PROJECT DOCUMENTATION

IOT BASED SAFETY GADGET FOR CHILD MONITORING AND NOTIFICATION

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ABSTRACT

This paper is mainly streamed towards child safety solutions by developing a gadget which can be tracked via its GPS locations and also a panic button on gadget is provided to alert the parent via GSM module calling for help. Parental android app is developed to manage and track the device anytime. Smart gadget device is always connected to parental phone which can receive and make phone calls and also receive SMS on gadget via GSM module, also a wireless technology is implemented on device which is useful to bound the device within a region of monitoring range, if device is moving out of monitoring range, then an alert will be triggered on binding gadget, this helps you keep a virtual eye on child. Health monitoring system on gadget checking for parameters like heart beat/pulse rate and temperature is included which can be monitored on parental app. Gadget also monitors whether it is plugged on hand or not using contact switch and alert the parent as soon as it is unplugged.

TABLE OF CONTENTS

1. INTRODUCTION

Project Overview

This invention is primarily focused on improving child safety by creating a device that can be tracked via GPS and has a panic button to notify the parent via a GSM module. In order to control and monitor the device at any time, an Android application has been created for parents. Smart gadget devices are always connected to parents' phones, which can receive and make phone calls as well as SMS gadgets via a GSM module. It is also equipped with wireless technology, which allows you to bind the device within a monitoring range, enabling you to maintain a virtual watch over the child. If the device leaves the monitoring range, an alert will be triggered on a binding gadget, which allows you to remain informed about the child's activities. Bound devices will receive an alert if they move outside of the monitoring range, allowing you to keep a virtual eye on them. 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 and notifies the parent the moment it is unplugged.

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 affect 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 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 careers without having to take any physical action. In essence, kids cannot tell their parents about the abuse they experience regularly. They are too young to 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 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 IoT 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. Sarveswarrao, 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 issue 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 tools 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 (SMSs).

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.

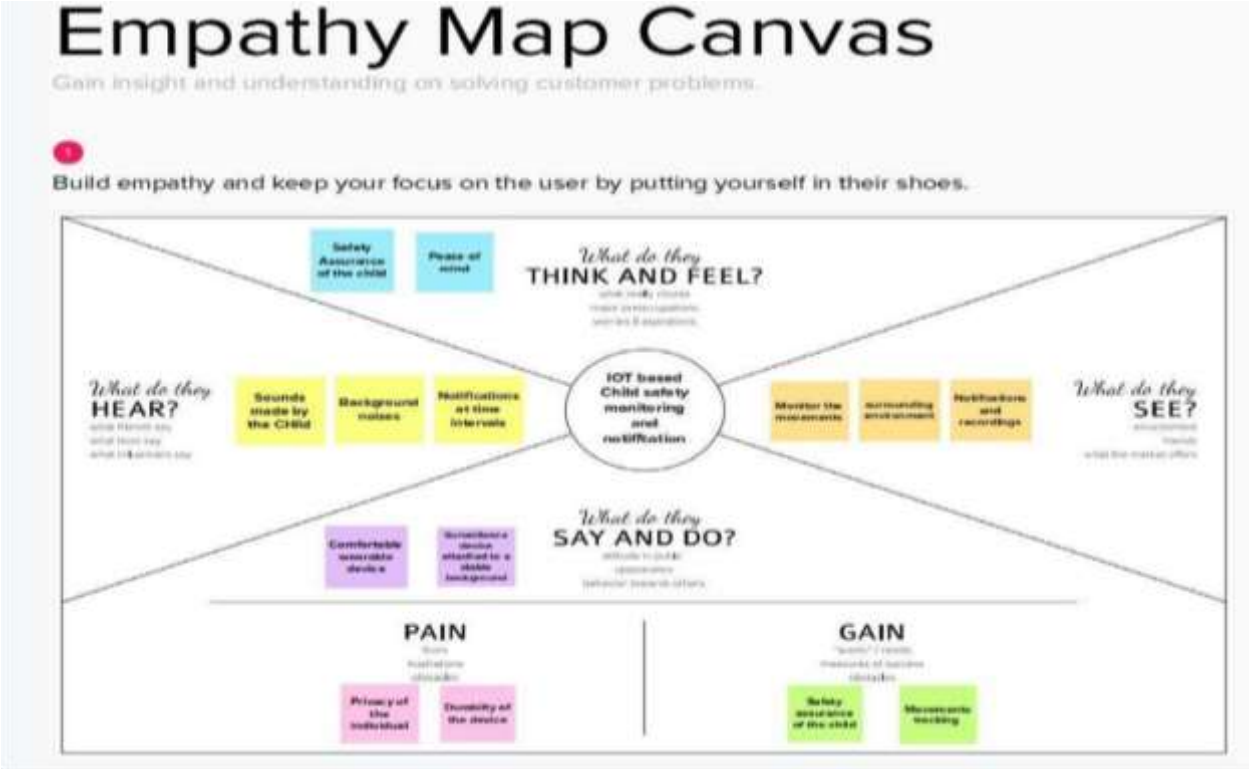
[2] Dheeraj Sunehera, Pottabhatini Laxmi Priya, 'Children Location Monitoring on Google Maps using GPS and GSM', 2016 IEEE 6th International Conference on Advanced Computing.

