IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

A PROJECT REPORT

Submitted by

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1. INTRODUCTION

1.1. Project Overview

People get to know one another by sharing their ideas, thoughts, and experiences with those around them. There are numerous ways to accomplish this, the best of which is the gift of "Speech." Everyone can very convincingly transfer their thoughts and understand each other through speech. It will be unjust if we overlook those who are denied this priceless gift: the deaf and dumb. In such cases, the human hand has remained the preferred method of communication. The communication and technologies associated with it is devoloping day by day. Especially, In the domain of Artificial Intelligence- healthcare systems, communication between specially abled and normal persons is becoming popular day by day. Differently abled peoples require better forms of communication, so that they can significantly improve their ability to get around and participate in daily activities.

1.2. Purpose

This device is programmed to continuously monitor the subject's parameters and take action when any dangerous situation presents itself. It does so by detecting the change in the monitored signals, following which appropriate action is taken by means of sending notifications/alerts to designated individuals.

It assists parents to monitor their children remotely. In case situations happen, notifications will be sent to parents so that actions can be taken. Through this, child safety can be ensured and crime rate will be reduced.

2. LITERATURE SURVEY

2.1. Existing problem

A smart IoT device for child safety and tracking is developed to help the parents to locate and monitor their children.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. To trigger the alarm and enable automatic video recording whenever the emergency button is pressed. Then, emergency notification along with real-time video will be sent to and display in the parents' mobile apps. By Developing 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. This child safety gadget can be used in the following manner:send a message to the GSM module, according to the message information, the GSM module replies back with particular details about the children. The location can be seen.on the Google map. When a particular child is facing an emergency situation, the device button should be pressed so that The device captures the image along with the user.information to the enrolled mobile numbers. The life of the A child can be saved in no time. In [3], for the children point of view GPS, GPRS, and GSM are used to monitor the speed and location tracking purposes. The system is fixed on the bus, car, or any vehicle so that the vehicle is going on a routine route or not can be identified by the GPS tracker, The speed of the bus can also be extracted. Now-a-days the Digital technology plays a major role in connecting people.via internet. For tracking the children, the android-based solution is provided to parents. The Internet is the one that will connects different components through a single device,is connected to the server. Parents track their children in real time.time of the location tracker by GSM and the the microcontroller used is the ARM-7 LPC2148. From day to day scenario, missing child cases are increasing.

2.2. References

[1] Authors: M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E.Kusuma Kumari. **Smart IoT Device for Child Safety and Tracking**. Published in: 2019 IEEE.

[2] Authors: Akash Moodbidri, Hamid Shahnasser. **Child safety wearable device**. Published in: 2017 IEEE.

[3] Authors: Aditi Gupta, Vibhor Harit. Published in: 2016 IEEE. **Child Safety & Tracking Management System by using GPS.**

[4] Authors: Dheeraj Sunehera, Pottabhatini Laxmi Priya. **Children Location Monitoring on Google Maps Using GPS and GSM.**

[5] Author**:** Mansi Kashyap. **RFID based System for School Children Transportation Safety.** International Journal of Scientific Research and Management Studies (IJSRMS) ISSN: 2349-3771 Volume 4 Issue 3.

[6] Author**:** P.Nandhini.**Study on Wearable Devices for the Safety and Security of a Girl Child and women.** Journal published: International Journal of Innovative Technology.

