IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING & NOTIFICATION

PROJECT REPORT

Submitted by

DHARANI S - 1931012

RAMYA M - 1931043

THARUNYA G - 1931052

SELVA SUDHA A S - 2031L06

In partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF ENGINEERING

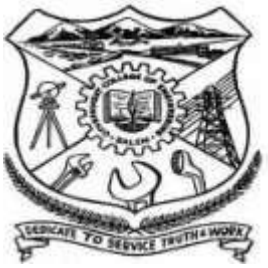
in

ELECTRONICS AND COMMUNICATION ENGINEERING

GOVERNMENT COLLEGE OF ENGINEERING

SALEM

(An Autonomous Institution)



ANNA UNIVERSITY, CHENNAI

MAY 2022

TABLE OF CONTENTS

CHAPTER NO	TITLE
1	**INTRODUCTION**
	1.1 Project Overview
	1.2 Purpose
2	**LITERATURE SURVEY**
	2.1 Existing problems
	2.2 References
	2.3 Problem Statement Definition
3	**IDEATION & PROPOSED SOLUTION**
	3.1 Empathy Map Canvas
	3.2 Ideation & Brainstorming
	3.3 Proposed Solution
	3.4 Problem Solution fit
4	**REQUIREMENT ANALYSIS**
	4.1 Functional requirement
	4.2 Non-Functional requirements
5	**PROJECT DESIGN**
	5.1 Data Flow Diagrams
	5.2 Solution & Technical Architecture
	5.3 User Stories
6	PROJECT PLANNING & SCHEDULING
	6.1 Sprint Planning & Estimation
	6.2 Sprint Delivery Schedule
	6.3 Reports from JIRA

CHAPTER NO **TITLE**

7 **CODING & SOLUTIONING**

7.1 Feature 1
7.2 Feature 2

8 **TESTING**

8.1 Test Cases
8.2 User Acceptance Testing

9 **RESULTS**

9.1 Performance Metrics

10 **ADVANTAGES & DISADVANTAGES**

11 **CONCLUSION**

12 **FUTURE SCOPE**

13 **APPENDIX**

1. INTRODUCTION

1.1 Project Overview

Creating a device that can be followed using GPS locations and has a panic button to inform the parent via a GSM module, this invention is primarily focused on improving child safety. An Android app for parents is created to control and monitor the device at any time. Smart gadget devices are always connected to parents' phones, which can receive and make phone calls as well as SMS gadget via a GSM module. Additionally, wireless technology is implementedon the device, which is useful to bind the device within a region of monitoring range; if the device is moving out of monitoring range, an alert will be triggered on a binding gadget, helping you maintain a virtual watch over the child. An alert will be sent to a bound device if the device moves outside of the monitoring range, allowing you to keep a virtual check on the child. Devices come with a health monitoring system that checks for factors including heart rate, pulse, and temperature. The parental app allows for the monitoring of these indicators. Using a contact switch, the device also keeps track of whether or not it is plugged in andnotifies the parent the moment it is unplugged.

1.2 Purpose

Approximately 80% of all reports of child abuse are made Nowadays, with 74% of the victims being girls and the remaining 20% being males. In this world, a child goes missing every forty seconds. Children are the foundation of a country; if their future was threatened, it would have an effect on the development of the whole country.

The emotional and mental stability of the children is compromised as a result of the abuse, ruining their futures and careers. The things that happen to these defenseless kids are not their fault. Therefore, parents are in charge of raising their own children. However, parents are compelled to seek money because of the state of the economy and their desire to concentrate on their child's future and job. Consequently, it becomes challenging for them to constantly cling to their kids. We have created a setting in our system where this issue can be effectively solved. It enables parents to keep a close eye on their kids in real time while concentrating on their own careers without having to take any physical action. In essence, kids cannot tell their parents about the abuse they experience on a regular basis. They are too young to really comprehend what truly occurs to them. Parents find it challenging to recognize when their children are being abused. So, the main objective of this module is to help working parents to be free from worry about their children by tracking their movements at any time. An autonomous real-time monitoring system is required for every child worldwide in order to stop attacks on children.

2. LITERATURE SURVEY

[1] **Authors:** Akash Moodbidri, Hamid Shahnasser
Title: Child safety wearable device.
Published in: 2017 IEEE. This gadget is designed to make it easier for parents to find their kids.
There are already a lot of wearables available on the market that may be used to track children's daily activity as well as to locate them utilizing the Wi-Fi and Bluetooth capabilities of the device.
Merits: The advantage of this wearable over others is that it can be operated with any phone; a high-end smartphone is not necessary, and it doesn't require a person to be highly tech knowledgeable.
Demerits: Due to its low battery life, this device.

