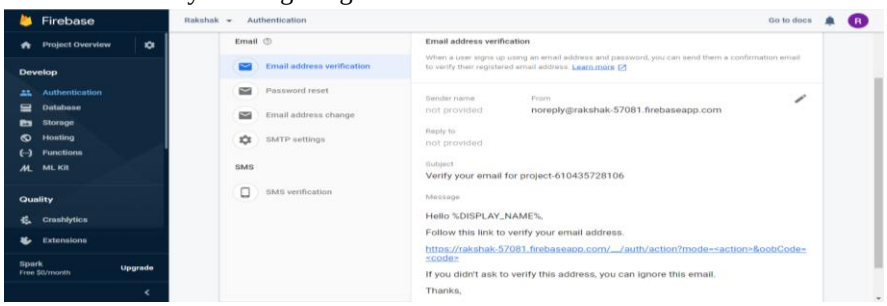

Fig.4 Firebase authentication

Step-3:

For read and write operations, it uses a protocol known as web sockets over HTTP.[8]

Client Request:

```
GET /chat HTTP/1.1
Host: server.example.com
Upgrade: websocket
Connection: Upgrade
Sec-WebSocket-Key: x3JJHMbDL1EzLkh9GBhXDw==
Sec-WebSocket-Protocol: chat, superchat
Sec-WebSocket-Version: 13
Origin: http://example.com
```

Server Response:

```
HTTP/1.1 101 Switching Protocols
Upgrade: websocket
Connection: Upgrade
Sec-WebSocket-Accept: HSmrc0sMlYUkAGmm5OPpG2HaGWk=
Sec-WebSocket-Protocol: chat
```

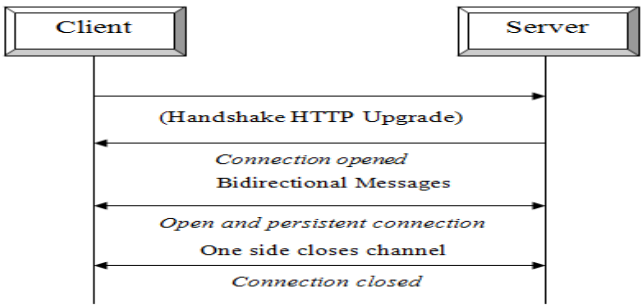

Fig.5 Web Socket connection

Step-4:

Make read and write rules as ‘false’, so that third party are denied permission to access the database which ensures data security.

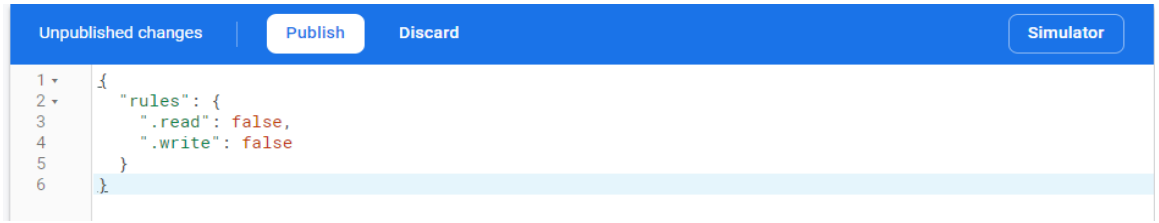

Fig.6 Database access rules

Step-5:

Data given in UI of application is stored in firebase by creating unique UID for each user.

