

Date	12th November
Team id	PNT2022TMID50704
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification

## 1. INTRODUCTION

### 1.1 Project Overview

A tracker that helps parents track a child's location so that the child does not get into dangerous situations.

### 1.2 Purpose

Now a day's Parents have more responsibility than older about their children's. Because Crimes rates are increasing day by day in our country, Crimes such as Child Amusement, Rapes, Murders, Illegal Relationship to avoid these kind of crimes parents must watch their children every step. Eventually mobile phones cause major allegations on our society. Many teens must be noticed by their own parents, it is our duty. But sometimes children are arguing with their parents for watching their steps, to overcome these issues, we need to watch them through online.

## 2. LITERATURE SURVEY

### 2.1 Existing Solution and Problem

- Vibha Chandrala, Niveditha N., Neha B. Reddy, Urmila N., Dr. Deepak G. "Child monitoring system using IoT", International Journal of Advance Research, Ideas and Innovations in Technology, volume: 5, issue: 3, 2019.

#### Description:

The objective behind the project is to design a child safety system through smart phones that provide the possibility to trace child's location as well as during emergency children can alert parents by saying a child is in an emergency via message. An Android application is developed and installed on parents phone so that their children can be traced, monitored to keep track of their activities and location using GPS. An android application is better than web interface.

- Bannuru Ranjeeth, B. Srinivasa Reddy, Y. Manoj Kumar Reddy, S. Suchitra, B. Pavithra. "Smart Child Safety Wearable Device", Department of Computer Science and Engineering., Hindustan Institute of Technology and Science, Chennai, India, August 19, 2020.

#### Description:

The technical goal of this task is to have an ordinary correspondence between the child and parent via the device, which aids in locating the child's location, pulse, and temperature using the gadget equipped with a pulse sensor, temperature sensor, and GPS tracker. As many hardware components are being used and some software for storing and analysing data, the

accuracy will be close to expectations. This can be improved.

- M. Benisha , Thandaiah Prabu R, Gowri. M, Vishali. K, Divya Priyadharshini. R, M. Anisha , Ponmozhi Chezhiyan, C. Jim Elliot "Design of Wearable Device for Child Safety", Proceeding of the Third International Conference on Intelligent Communication Technologies and Virtual Mobile Network (ICICV 2021). IEEE Xplore Part Number CFP21ONG-ART: 978-7381- 1183-4, 2021.

#### **Description:**

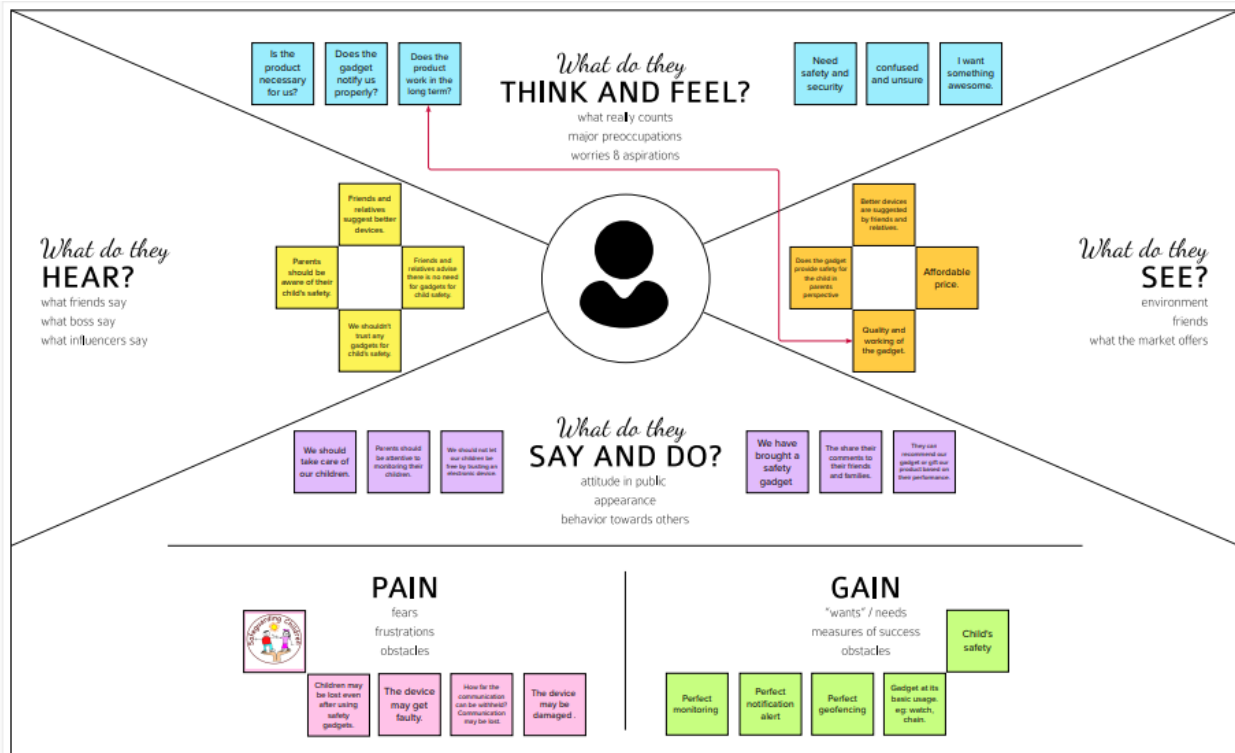
The mechanism provides a better methodology to view & track the location of the children in terms of latitude and longitude which can additionally track using Google maps. If an accident happens, message with location sends instantly to the registered contacts and also to the nearest police stations and rescue the children.