[2] **Authors:** M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari.
Title: Smart IoT Device for Child Safety and Tracking.
Published in: 2019 IEEE.
The Link-It ONE board, programmed in embedded C, is used to construct the system. It is connected to temperature, heartbeat, touch, GPS, GSM, and digital camera modules. The work is innovative in that when a child is in need of rapid attention during an emergency, the system instantly notifies the parent or caregiver by sending an SMS.
Merits: The child's heartbeat, temperature, and touch are employed as parameters in a parametric analysis, and the results are shown.
Demerits: To put in place an IoT gadget that offers a comprehensive remedy for issues with child safety.

[3] **Authors:** Dheeraj Sunehera, Pottabhatini Laxmi Priya.
Title: Children Location Monitoring on Google Maps Using GPS and GSM.
Published in: 2016 IEEE.
This study offers parents an Android-based tool to follow their kids in real-time. Through internet-connected channels, various gadgets can communicate with one another. The concerned gadget has an internet connection to the server. Parents can use the gadget to keep track of their kids in real-time or to protect ladies. The location services offered by the GSM module are used in the suggested solution. It enables parents to receive an SMS with their child's location information.
Merits: Uses an Android terminal and ad hoc networks, a child tracking system.
Demerits: This device cannot be used in rural areas.

[4] **Authors:** Aditi Gupta, Vibhor Harit.
Published in: 2016 IEEE.
Title: Child Safety & Tracking Management System by using GPS.
This study offered a model for child safety using smartphones that give parents the option to track their children's whereabouts as well as the ability for kids to send a fast message and their current location in case of an emergency via Short Message Services.

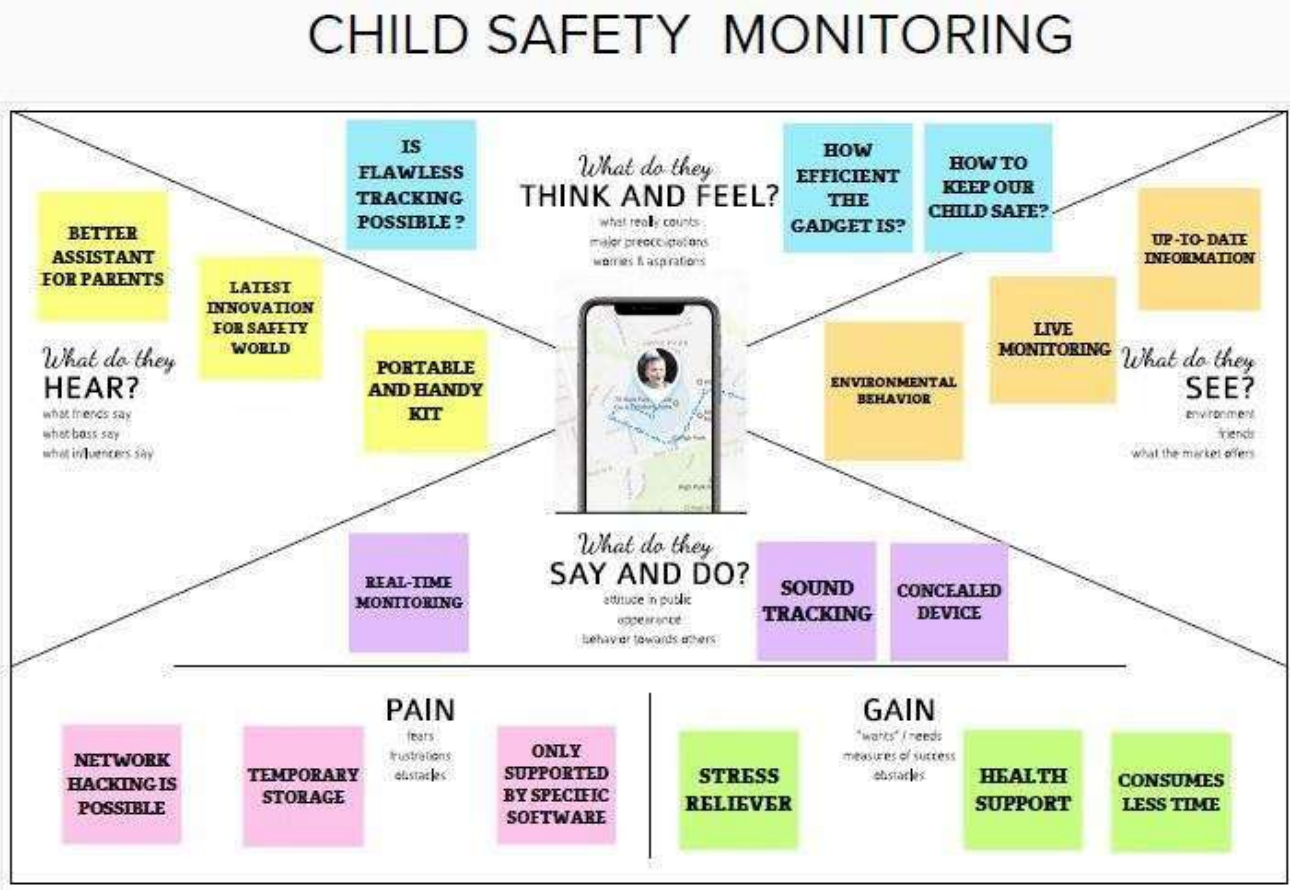
Merits: The benefits of smartphones that offer a wealth of capabilities like GPS, SMS, Google Maps, etc.
Demerits: This system is unable to detect child-like human behavior.