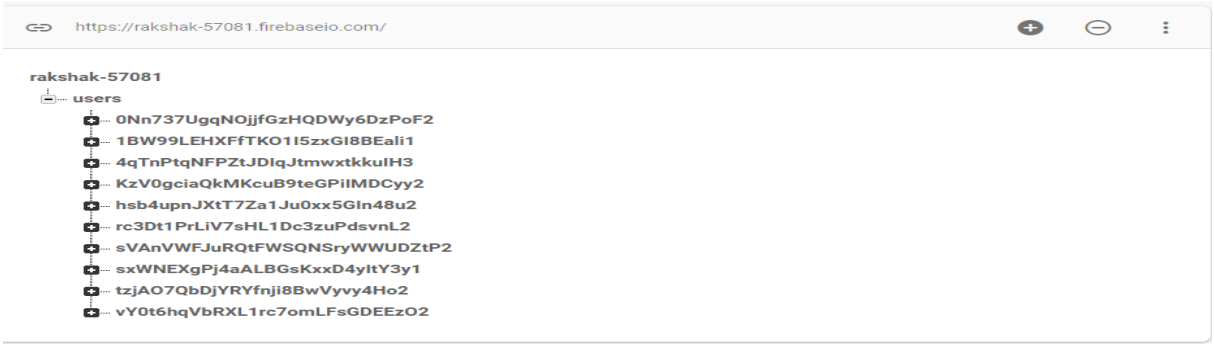

Fig.7 Data stored in firebase with unique UID

Step-6:

Google Key Management Service (KMS) for Key Encryption. It involves encryption of the key with another data key stored in Google Key Management Service. The user’s key encrypts the data, and then the key is encrypted by a KMS key and stored in the database.

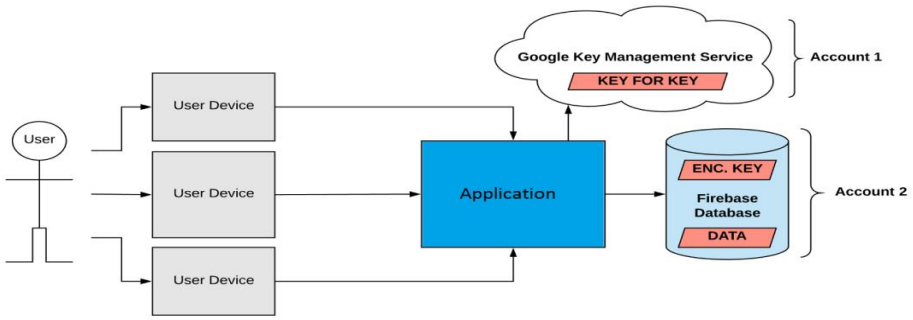

Fig.8 Storing Key with Key Management Service

Step-7:

GPS helps us to locate the user with the latitude and longitude coordinates. It is also possible to get the last known location of the user when it is offline.

private FusedLocationProviderClient mFusedLocationClient;

mFusedLocationClient=LocationServices.getFusedLocationProviderClient(this);

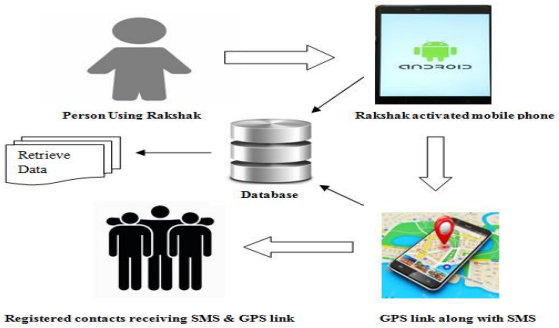

Fig.9 Architectural Diagram of Proposed Work

H. Explanation

From the figure, the user installs the application in their android mobile phone. Initially, he needs to login with their email id and password. Firebase checks whether there exists user with same email id. If not it creates unique user id (UID) and provides authentication. All the personal details are to be registered. These details are stored in firebase using write operation and UID. User can use this app whenever required. When the user goes out, estimated time duration can be set. All the details including location and time is updated in firebase regularly which helps for future references. When timer exhausts, an alarm is fired. If the user did not cancel the alarm by entering the appropriate code pin, the alarm will be repeated for every 2 minutes until it is cancelled. User's location is sent to the emergency contacts registered before in two cases.

1) When the code pin given during the cancellation of alarm is wrong.
2) When the user did not cancel the alarm even after the second time an alarm is fired.

It also activates automatic outgoing call to the first registered contact if the alarm repeats for more than 2 times. When the user shouts the code word, voice recognition system recognizes the code word and matches with the registered word. It activates the camera for auto audio-video recording. Video evidences are stored in the database.