## **2.2 References**

1. Vibha Chandrala, Niveditha N., Neha B. Reddy, Urmila N., Dr. Deepak G. "Child monitoring system using IoT", International Journal of Advance Research, Ideas and Innovations in Technology, volume: 5, issue: 3, 2019.
2. Bannuru Ranjeeth, B. Srinivasa Reddy, Y. Manoj Kumar Reddy, S. Suchitra, B. Pavithra. "Smart Child Safety Wearable Device", Department of Computer Science and Engineering., Hindustan Institute of Technology and Science, Chennai, India, August 19, 2020.
3. M. Benisha , Thandaiah Prabu R, Gowri. M, Vishali. K, Divya Priyadharshini. R, M. Anisha , Ponmozhi Chezhiyan, C. Jim Elliot "Design of Wearable Device for Child Safety", Proceeding of the Third International Conference on Intelligent Communication Technologies and Virtual Mobile Network (ICICV 2021). IEEE Xplore Part Number CFP21ONG-ART: 978-7381-1183-4, 2021.

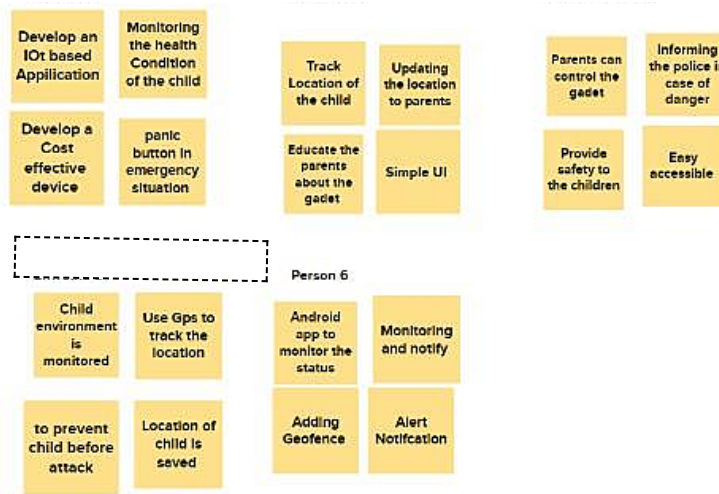
## **3. IDEATION & PROPOSED SOLUTION**

### **3.1 Empathy Map Canvas**

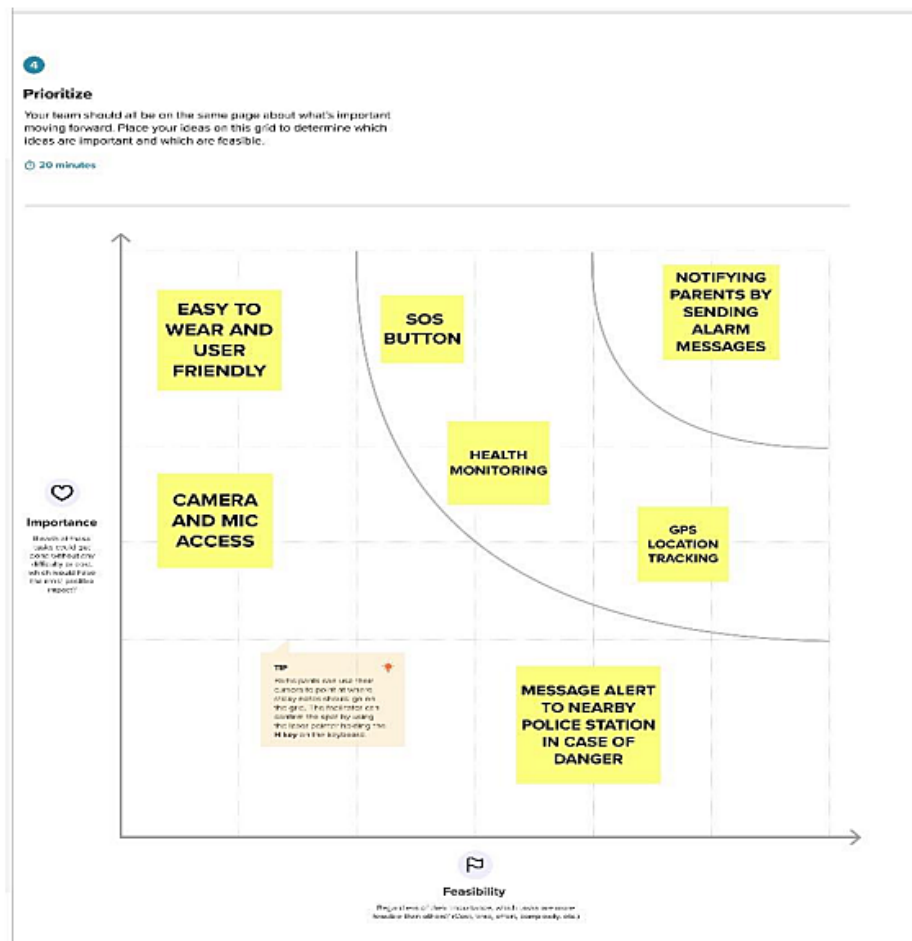


### 3.2 Ideation & Brainstorming

#### Brainstorming



## Ideation Prioritization



### 3.3 Proposed Solution

s. no	Parameter	Description
1.	Problem Statement (Problem to be solved)	The child needs to be monitored even when the parents get distracted.
2.	Idea / Solution description	Create a virtual geographic boundary, known as geofencing.
3.	Novelty / Uniqueness	An automatic alert for child health care will be generated whenever the child crosses the geofencing.
4.	Social Impact / Customer	Relax with safety gadgets for keep monitoring any-

	Satisfaction	time.
5.	Business Model (Revenue Model)	It may be model as children using things.
6.	Scalability of the Solution	It helps reduce the number of children kidnapped.

### 3.4 Problem Solution fit

Project Title: IoT Based Safety Gadget For Child Safety Monitoring & Notification  
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Project Design Phase-I - Solution Fit Template