References:

[1] Aditi Gupta, Vibhor Harit, 'Child Safety & Tracking Management System by using GPS, GeoFencing & Android Application: An Analysis,' 2016 Second International Conference on Computational Intelligence & Communication Technology.
[2] Dheeraj Sunehera, Pottabhatini Laxmi Priya, 'Children Location Monitoring on Google Maps Using GPS and GSM,' 2016 IEEE 6th International Conference on Advanced Computing.
[3] M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari,
'Smart IoT Device for Child Safety and Tracking' International Journal of Innovative Technology and Exploring Engineering, Volume 8, Issue 8, June 2019.
[4] Akash Moodbidri, Hamid Shahnasser (Jan. 2017) 'Child safety wearable device', International Journal for Research in Applied Science & Engineering Technology, Vol. 6 Issue 2, pp. 438-444.

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy map canvas



3.2 Ideation and brainstorming

3.3 Proposed solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To prevent children for abuse and make them safe
2.	Idea / Solution description	compact wearable gadget with pressure button which can the parents can find the ahacker easier
3.	Novelty / Uniqueness	Pressure button with Gsm
4.	Social Impact / Customer Satisfaction	It is useful to working parents when they are leaving children
5.	Business Model (Revenue Model)	wearable gadget
6.	Scalability of the Solution	compact and easy to use

3.4 Problem solution fit

4. REQUIREMENT ANALYSIS

4.1 Functional requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Notification	Notification Via Mobile App and normal message
FR-4	Monitoring	App to monitor the child location
FR-5	Health monitoring	Heart beat rate , Temperature

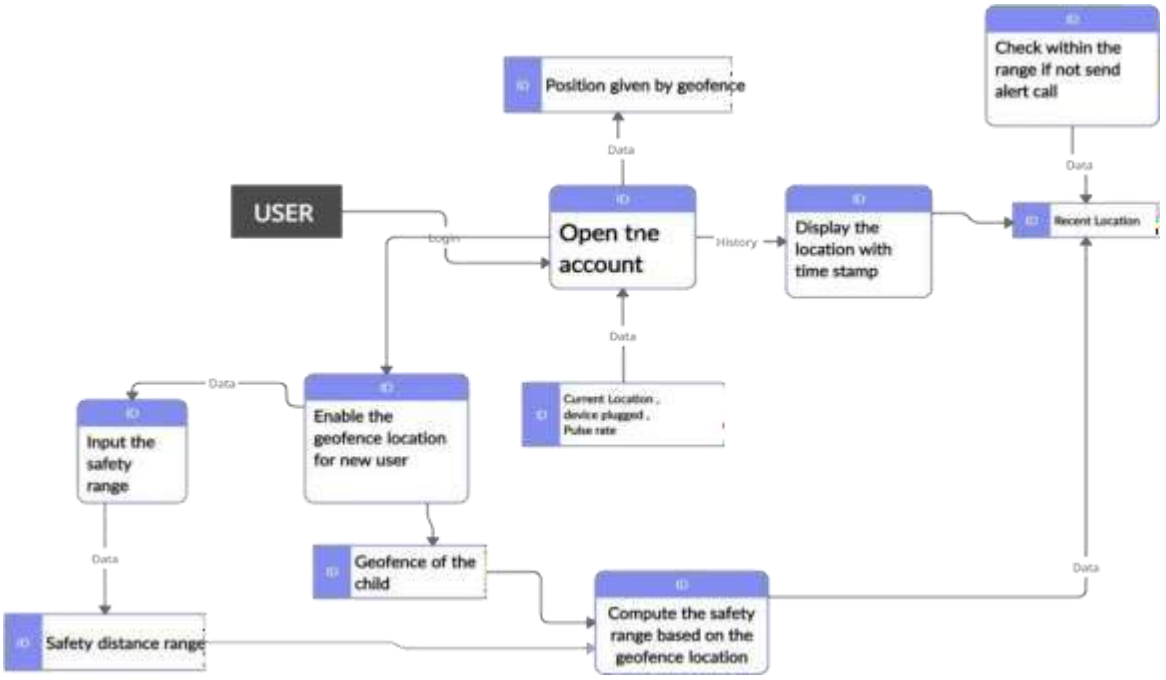
4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR -1	**Usability**	This model has GSM that can help to notify the parents in case of emergency or the smart band not connected
NFR -2	**Security**	Parents can feel secure because if the child forget or not connect the band it