[3] M. Nandini Priyanka, S. Murugan. K.N.H. Srinivas, T.D.S. Sarveswarrao, 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 and Engineering Technology, Vol. 6 Issue 2, pp. 438-444.

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas



Ideation and Brainstorming

Idea 1:

A compact wearable gadget with a pressure switch. The user can apply pressure to the device by squeezing or compressing it as soon as an attacker is preparing to attack the person or as soon as the person perceives any insecurity from a stranger. Instantaneously the pressure sensor detects this pressure, and a call is placed to the victim's parents' or guardian's mobile phone numbers that were put in the device at purchase, along with a regular SMS that includes the victim's location. An identical message will be delivered to the police if the call goes unanswered for an extended period. Further, a message with the person's current location is sent to the parent or guardian's phone by standard SMS if the person enters an area that is typically off-limits to them.

Idea 2:

By 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 device is always connected to parents' phone, which can receive and make phone calls as well as SMS on gadget via GSM module. Additionally, wireless technology is implemented on 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 and notifies the parent the moment it is unplugged.

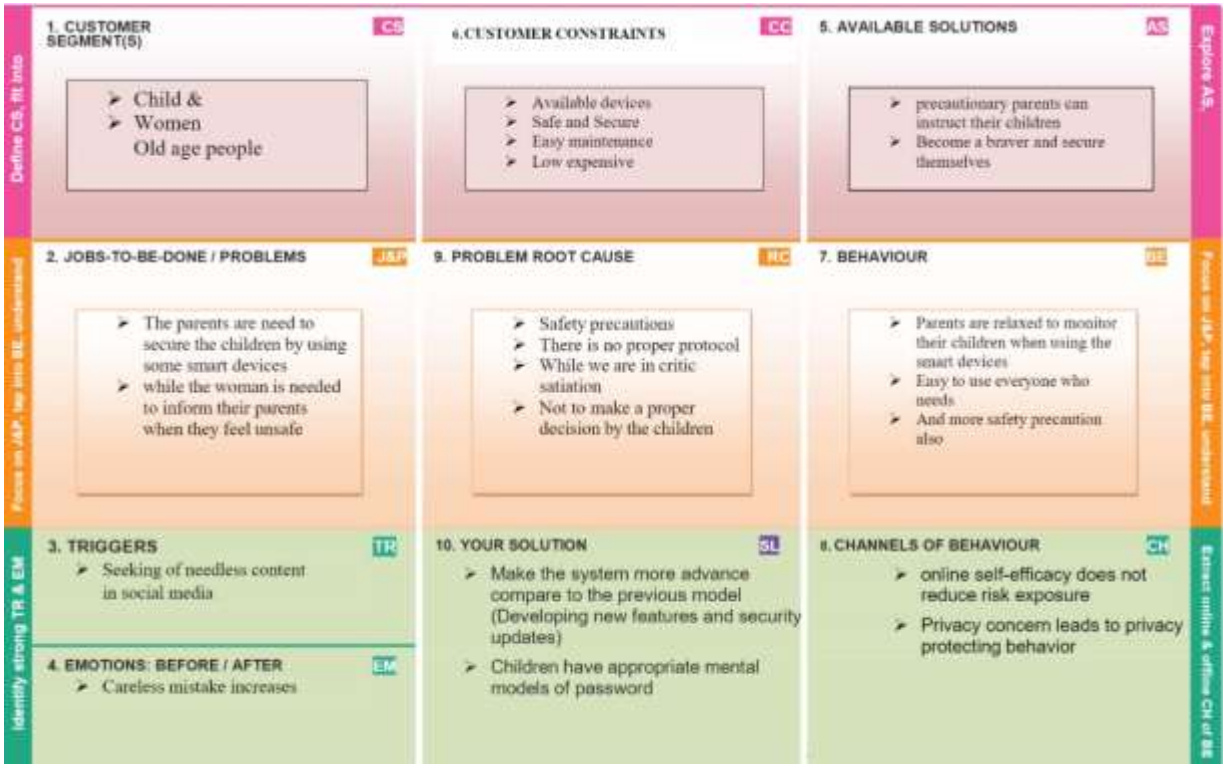
Idea 3:

According to the latest surveys, the number of cases of child abduction and missing children in India is steadily rising. One of the primary worries for parents today is the safety of their children on school buses and outside of school premises, The suggested system makes an effort to give kids security features using new techniques that are introduced to the current safety system for better defense. A portable unit, a cloud platform, and an Android application make up the proposed system. A raspberry pi 2 model B, a GPS receiver with an antenna, and a pulse rate sensor make up the portable device. Using a GPS receiver and a heartbeat sensor, this device will track the child's location in terms of latitude, longitude, and altitude. These data are transmitted to a raspberry pi module, which uses internet connectivity to inject them into elastic search. The android program has a user interface that displays the child's location on a map, the path they took, and their rate of movement. The child's heart rate is also continuously tracked by the application.

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 on description	Compact wearable gadget with pressure button on which can the parents can find the tracker easier
3	Novelty / Uniqueness	Pressure button on with GSM
4	Social Impact / Customer satisfaction	It is useful to working parents when they are leaving their children
5	Business Model (Revenue Model)	Wearable Gadget
6	Scalability of the solution	Compact and easy to use

PROBLEM SOLUTION FIT:



4. REQUIREMENT ANALYSIS

Functional Requirements:

FR. NO.	FUNCTIONAL REQUIREMENTS (EPIC)	SUB REQUIREMENT (STORY / SUB-TASK)
FR-1	User Registration	Registration through Form Registration through e-mail
FR-2	User Confirmation	Confirmation via e-mail Confirmation via OTP

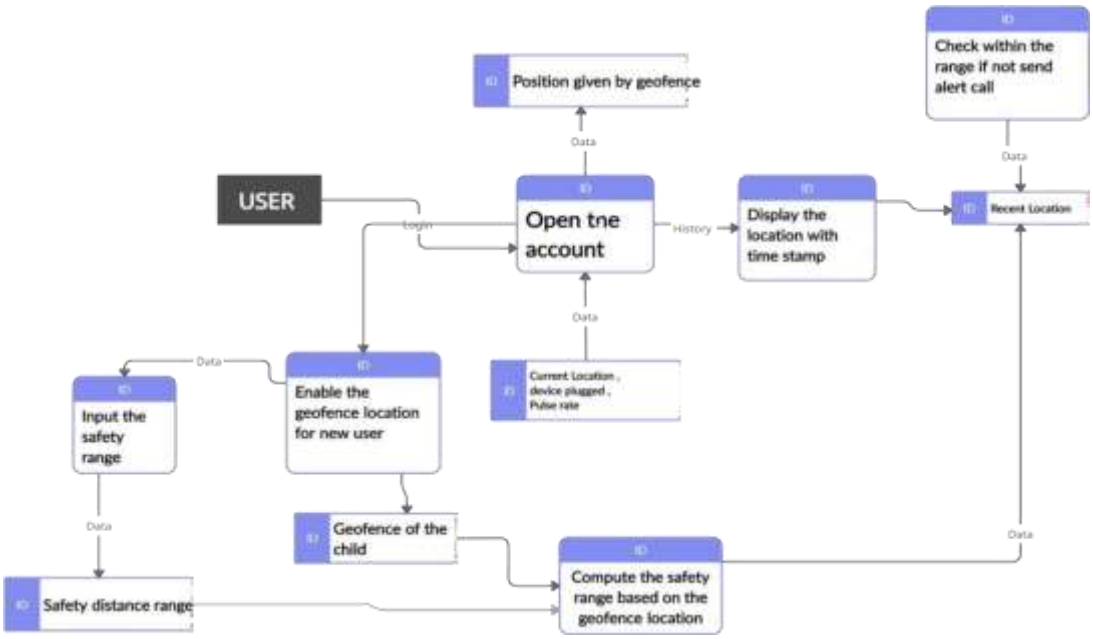
FR-3	Notification	Notification via Mobile App and Normal Message
FR-4	Monitoring	App to monitor the child location
FR-5	Health Monitoring	Health Beat Rate, Temperature

