PROJECT REPORT ON

IoT Based Safety Gadget for Child Safety Monitoring & Notification

TEAM ID : PNT2022TMID42649

SUBMITTED BY

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1. INTRODUCTION

1.1 Project Overview

As it pertains to parents monitoring their child's whereabouts, geofencing allows someone to create virtual perimeters of a geographic area that is "safe" for a child to be located. A parent can create these safe areas by using settings within a child's phone (depends on the phone), third-party apps, or phone carrier location services.

Once the geo fence is set-up, a parent will be able to view their child's real-time location data. If the child strays from a safe area, the parent will be sent push notifications in the form of a text message, pop-up, etc. Every geofencing option works differently, so the process of getting notifications may vary.

1.2 Purpose

To detect a user's location, and to use that location to serve them relevant, valuable communications. Geofencing in Action Braze customer Burger King used this location-based approach in a clever, fairly hilarious way.

2. LITERATURE SURVEY

2.1 Existing problem

In this year, around 3,600 children went missing in Tamil Nadu. Data released recently shows that the maximum number of missing children were aged 12-18 years, with the number in this age group being 1,583. Police were also able to track down 1,178 kids. With the advancement of smartphone technology, a smart location tracking application can be developed and installed to help parents to track the location of their children in real time. Its portability also facilitates parents to receive immediate notification about their children's movement at any time.

2.2 References

[1] M. Izham Jaya,Goh Xin Tong,Mohd Faizal Ab Razak “Geofence Alerts Application With GPS Tracking For Children Monitoring (CTS)” 2021 International Conference on Software Engineering & Computer Systems and 4th International Conference on Computational Science and Information Management (ICSECS-ICOCSIM).

[2]. Bernama.com. ‘Cases of Missing Children & Teenagers’, 2019. [Online].Available:https://bernama.com/en/infographics/index.php?v =3678. [Accessed: 20-February-2021].

[3]. Allahham, A. A. and Rahman, M. A., “A Smart Monitoring System for Campus Using Zigbee Wireless Sensor Networks,” Journal of Software Engineering and Computer Systems (IJSECS), 2018, 4(1), pp. 1-14, doi: 10.15282/ijsecs.4.1.2018.1.0034