		will notify the parents and if panic Button is pressed it will send alert messageand parents able to track the location
NFR -3	**Reliability**	• Easy to use • Portable • Flexible • Cost effective
NFR -4	**Performance**	• Create a Child tracker which helps the parents with continuously monitoring the child'slocation. • The notification will be sentaccording to the child's location to their parents or caretakers.
NFR -5	**Availability**	• Track your child even in a crowd • Know the current location
NFR -6	**Scalability**	• This model ensures the safety and tracking of the children. Parents need not worry about their children.

5. PROJECT DESIGN

5.1 Data Flow Diagrams



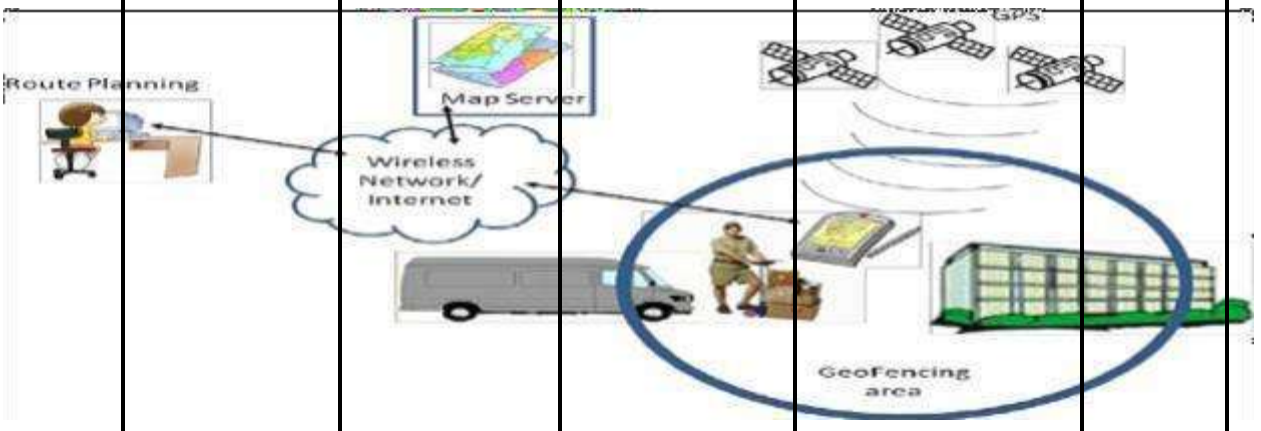
5.2 Solution & Technical Architecture

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the test tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software toproject stakeholders.

- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, anddelivered.

5.2 User Stories

User Type	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**
Customer (Mobile user)	Registrati -on	USN-1 (FATHER)	As a user, I can register by entering my email, and password, and confirming my password. Ican access the location	I can access my account/ Dashboard and receive a confirmation email & click confirm	High	Sprint-1
						

			of the children using the credentials provided as a Father.			
		USN-2 (MOTHER)	As a user, I can register by entering my email, and password, and confirming my password. I can access the location of my children using the credentials provided as a Mother.	I can access my account/dashboard and receive a confirmation email & click confirm	High	Sprint-1

		USN-3 (GUARDIAN/ CARETAKER)	As a user, I can monitor the children's activities Using a safety gadget monitoring system.	I can access my account/dashboard and receive a confirmation email & click confirm	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering my email & password.	I can access my account/dashboard.	Medium	Sprint-2
	Dashboard	USN-5	As a user, I can fix the geofence for my child's location so	I can monitor the current location of my child.	High	Sprint-2

			that I will receive alerts if my child crosses the geo-fence and monitor the child's pulse and check whether the device Is plugged in or not.			

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint planning and estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration (Parent Mobile User)	USN-1	Registering for an application, as a user we can register by entering our email, password and again, we need to confirm the password	3	High	Tharunya.G
Sprint-1	Login	USN-2	If we have register for the application as a user a confirmation mail will be received to our mail	3	High	Dharani S
Sprint-2	User Interface	USN-3	Using Facebook, we can register for This application	3	Low	Ramya.M
Sprint-1	Data Visualization	USN-4	We can also register for the application through Gmail	3	Medium	Selva sudha.A.S
Sprint-3	Login	USN-5	As a user, I can log into the application by entering email	3	Low	Tharunya G