Non-functional Requirements:

NFR.NO.	NON-FUNCTIONAL REQUIREMENTS	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 forgot or not connected the band it will notify the parents and if panic button is pressed, it will send alert message and parents able to track the location.
NFR-3	Reliability	• Easy to use • Flexible • Cost effective
NFR-4	Performance	• Create a child tracker which helps the parents with continuous monitoring the child's location. • The notification will be sent according 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

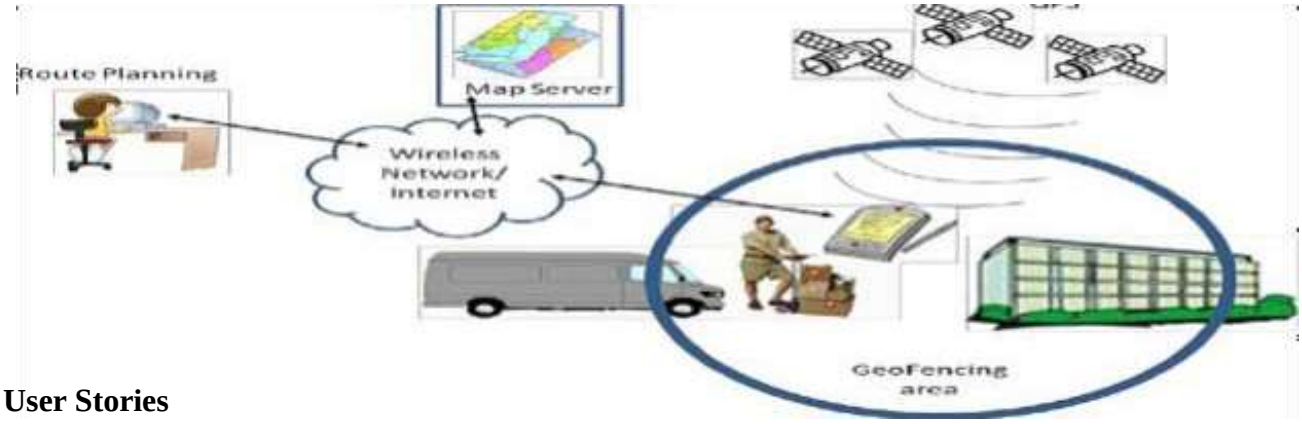
Data Flow Diagrams



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 best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior and other aspects of the software to project stakeholders.
- Define features, development phases and solution requirements.
- Provide specifications according to which the solution is defined, managed and delivered.



User Stories

USER TYPE	FUNCTIONAL REQUIREMENT (EPIC)	USER STORY NUMBER	USER STORY / TASK	ACCEPTANCE CRITERIA	PRIORITY	RELEASE
Customer (Mobile User)	Registration	USN-1 (Father)	As a user, I can register by entering my e-mail and password and confirming my password. I can access the location of my children using the credentials provided as a father.	I can access my account / dashboard and receive a confirmation email and click confirm.	High	Sprint-1
		USN-2 (Mother)	As a user, I can	I can access my account /	High	Sprint-1

			register by entering my e-mail and password and confirming my password. I can access the location of my children using the credentials provided as a mother.	dashboard and receive a confirmation email and click confirm.		
		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 and click confirm.	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering my email and 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 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

Sprint planning and estimation

SPRINT	FUNCTIONAL REQUIREMENT (EPIC)	USER STORY NUMBER	USER STORY / TASK	STORY POINTS	PRIORITY	TEAM MEMBERS
Sprint - 1	Registration	USN-1	As a parent / guardian, I can register for the application by entering my email, password and confirming my password.	2	High	Manikandan S
		USN-2	As a parent / guardian, I can register for the application through e-mail.	1	Medium	Naveen S
	User Confirmation	USN-3	As a parent, I will receive connection location in SMS / e-mail once I have	1	High	Kishore Kumar S

			entered this application.			
	Login	USN-4	As a guardian / parent, I can log into the application by entering email and password.	2	High	Navaneethan M