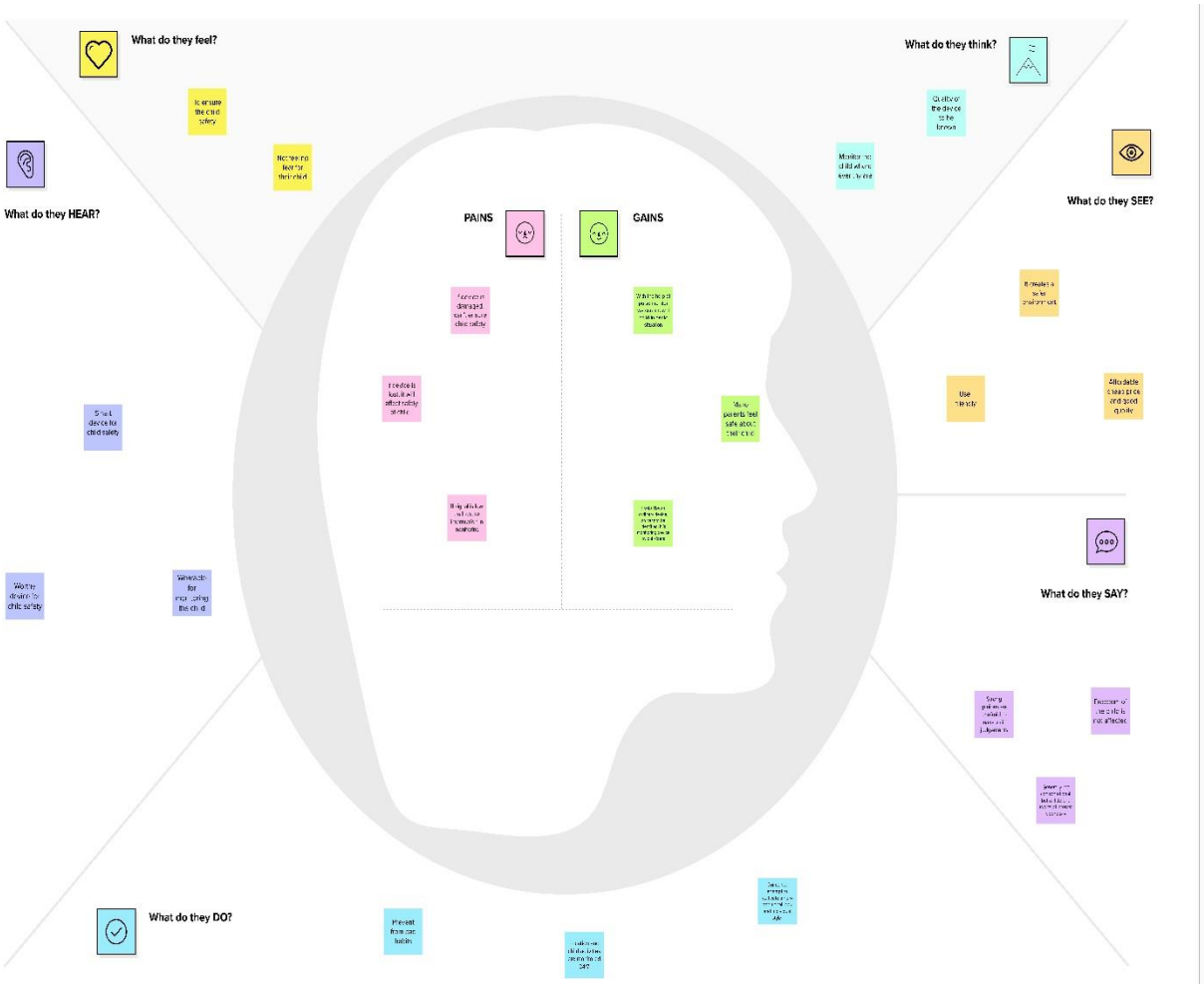
[4]. M.T.Kamisan, A.A.Aziz, W.R.W. Ahmad and N. Khairudin, "UiTM campus bus tracking system using Arduino based and smartphone application,"2017 IEEE 15th Student Conference on Research and Development (SCOReD), Wilayah Persekutuan Putrajaya, Malaysia,2017, pp.137-141, doi:10.1109/SCORED.2017.8305406.

2.3 Problem Statement Definition

Today’s children are inquisitive and adventurous in their activities. They always want to move around playing with other children or explore the different things of the entire world. However, dangers lurk everywhere and the cases of kidnapping and missing children continues to rise. There also had been times your child got lost by wandering away in amusement parks or airports. These painful experience you even won’t talk about. As a parent, it’s your responsibility to keep an eye on your children’s activities for their safety. Luckily, technology has made it easier for parents to keep track of their children with geofence alert.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

Step-1: Team Gathering, Collaboration and Selectthe Problem Statement

IoT or the internet of things is characterized as a forthcoming innovation that empowers us to create worldwide networked machines and also the devices that can be helped for exchangingof communication. As we all know that the real-time application has been increasing day by day, the smart connection also had increased. Rapid population growth, led to the increase in global life expectancy and the advance of technology, paving the pathway for the creation of age-friendly environments. This had led to the necessity in designing new products for infantsprotection.

Infants or toddlers need parents' attention 24×7. In this present era, the cases regarding missing children have been increasing day by day, which was the main motivation that comes for the safety of little children. However, the parents cannot continuously monitor their babies' conditions either in normal or abnormal situations. Still, certain incidents like infant attacks have been reported, it is necessary to protect the baby.