Sprint-1	Dashboard	USN-5	We need to be able to view the function that can perform	4	High	Dharani S
Sprint-2 n	Notification	USN-1	Using minimum time, we should be able to notify their parent and guardian	4	High	Ramya.M
Sprint-1	Store data	USN-2	We need to continuously store location data into the database	3	Medium	Selva sudha.A.S
Sprint-4	Web UI	USN-3	We all will need a friendly interface to view and access the resource easily	3	Medium	Tharunya G
Sprint-3	Registration (Parent Web User)	USN-1	By entering email and password we can log into the application as a user	3	High	Dharani S
Sprint-2	Login	USN-2	Using minimum time, we need to login to registered account via web page	3	High	Ramya.M
Sprint-4	Web UI	USN-3	To easily view and access the resources we need a user-friendly interface application	3	Medium	Selva sudha.A.S

6.2 Sprint Delivery schedule

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed (as on Planned End Date)**	**Sprint Release Date (Actual)**
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7. CODING & SOLUTIONING
(Explain the features added in the project along with code)

7.1 Feature 1:
(Adding Geofence)

- Geofence is like a round wall covering the given location. So parents can use them to mark the location where their children are going.
- Multiple Geofence can be added

CODING:

```
Package
com.example.geofence;          import
android.app.PendingIntent;     import
android.content.Context;       import
android.content.ContextWrapper;
import android.content.Intent; import
android.widget.Toast;

Import
com.google.android.gms.common.api.ApiException;      import
com.google.android.gms.location.Geofence;            import
com.google.android.gms.location.GeofenceStatusCodes; import
com.google.android.gms.location.GeofencingRequest;   import
com.google.android.gms.maps.model.LatLng;  public  class
GeofenceHelper extends ContextWrapper {
```

```
        private static final String TAG = "GeofenceHelper"; PendingIntent
        pendingIntent;

        public GeofenceHelper(Context base)  {super(base);
        }

    public GeofencingRequest getGeofencingRequest
   (Geofencegeofence) { return new GeofencingRequest.Builder()
.addGeofence(geofence)

          .setInitialTrigger(GeofencingRequest.INITIAL_TRIGGER_ENTER)
                .build();
        }

        public Geofence getGeofence(String ID, LatLng latLng, floatradius,
int transitionTypes) {
            return new Geofence.Builder()
                .setCircularRegion(latLng.latitude, latLng.longitude, radius)
                .setRequestId(ID)
.setTransitionTypes(transitionTypes)
                .setLoiteringDelay(5000)
                .setExpirationDuration(Geofence.NEVER_EXPIRE)
                .build();
        }

        public PendingIntent getPendingIntent() {if
           (pendingIntent != null) {
```

```
            return pendingIntent;
        }
        Intent intent = new Intent(this,
    GeofenceBroadcastReceiver.class);
        pendingIntent = PendingIntent.getBroadcast(this, 2607, intent,
     PendingIntent.FLAG_IMMUTABLE);

        return pendingIntent;
      }

      public String getErrorString(Exception e) {if (e
        instanceof ApiException) {
          ApiException apiException = (ApiException) e;
          switch (apiException.getStatusCode()) {
            case GeofenceStatusCodes
              .GEOFENCE_NOT_AVAILABLE:    return
          "GEOFENCE_NOT_AVAILABLE";
    case GeofenceStatusCodes
          .GEOFENCE_TOO_MANY_GEOFENCES:
 return      "GEOFENCE_TOO_MANY_GEOFENCES";
            case GeofenceStatusCodes
.GEOFENCE_TOO_MANY_PENDING_INTENTS:
              return     "GEOFENCE_TOO_MANY_PENDING_INTENTS";
          }
        }
```

7.2 Feature 2

(Alert Notification)

- Once geofence is added , when the child enters the geofence a notification willbe sent

- When the child leaves the geofence a notification will be sent .

package com.example.geofence; import android.content.BroadcastReceiver; import android.content.Context;import android.content.Intent; import android.location.Location; import android.os.CountDownTimer; import android.util.Log; import android.widget.Toast; import com.google.android.gms.location.Geofence;import com.google.android.gms.location.GeofencingEvent import java.util.List; import android.os.Handler;

public class GeofenceBroadcastReceiver extends BroadcastReceiver {private

static final String *TAG* = "GeofenceBroadcastReceiv";