Sprint Delivery Schedule

SPRINT	TOTAL STORY POINTS	DURATION	SPRINT START DATE	SPRINT END DATE (PLANNED)	STORY POINTS COMPLETE (AS ON PLANNED DATE)	SPRINT RELEASE DATE (ACTUAL)
Sprint-1	20	4 days	24 Oct, 2022	29 Oct, 2022	20	29 Oct, 2022
Sprint-2	20	5 days	28 Oct, 2022	05 Nov, 2022	20	04 Nov, 2022
Sprint-3	20	8 days	02 Nov, 2022	12 Nov, 2022	20	11 Nov, 2022
Sprint-4	20	9 days	10 Nov, 2022	19 Nov, 2022	20	19 Nov, 2022

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

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.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(Geofence geofence) {
		return new
GeofencingRequest.Builder().addGeofence(geofence).setInitialTrigger(GeofencingRequest.INITIA
L_TRIGGER_ENTER).build();
	}
	public Geofence getGeofence(String ID, LatLng latLng, float radius, int transitionTypes) {
		return new Geofence.Builder().setCircularRegion(latLng.latitude, latLng.longitude,
radius).setRequestId(ID).setTransitionTypes(transitionTypes).setLoiteringDelay(5000).setExpiratio
nDuration(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";
            }
        }
        return e.getLocalizedMessage();
    }
}
```

Feature 2 (Alert Notification):

- Once geofence is added, when the child enters the geofence a notification will be sent.
- When the child leaves the geofence, a notification will be sent.