Step-2: Brainstorm, Idea Listing and Grouping

Team Member 1: Elakkiya. S

Child and women safety is a challenging problem nowadays due to antisocial elements in the society. The crime rate is day by day increasing. Schools and working places need high surveillance for ensuring the safety among children and women. Smart phones are playing major role for ensuring the safety, where some mobile based applications provide alert systems. During the emergency, mobile apps alert the control room of nearby police station or caretakers of children. The literature shows that location tracking devices are available in the market, but it does not provide the complete solution to the problem. The solution to this problem is to design an IoT device, which senses the child's location and environment and during emergency, it should send the alert to the parents automatically.

Team Member 2: Jenith Ebinesh. S

The children are too young to take care of themselves. We cannot monitor the children at all times in school, play area, and outside place. In this paper, we discuss the concept of child safety device based on Internet of things. The aim of this device is to provide safety to the child by allowing the parent to locate the child and view their surroundings. This device can be used to monitor the temperature and motion of the child. If any problem persists, the GSM mobile communication module automatically sends a text message to the parent as SMS.

Team Member 3: Riyaz Ahamed. S

Crimes on children keep increasing despite actions have been taken by the government. Revealed by [9], the overall percentage of child abasements worldwide is about 80% nowadays, out of which 74% are girls and the remaining are boys. For every 40 seconds, a child is gone missing in the world. Due to that, parents are worried for their children and perhaps, a hard challenge for them to guarantee safety of their children when they are out.

Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more.

To show the child's actual data with reference values.

Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations

Team Member 4: Shanmathi. G

Develop a prototype of IoT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace. Besides, unlike existing smart band, which is less focusing on child security aspect, the proposed system emphasizes in getting as much data as possible so that actual situation can be identified. , the information indicating children's status, along with reference values will be sent to parents' devices with the app installed. If children's actual data is not within the range of reference value, alert notification and some suggestions will be sent to parents' devices. Also, when children leave geofences, notification will be sent to parents' device.

Step-3: Idea Prioritization

The section mainly discussed about significant of the research and why this study needs to be carried out. The child security system benefits parents as well as children. Since it aids in locating children, monitoring child's condition and security status instantly at anyplace and any time, parents who often tied up in work or neglect their children are gaining advantages from it. Through the proposed system, immediate actions can be taken forthwith in case the child is threatened. Thus, child security is guaranteed, crime rate related to children is reduced and eventually, parents can rest assured. In fact, reduction of crime rate brings about long-term positive effects such as improving country's reputation and quality of life, increasing community security, safety, and cohesion as well as generating economic benefits for individuals, committee and taxpayers. Besides, the proposed system makes ample use of IoT, proving IoT is evolving which can be included in multiple areas comprising the child security field.

Throughout the research, it is clearly explained the IoT concept, child safety issues and the need of using child security system. Some previous studies have been included for designing the IoT-based child security smart band. It assists parents to monitor their children remotely. In case situations happen, notifications will be sent to parents so that actions can be taken.

3.3 Proposed Solution

The Geofence Alerts Application with GPS Tracking for Children Monitoring is comprised of a GPS tracker and a web application. The GPS tracker is responsible for sending the location of the children to the Firebase cloud database . The web application then acquired the longitude and latitude of the children's location and provide the parents with real-time location tracking along with other functionalities such as geofence setup and time scheduling, alarm, and notification, as well as the history route. The overview of the Geofence Alerts Application with GPS Tracking for Children Monitoring.

3.4 Problem Solution fit

1.	CUSTOMER SEGMENT(S)	Our Customers are mainly parents who are working and do not have enough time to take care of their children. Such parents are not provided with availability at any time to look after their children. If the case so they are in need of something to make their children under the surveillance of them.
2.	JOBS-TO-BE-DONE/PROBLEMS	To enhance the operating condition of the developed solution the way it is not supposed to deal with any fault at any point of time so that the child safety can be highly ensured. To ensure the parents that their surveillance on their children can never be taken off.
3.	TRIGGERS	The trigger which induces the customers is the one that when other working parents give a try to this and comment a positive review on this, they are also focusing on their child safety today.
4.	EMOTIONS: BEFORE/AFTER	Customers are being frustrated that their children are doing safe or not before using the gadget designed. Once they start to use the developed solution they might feel free to focus on their work and also the surveillance of their children would happen with ease at any point of time.
5.	AVAILABLE SOLUTIONS	Of course the solutions are available readily in the market such as Child GPS Tracking System, Child Safety GSM Kit, etc.... One such constraint the customers facing are cost and inefficiencies in the working once purchased.