@Override

public void onReceive(Context context, Intent intent) {

// *TODO: This method is called when the BroadcastReceiver is receiving*

// an Intent broadcast

```
            int toastDurationInMilliSeconds = 1200000; mToastToShow
=   Toast.makeText(context,   "GEOFENCE_EXITED",
        Toast.LENGTH_LONG);
        // Set the countdown to display the toast
            CountDownTimer     toastCountDown;
            toastCountDown = new
        CountDownTimer(toastDurationInMilliSeconds,   100000)   {public
              void onTick(long
millisUntilFinished) {              mToastToShow.show();
}

              public void onFinish() {
                mToastToShow.cancel();
              }
            };
        //  Show  the  toast  and  starts  the  countdown
            mToastToShow.show();
            toastCountDown.start();*/
         NotificationHelper notificationHelper = new NotificationHelper(context);
notificationHelper.sendHighPriorityNotification("GEOFENCE_TRANSITION_ENT ER",
        "",  MapsActivity.class);  GeofencingEvent

          geofencingEvent =
```

```
GeofencingEvent.fromIntent(intent);

 if (geofencingEvent.hasError())
Log.d(TAG, "onReceive: Error receiving geofence event...");return;
 }

 List<Geofence> geofenceList
=
geofencingEvent.getTriggeringGeofences();for
 (Geofence geofence:
geofenceList) {
 Log.d(TAG, "onReceive: " + geofence.getRequestId());
 }
// Location location = geofencingEvent.getTriggeringLocation();int
 transitionType = geofencingEvent.getGeofenceTransition();

 switch (transitionType) {

 case

 Geofence.GEOFENCE_TRANSITION_
ENT
notificationHelper.sendHighPriorityNotification

 ("Entered the Location", "",
MapsActivity.class);
```

```
            break;

        case    Geofence.GEOFENCE_TRANSITION_EXIT:

                notificationHelper.sendHighPriorityNotification("Exited
the Location ", "",MapsActivity.class);
            break;
      }
  }
  }
```

8. TESTING

8.1 Test Cases

Test case ID	Feature Type	Compon ent	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Stat us	Comments	TC for Automation(Y/N)
LoginPage_TC_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on App		1.Enter App 2.Verify login/Signup popup displayed or not		Login/Signup popup should display	Working as expected	Pass		Y
LoginPage_TC_002	UI	Home Page	Visibility the UI elements in Login/Signup popup		1.Enter App 2.Verify login/Signup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Register		Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Register	Working as expected	Pass		Y
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter App 2. Enter Valid username/email in Email text box 3.Enter valid password in password text box 4. Click on login button	Username: abcd@gmail.com password: Testing@123	User should navigate to user account homepage	Working as expected	Pass		Y
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter App 2. Enter InValid username/email in Email text box 3.Enter valid password in password text box 4. Click on login button	Username: abcd@gmail password: Testing@123	Application should show "Login error. There is no user record corresponding to the identifier"	Working as expected	pass		Y
LoginPage_TC_005	Functional	Login page	Verify user is able to log into application with Valid credentials		1.Enter App 2. Enter Valid username/email in Email text box 3.Enter invalid password in password text box 4. Click on login button	Username: ouc9bc0200@rumamtp.vidhya password: Testing@2367855678867567 5	Application should show "the Password is invalid"	Working as expected	Pass		Y
LoginPage_TC_006	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter App 2. Enter InValid username/email in Email text box 3.Enter invalid password in password text box 4. Click on login button	Username: abcd password: Testing@2367855678867567 5	Application should show "Login error. There is no user record corresponding to the identifier"	Working as expected	Pass		Y
Dashboard	Functional	Dashboard	Adding geofence in the location need		1.Enter App 2.Enter the valid username and password 3.Add the Geofence		Application show send alerts around the location	Working as expected	Pass		Y
Alert Notification	Functional	Notification	Notification when the user entered the geofence		1.Enter App 2.Enter the valid username and password 3.Add the Geofence		Application sent the notification " Entered the location"	Working as expected	Pass		Y
Alert Notification	Functional	Notification	Notification when the user exited the geofence		1.Enter App 2.Enter the valid username and password		Application sent the notification " Exited the location"	Working as expected	Pass		Y

8.2 User Acceptance Testing

1 .Defect Analysis

Resolution	**Severity 1**	**Severity 2**	**Severity 3**	**Severity 4**	**Sub total**
By Design	11	4	2	2	19
Duplicate	1	1	2	0	4
External	2	3	0	1	6
Fixed	10	2	3	20	35
Not Reproduced	0	0	2	0	2
Skipped	0	0	2	1	3
Won't Fix	0	5	2	1	8
Totals	24	15	13	25	77

2. Test Case Analysis

Sec on	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	1	4
Client Application	47	0	2	45
Outsource Shipping	2	0	0	2
Except on Reporting	11	0	2	9
Final Report Output	5	0	0	5
Version Control	3	0	1	2
Security	3	0	0	3