```
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";
    receiving
    @Override
    public void onReceive(Context context, Intent intent) {
    // TODO: This method is called when the BroadcastReceiver is
    // an Intent broadcast
    //.
    Toast.makeText(context, "GEOFENCE_ENTERED", Toast.LENGTH_SHORT).show();
    final Toast mToastToShow;
    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(longmillisUntilFinished) {
            mToastToShow.show();
        }
        public void onFinish() {
            mToastToShow.cancel();
        }
    };
    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());
        }
        switch (transitionType) {
            case Geofence.GEOFENCE_TRANSITION_ENTER:
                notificationHelper.sendHighPriorityNotification("Entered the Location", "",
        MapsActivity.class);
                break;
            case Geofence.GEOFENCE_TRANSITION_EXIT:
                notificationHelper.sendHighPriorityNotification("Exited the Location ", "",
        MapsActivity.class);
                break;
            }
        }
}
```

8. TESTING

Test Cases

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
[illegible]	Functional	Home Page	[illegible]		[illegible]		[illegible]	Working as expected	Pass		Y		[illegible]
[illegible]	UI	Home Page	[illegible]		[illegible]		[illegible]	Working as expected	Pass		Y		[illegible]
[illegible]	Functional	Home page	[illegible]		[illegible]	[illegible]	[illegible]	Working as expected	Pass		Y		[illegible]
[illegible]	Functional	Login page	[illegible]		[illegible]	[illegible]	[illegible]	Working as expected	pass		Y		[illegible]
[illegible]	Functional	Login page	[illegible]		[illegible]	[illegible]	[illegible]	Working as expected	Pass		Y		[illegible]