Define CS, fit into CC Focus on J&P, tap into BE.	<b>1. CUSTOMER SEGMENT(S)</b> <ul style="list-style-type: none"> <li>It designed for parents for the continuous monitoring.</li> </ul>	<b>6. CUSTOMER SOLUTIONS</b> <ul style="list-style-type: none"> <li>Keep tracking</li> <li>Technology awareness.</li> </ul>	<b>5. AVAILABLE SOLUTIONS</b> <ul style="list-style-type: none"> <li>In early stage parents wants attention to their children.</li> <li>By using this gadget parents where easy to focus on their duties .</li> </ul>	Explore AS, differen
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <ul style="list-style-type: none"> <li>More reliable to use</li> <li>High security purpose</li> <li>Monitoring and alert be send .</li> </ul>	<b>9. PROBLEM ROOT CAUSE</b> <ul style="list-style-type: none"> <li>Parents wants to take care and monitoring</li> <li>User friendly and security guidance.</li> </ul>	<b>7. BEHAVIOUR</b> <ul style="list-style-type: none"> <li>If any technical issue in software faced by customer, they will send us feedback on the same and our technical team will solve their problem in efficient way and get back to them by sending mail.</li> </ul>	

## 4. REQUIREMENT ANALYSIS

### 4.1 Functional requirement

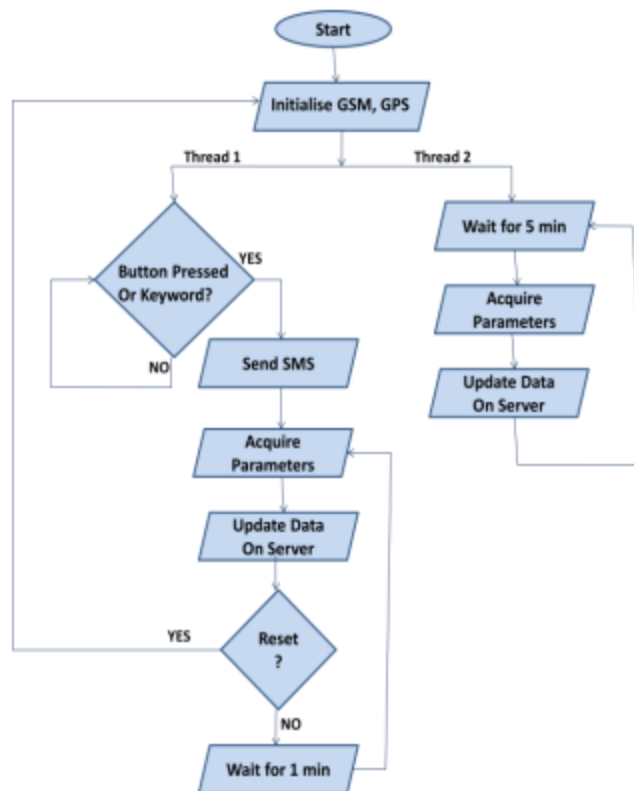
Fr no	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Notification	Notification Via Mobile App and normal message
FR-4	Monitoring	App to monitor the child location

## 4.2 Non-Functional requirements

FR No	Non-Functional Requirement	Description
NFR-1	Usability	This model can help to notify the parents in case of emergency
NFR-2	Security	Parents can feel secure because if the child leave the desired location and immediately a notification will be sent
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'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