6.	CUSTOMER CONSTRAINTS	The constraints our customers facing are such connectivity issues or may be the protocols being used for communication. There may be chances of issues arised due to technical dis efficiencies. Giving a second thought, price to be afforded for buying the developed solution kit might be the one they could not afford.
7.	BEHAVIOUR	Our proposed solution has the modes of working in both offline and Online. In case of any dis connectivities happen the gadget which has been developed might tend to work on a plan B which includes the backup of the failure of actual working kit.
8.	CHANNELS of BEHAVIOUR	Our proposed solution has the modes of working in both offline and Online. In case of any dis connectivities happen the gadget which has been developed might tend to work on a plan B which includes the backup of the failure of actual working kit.
9.	PROBLEM ROOT CAUSE	Considering the origination of the problem, it occurs in the base of merely irrespective persons that are no way relatable to the children but for the currency kind of thing and also the child abuse(mainly in case of girl children)
10	YOUR SOLUTION	Our Team has highly been intending to develop an efficient solution to overcome all the flaws that the existing solutions hold back still. We are highly on demand to ensure the efficient functionalities of the developing module the way it will not fail at anytime.

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

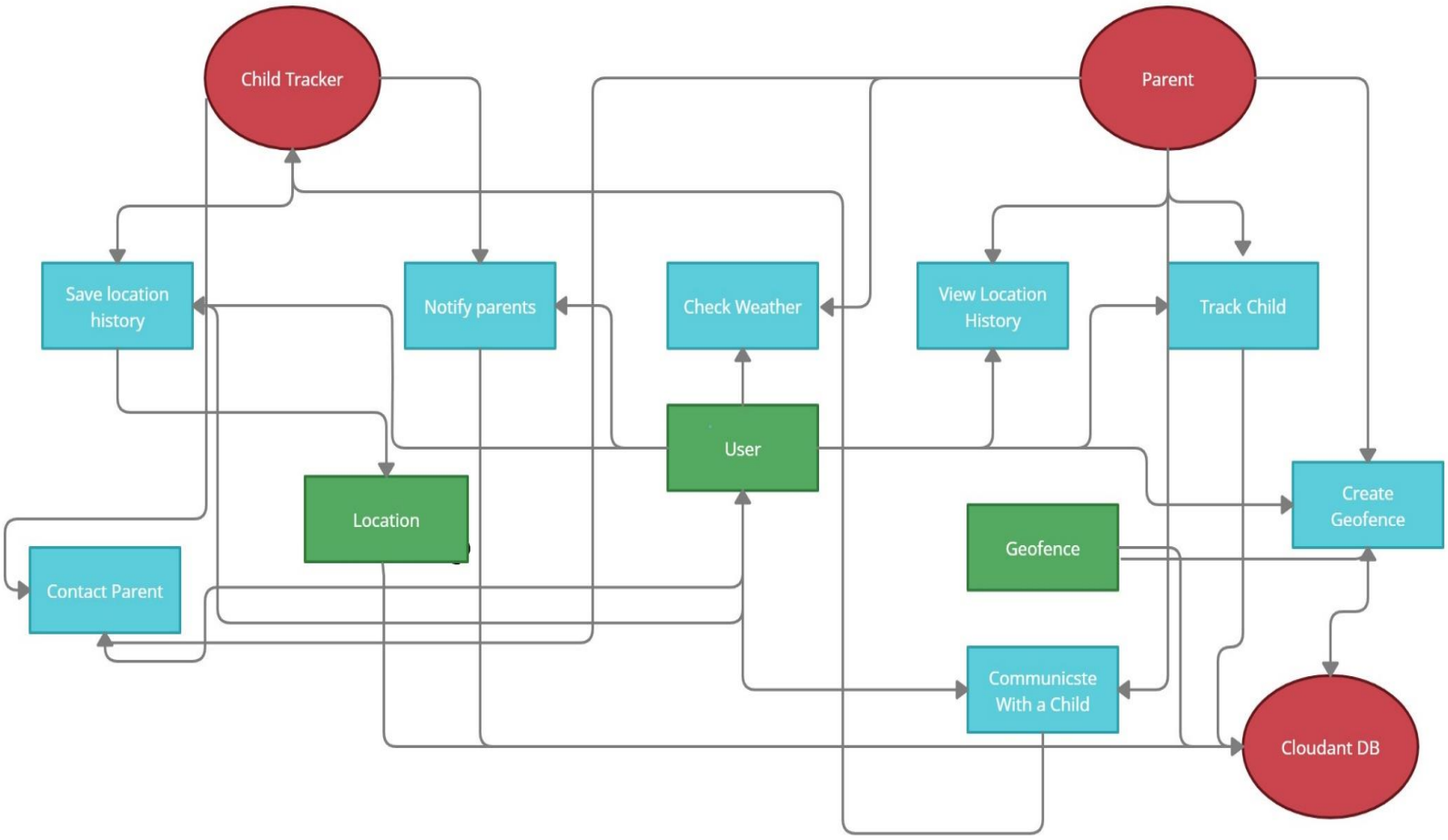
SI No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
1.	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
2.	User Confirmation	Confirmation via Email Confirmation via OTP
3.	Authentication	Only the authorized person for that product will know Ensures security
4.	User Interface	The Inventor Able to see the location of children when they are out of geofence will also track the exact information about the children
5.	Notification	Notified through mobile and mail