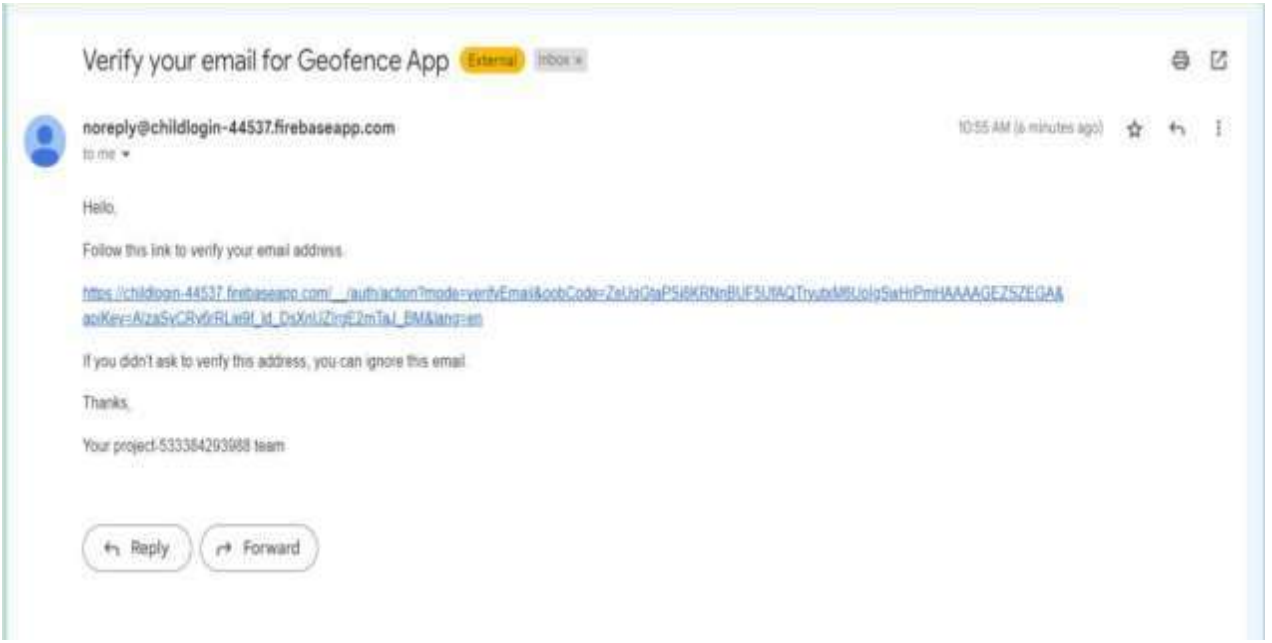
9. RESULTS

9.1 User Registration:

Users get registered to the app using their mail and create their password. On the user is registered a verification mail will be sent to the user mail id. The user needs to verify the account. All user details are stored in the firebase and verification mail is sent by firebase authentication.