### 5.1 Data Flow Diagrams

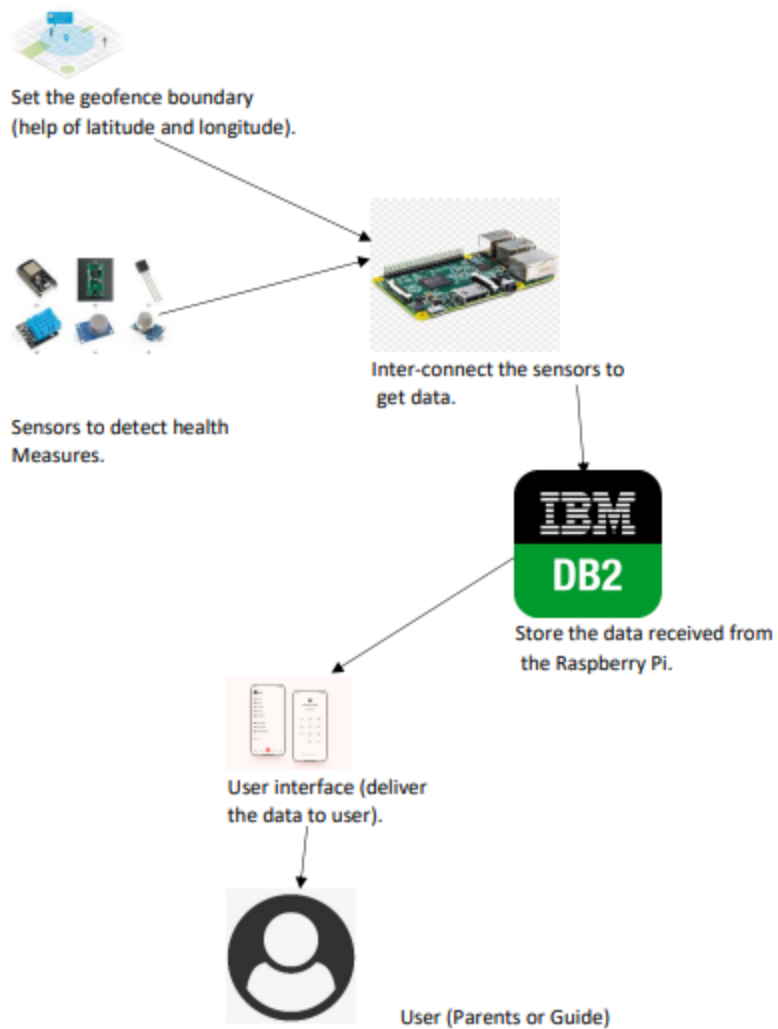


**DATA FLOW DIAGRAM: IOT based safety gadget for child safety monitoring and notification**

## 5.2 Solution & Technical Architecture

→ Solution Architecture

### IoT Based Safety Gadget For Child Safety Monitoring & Notification



### Technical Requirements:



**Table-1: Components & Technologies:**

S. No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	Java
2.	Application Logic-1	Logic for a process in the application	Java
3.	Database	Data Type, Configurations etc.	Firebase
4.	External API-1	Purpose of External API used in the application	Google Maps API
5.	Notification	Alert Notification when exited the geofence	Firebase Cloud Messaging

**Table-2: Application Characteristics:**

S.No	Characteristics	Description	Technology
1.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	We are using the Google Maps <a href="#">API</a> , so for every instance of time it updates the current location of the children to their parents/caretakers.
2.	Scalable Architecture	Justify the scalability of architecture (3 - tier, Micro-services)	The technology is used to monitor and send alert notification.
3.	Availability	Justify the availability of applications (e.g. use of load balancers, distributed servers etc.)	We are using the geofence, a service that triggers an action when a device enters a set location
4.	Performance	Design consideration for the performance of the application	We are using Firebase , to send the notification

### 5.3 User Stories

### Group Ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

#### MONITORING

GPS  
LOCATION  
TRACKING

SENDING  
MESSAGE  
THROUGH  
GSM

CAMERA  
AND MIC  
ACCESS

HEALTH  
MONITORING

#### NOTIFICATION

SOS  
BUTTON

MESSAGE ALERT  
TO NEARBY  
POLICE STATION  
IN CASE OF  
DANGER

NOTIFYING  
PARENTS BY  
SENDING  
ALARM  
MESSAGES

CONTACT  
NEARBY  
RELATIVES  
AND NOTIFY  
PARENTS

TIP

Add customizable tags to stick notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

#### SECURITY

CAMERA  
FOR  
CAPTURING  
STRANGERS

SMART  
ASSISTANCE  
TO GUIDE  
THE  
CHILDREN

MIC ACCESS  
IN CASE OF  
UNUSUAL  
SITUATIONS

PERIODIC  
MONITORING  
OF THE  
CHILDREN BY  
PARENTS

#### DESIGN

BEST  
DESIGN  
FOR EASE  
OF USE

USING ALL  
NANO  
EQUIPMENTS  
TO MAKE IT  
COMPACT

EASY TO  
WEAR AND  
USER  
FRIENDLY

INTEGRATING  
ALL  
ELECTRONICS  
AND BATTERY  
PACK IN A  
COMPACT WAY

## 6. Planning Tool

If the child goes beyond that particular boundary specified, the respective guardians will receive an Alert call using GSM.