4.2 Non- Functional requirements

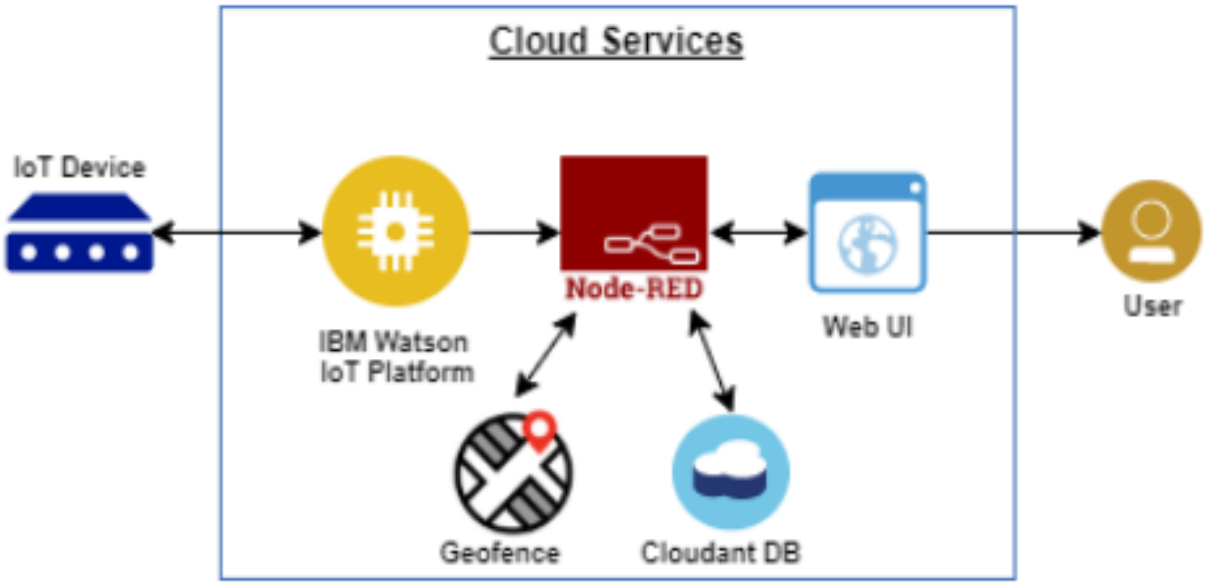
SI No.	Non-Functional Requirement	Description
1.	Usability	Accessed through Mobile App Showing location (latitude and longitude) of child and also other measures to ensure safety like notification. Portable and comfortable to use.
2.	Security	Database security and ensuring the safety of the product while in use.
3.	Reliability	Once logged in, the webpage is available until logging out of the app, and a comfortable platform or creates a good environment for users to use.
4.	Performance	Each page must load within 4 seconds and database needs to be updated every few seconds and a notification must be sent immediately if seen a change in the child’s location.