IV. RESULT AND DISCUSSION

The crime rate cannot be controlled totally and security cannot be provided to the maximum. But this proposed system might decrease the crime rate and helps people to feel safe wherever they go. Alone or night travelling becomes more secure with this system. Further independent women will fully feel secure. Data storage enables availability of evidences.[11] This application creates unique user id for each individual. The estimated time duration can be set only when required. Once the time exhausts, an alarming sound is fired. GPS need not be turned on every time. It requires only one time permission. If permission is denied, then it will prompt for permission repeatedly until the permission is granted. Internet connection is not necessary at all circumstances.

When the user is offline, data is stored locally on the user's device and it gets synchronized once the device is restored to online.[10] This offline capabilities become advantageous and works in all situations.

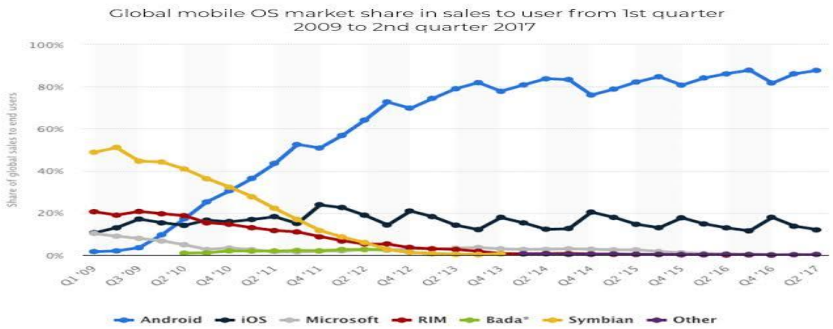

Fig.10 Global mobile OS market share

	GPS & SMS access	Internet	Offline	Not Reachable
Analysis 1	7	10	2	5
Analysis 2	5	8	4	6
Analysis 3	8	5	4	7
Analysis 4	9	6	7	5
Analysis 5	10	3	10	7

Table.1 Feasibility Analysis of Rakshak (Fig. 11)

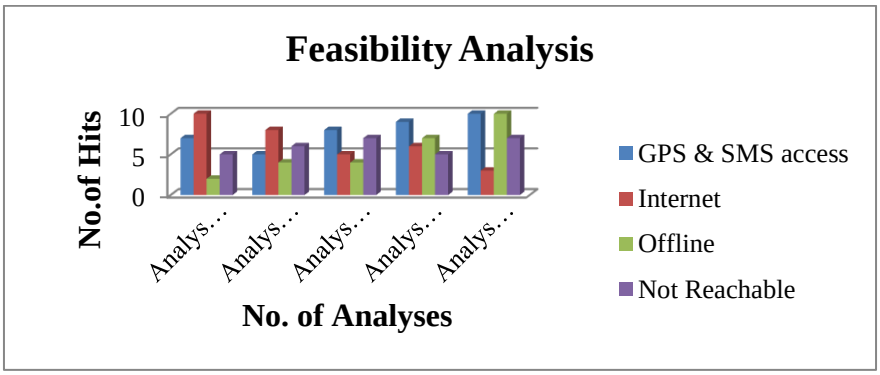

Fig.11 Feasibility analysis of Rakshak

From Table.1 feasibility analysis of Rakshak is obtained based on 5 analyses conducted. In the first time, the app was able to run only when the user's mobile is online. In further analysis, the app was built to run even when the user's mobile is offline. It is enough to provide only one time permission for GPS and SMS access initially. Later, it checks for the permission automatically and fetches the location and sends SMS.

Analysis-5 seems to be feasible when compared to other four analyses. Because in this, the range of offline usage and GPS & SMS access is higher and so the app do not need any internet facility. Internet facility is only needed to synchronize the data modified during offline back to the server.

V. CONCLUSION

It can be concluded that the system helps to supports the gender equality by providing safe environment to women in the society, and allows them to work till late nights. Anyone before doing any crime against the women will be deterred and it help reducing the crime rate against the women. In some of the cases the system can provide useful evidences. Since the system can do audio-video recording of incidences which can act as the evidences. The proposed system provides a tool for recording videos which will act as evidence during crime scenarios. The system allows people to go out without any fear since there is someone to track their location immediately and rescue them easily. Even though the mobile phone's screen is off, this application enables the SMS to be sent to registered contacts.

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