In our system, we use several components like,

1. Temperature sensor
2. Pulse sensor
3. GPS
4. GSM
5. Web camera
6. Raspberry pi microprocessor.

### BLUETOOTH:

Bluetooth technology is one of the early implementations of wireless connectivity of devices,

which operates at the band of 2.4 to 2.485 GHz [36]. Other wireless technologies such as Zigbee and Wi-Fi also have implementations for tracking. Position estimation in outdoor localization using Zigbee technology [67] and an automated tracking & monitoring system for construction materials [31] are a few implementations of wireless technology in location services.

Bluetooth Low Energy (BLE) beacons are low power devices which were developed to control short range applications [24].

### **GPS TRACKING:**

GPS tracking is the surveillance of location through use of the Global Positioning System (GPS ) to track the location of an entity or object remotely. The technology can pinpoint longitude, latitude, ground speed, and course direction of the target. The GPS is a "constellation" of 24 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment. Accuracy can be pinpointed to within one meter with special military-approved equipment.

GPS equipment is widely used in science and has now become sufficiently low-cost so that almost anyone can own a GPS and many do in a smartphone, tablet or GPS navigation device. GPS tracking is invaluable for police, fire fighters, military personnel and large courier businesses. Many of these use automatic vehicle locator (AVL) systems. AVL systems generally include a network of vehicles that are each equipped with a mobile radio receiver, a GPS receiver, a GPS modem and a GPS antenna.

This network connects with a base radio consisting of a PC computer station as well as a GPS receiver and interface. GPS uses interactive maps rather than static map images on the Web. AVL systems can be used to increase the accountability of field personnel and boost the efficiency of a company's dispatching procedure through tracking and communication. Other GPS tracking technologies include GPS guns that law enforcement can fire at a fleeing car, avoiding a dangerous pursuit.

In some places, law enforcement representatives also use GPS dust, which consists of GPS trackers so small they might be blown or rubbed on a target's clothing. GPS devices in smartphones and other mobile devices are often used to track employee location. Privacy advocates warn that the technology can also make it possible for advertisers, government, hackers and cyberstalkers to track users through their mobile devices.

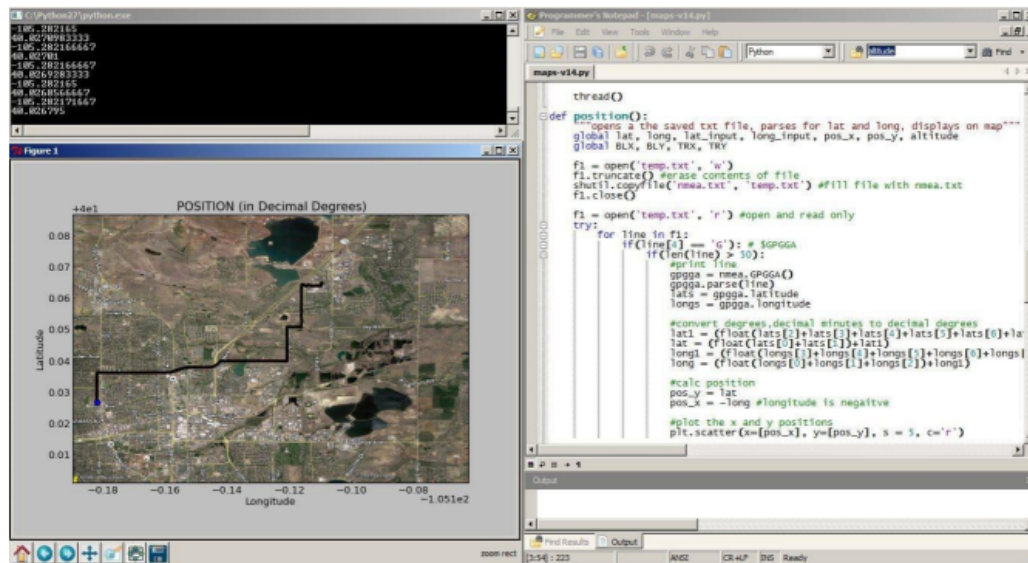
## **7. CODING & SOLUTIONIN**

(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 is going .