[illegible]	Functional	Login page	[illegible]		[illegible]	[illegible]	[illegible]	Working as expected	Pass		Y		[illegible]
Dashboard	Functional	Dashboard	[illegible]		[illegible]		[illegible]	Working as expected	Pass		Y		[illegible]
[illegible]	Functional	Notification	[illegible]		[illegible]		[illegible]	Working as expected	Pass		Y		[illegible]
[illegible]	Functional	Notification	[illegible]		[illegible]		[illegible]	Working as expected	Pass		Y		[illegible]

User Acceptance Testing

1. Defect Analysis

RESOLUTION	SERVERITY 1	SERVERITY 2	SERVERITY 3	SERVERITY 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

2. Test Case Analysis

SECTION	TOTAL CASES	NOT TESTED	FAIL	PASS
Print Engine	5	0	1	4
Client Application	47	0	2	45
Security	3	0	0	3
Outsource Shipping	2	0	0	2
Exception Reporting	11	0	2	9
Final Report Output	5	0	0	5
Version Control	3	0	1	2

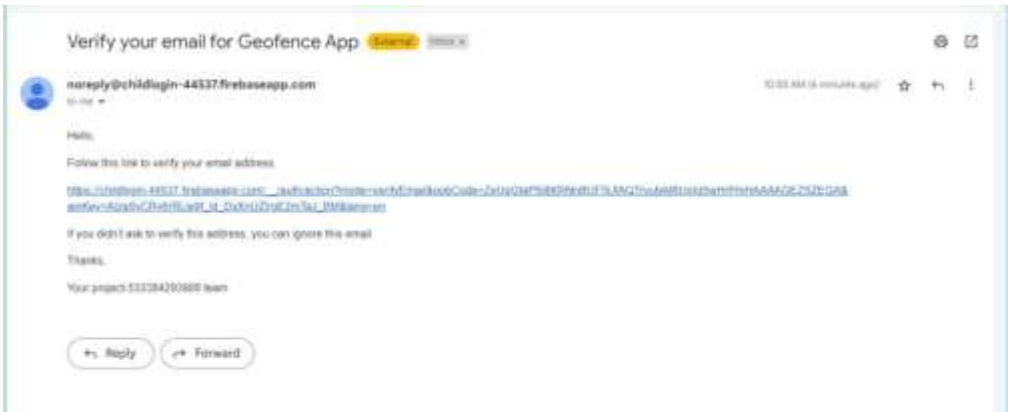
9. RESULTS

I. 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.

II. Registration Page

III. Verification Mail

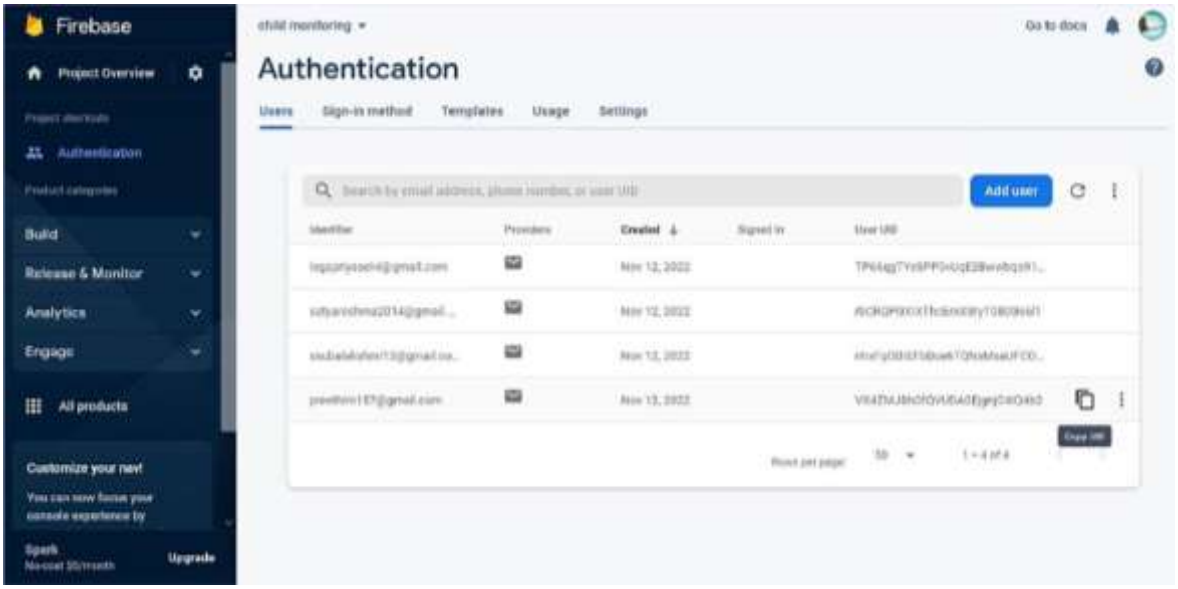


IV. User Login

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 occur.

V. Login Page:

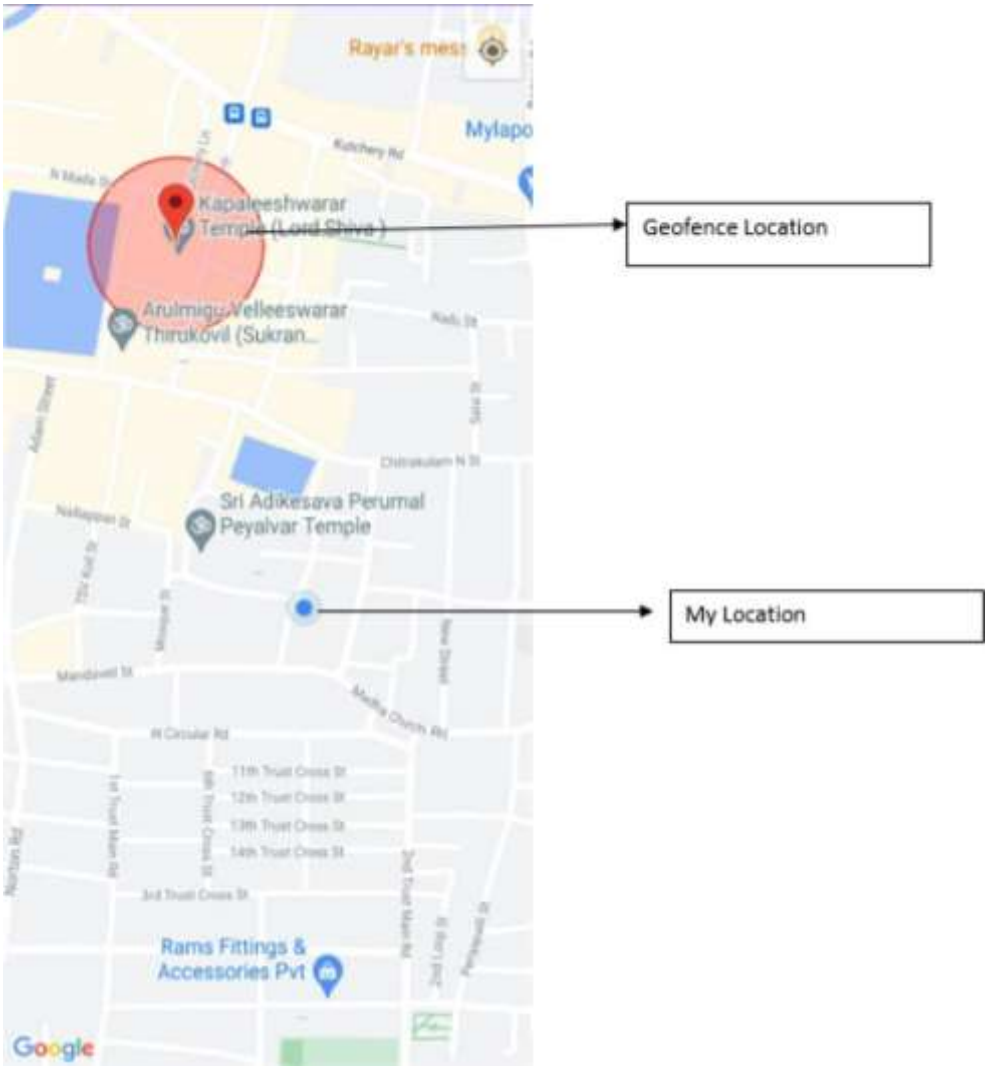
VI. User Details:



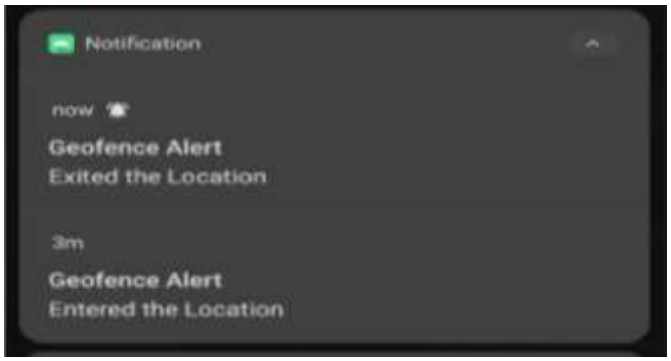
VII. Adding Geofence and Alert Notification

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.

VIII. Geofence:



IX. 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. 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 satellite connection problems. Additionally, there is a lag when streaming videos through the 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.

12. 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.