1. Registration Page:

2. Verification mail

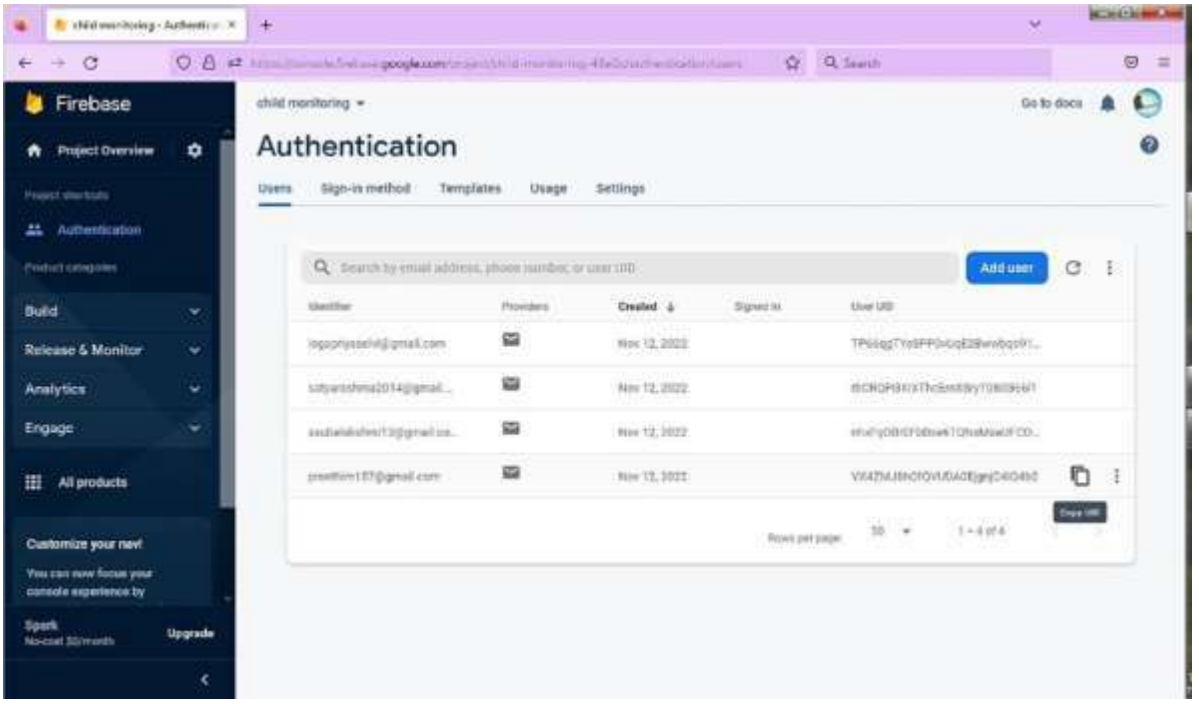


1. User Login

Users with their registered mail and password will login to the account . As the details are stored in firebase, when invalid email or password is entered a message say invalid email or password occurs.

2. Login page:

User Details

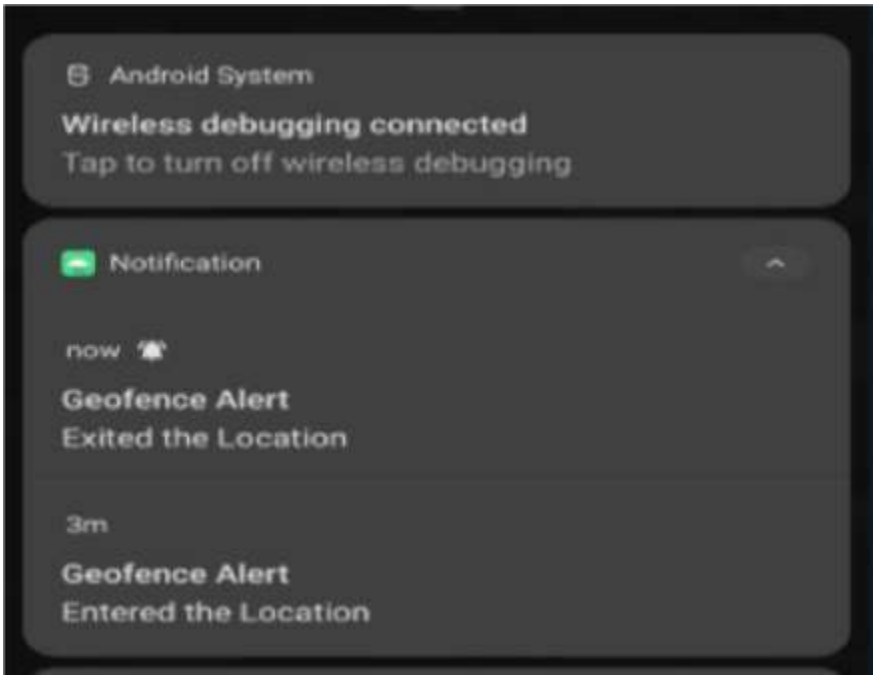


1. Adding Geofence and Alert Notification

Users can add geofence in the location where they want to add or where their child is going to play so they can monitor the child location . Once the child enters the geofence alert notification says entered the location will be displayed . When the child leaves the geofence alert notification says exited the location will be displayed.

Geofence

Notification



10. ADVANTAGES AND DISADVANTAGES

The parent can monitor their child from anywhere at any time, and also get a notification when the child goes away from the permitted radius. It also allows the parent to know if their child is in any dangerous situation. The disadvantages of this system are that the child could not produce the exact alert command during a panic condition. The command produced may not match the previously stored command. This project requires manual intervention.

11. CONCLUSION

Future is similar to the word children. Young people are the future pillars of one's nation, as Dr. A.P.J. Abdul Kalam once said, thus it is important to protect today's children's dreams and lives in order to give them a better future. Therefore, every parent should take good care of their own children to prevent them from being victims of abuse that will completely harm them on a physical, mental, and emotional level, wrecking our future. Due to the significance of our future, our product makes it simple for parents to track their kids and regularly visually monitor them, enabling them to assure their safety and lowering the incidence of child abuse.

13. FUTURE SCOPE

In our system, we use the Internet of Things, GPS, GSM, and Raspberry Pi to automatically monitor the youngster in real time. When we utilize a web camera and GPS to actively monitor, this system needs network

Connections, satellite communication, and a high-speed data connection. It is challenging to keep an eye out for any network problems or satelliteconnection problems. Additionally, there is a lag when streaming videos throughthe server. The Zigbee concept or accessing the system without the internet and employing high-speed server transmission can therefore be used in the future to solve these problems.

13 .APPENDIX

Source code

Source code link:

https://github.com/IBM-EPBL/IBM-Project-22042-1659801817

GitHub link:

https://github.com/IBM-EPBL/IBM-Project-22042-1659801817

Demo link:

https://drive.google.com/drive/folders/1SWKiA1jGfpEp6bZZnf3YvcddHMOTRjCZ