→ Multiple Geofence can be added. 8. package com.example.geofence



## 8. User Acceptance Testing

### 1. Defect Analysis

Resolution	Severit y1	Severit y2	Severit y3	Severit y4	Subtota l
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

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

### 1. User Registration :

User gets 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 .

### Registration Page :

## Geofence



## Register

REGISTER

Already registered [Login here](#)

## Verification mail

Verify your email for Geofence App

External

Inbox x



noreply@childlogin-44537.firebaseio.com

to me

10:55 AM (6 minutes ago)



Hello,

Follow this link to verify your email address.

[https://childlogin-44537.firebaseio.com/\\_/auth/action?mode=verifyEmail&osbCode=ZaUoGtaPSj8KRNnBUFSUJAQTovtM5UoigSwH:PmHAAAAQEZSZEQA&sciKey=AlzaSvCRy6RLw9f\\_Ht\\_DsXniU7InE2mTaj\\_RM&lang=en](https://childlogin-44537.firebaseio.com/_/auth/action?mode=verifyEmail&osbCode=ZaUoGtaPSj8KRNnBUFSUJAQTovtM5UoigSwH:PmHAAAAQEZSZEQA&sciKey=AlzaSvCRy6RLw9f_Ht_DsXniU7InE2mTaj_RM&lang=en)

If you didn't ask to verify this address, you can ignore this email.

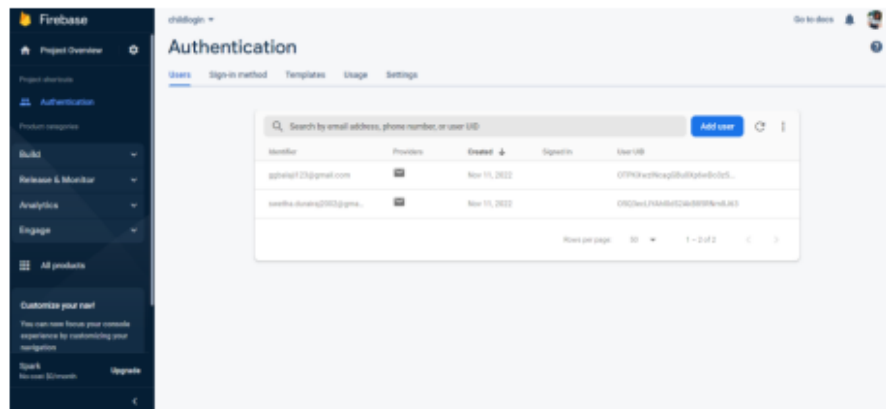
Thanks,

Your project-533384293988 team

Reply

Forward

## User Details



### Adding Geofence and Alert Notification

User can add geofence in the location where they want to add or where their child is going play so they can monitor the child location .

Once the child enter the geofence alert notification says entered the location will be displayed .

When the child leaves the geofence alert notification says exited the location will displayed.

### Geofence

## **10. ADVANTAGES & DISADVANTAGES ADVANTAGES:**

- ✓ Simple and easy to use
- ✓ Parents can feel secure because if the child leave the desired location and immediately a notification will be sent
- ✓ Geofence can be added easily

## **DISADVANTAGES:**

- ✓ Multiple geofence can be a problem

## **11. CONCLUSION**

- This research demonstrates Smart IoT device for child safety and tracking, to help the parents to locate and monitor their children. Through this device, the parent can track and monitor their child with just a simple app.
- It is not possible to always stay beside children as most of the parents need to go for work. With this project, parents can track the location of their children and get alerts whenever the child out of the geofence.
- It becomes easy for parents to look after their child while working. This device is efficient to use. Thus, by keeping in mind the advantages and applications we are developing a child monitoring device.
- In order to avoid kidnapping cases, the child monitoring system is needed.

## **12. FUTURE SCOPE**

The future work would be to further develop and implement the safety wearable device so that it could be watch or sown into a fabric that could be worn, using synthetic fibers