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 Solution 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 solution

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	User Registration	USN-1	Registration through website Registration through app	2	High	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G
Sprint-1	User Confirmation	USN-2	Confirmation via Email Confirmation via OTP	1	High	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G
Sprint-2	User login	USN-3	Setting up User Id and password	2	Low	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G
Sprint-1	App permission	USN-4	Grant the permission for the app to access location, contact etc..	2	Medium	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G
Sprint-1	Interface with the Device	USN-5	Connecting the device with the registered app with the device ID.	**1**	**High**	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G
Sprint-2	Setting Geo-location	USN-6	Creating the Geo-location area in the map	**2**	**Low**	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G
Sprint-3	Database	USN-7	Location history is stored in the cloud. Can be accessed from the dashboard.	**2**	**High**	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G

Sprint-4	Tracking location	USN-8	Tracking the location through app. Tracking the location through website.	**2**	**High**	Elakkiya. S Jenith Ebinesh. S Riyaz Ahamed. S Shanmathi. G

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	31 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	07 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7. RESULTS

Tracking your child's location with geofence alert can make sure your child is safe and prevent kidnapping. When they come into an unknown place, you will receive alert and can react immediately. Moreover, it helps fight the habit of coming late and wasting time at places which are inappropriate for children.

8. ADVANTAGES

☆ It helps in targetting customers in shops or retail outlets with appropriate ads as well as direct them to desired sections in order to increase sales.

☆ It helps in influencing purchase decisions.

☆ It does not require additional hardware to implement it. Mobile apps are available for android and iOS operating systems.

☆ It is very easy to implement and use with the help of google maps.

☆ It is very cheaper due to less costly mobile phones and availability of free apps.

9. DISADVANTAGES

☆ The size and accuracy of the geofences depends on the location and positioning technologies used. The geofencing positioning technologies such as GPS, cellular and wifi deliver accuracies from 20 meters to 50 meters. Smaller geofencing use bluetooth positioning technologies such as iBeacons and Eddystone beacons. These technologies deliver accuracies of about 2 meters.

☆ GPS positioning technique can also be used for geofencing but due to higher power consumption it is not recommended for battery hungry devices.

10. CONCLUSION

The System proposed in this paper is to ensure safety of children and increase their confidence. Many researchers are working in this area and have developed different technologies to help the children. The solution represented in this paper takes the advantage of smart phones which offers rich features like Google maps, SMS, etc. The child safety device is capable of acting as a smart IOT device. It provides parents with real-time location. This paper describes the basic design concept and functionality along with the expected outcomes.

11. FUTURE SCOPE

This system can be further enhanced by installation of minicamera inside smart gadget for better security so that live footage can be seen on parental phone during panic situations. The system can be modified by installation of small solar panels for charging the battery of smart gadget to gain maximum battery backup.

12. APPENDIX

12.1 Source Code

```
        import json
import wiotp.sdk.device
import time
myConfig = {
    "identity": {
        "orgId":" t1sqja",
        "typeId": "NodeMCU",
        "deviceId": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None)
client. connect()

while True:
    name= "elakkiya"
    latitude= 11.114778283092631
    longitude= 77.1881467129582
    myData= ('name': name, 'lat' :latitude, 'lon': longitude)
    client.publishEvent(eventId="status", msgFormat="json", data-
myData, qos=0, onPüblish=None)
    print("Data published to IBM IoT platfrom: ",myData)
    time.sleep (5)

client.disconnect()
```