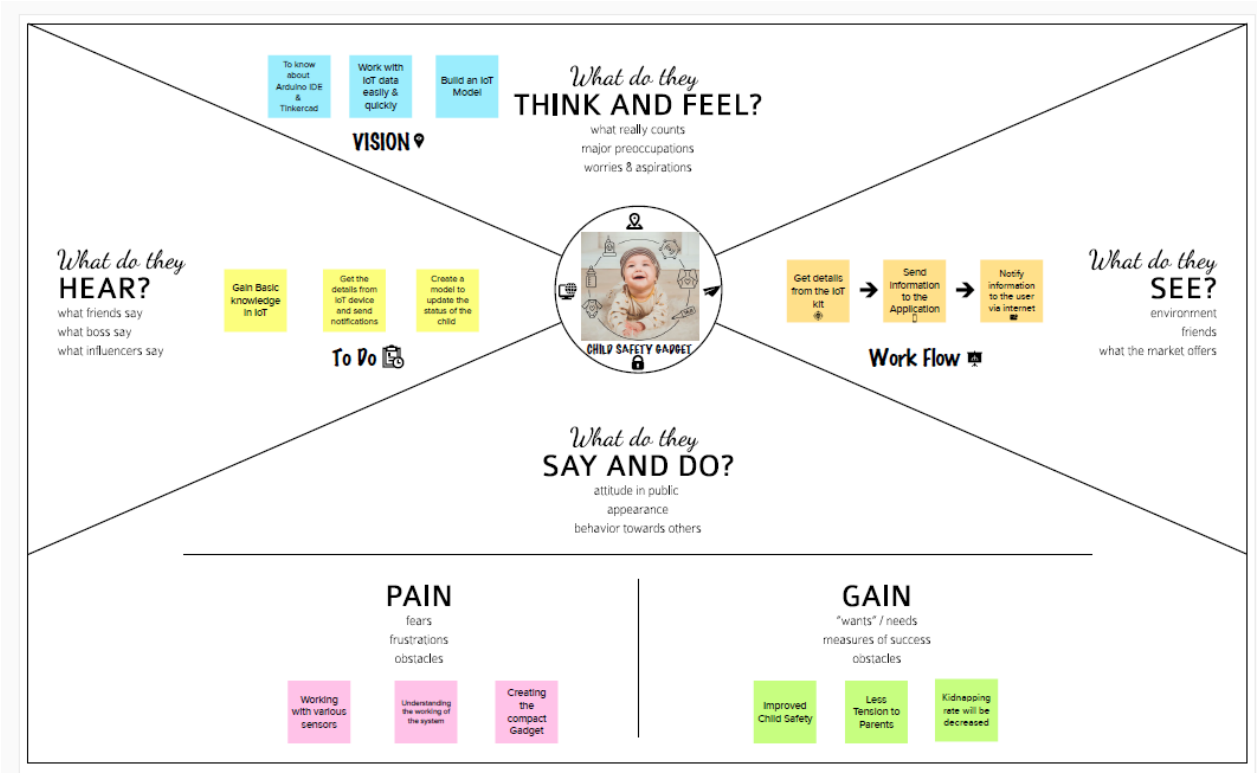
[7] Author: S. Deepa, S. Dinesh Kumar, P. Prasanth **New Generation Children Tracking System**:. Journal published: IJESC Research Article Volume 9 Issue 3.

2.3. Problem Statement Definition

Many families are spending time on work and social duties, hence away from their childern . This values increased concern towards their child's safety and whereabouts, and has made keeping a track of their activities quite challenging. so the parent / guardian, needs to ensure the safety of their childern by receiving notifications and tracking to continuously monitor the child location. This gadget helps to monitor the child's activity. By creating geofence,the GPS coordinates of the child will be sent to the IOT platform. Location of child could be viewed in the web application. The web application will check if the child is inside the geofence or not. If the child is outside the SMS will send to the parent.

3. IDEATION & PROPOSED SOLUTION

3.1. Empathy Map Canvas



3.2. Ideation & Brainstorming

IDEA 1:

The device has IoT monitoring and a GSM module that allows the child to be monitored at all times. It also has numerous sensors that are connected to a CPU and are used to detect exact signals such as heart rate, temperature, and other dangers and alert the parents. In the event of a power outage, the wearable serves as a backup. On the device, there is an additional panic button. The purpose of this button is to notify parents and the police of a child's current location whenever they are in a perilous scenario. A GPS module is utilised to access their present location, and a GSM module assists in transmitting the information via SMS to designated contacts. In this approach, the device tries to provide child safety while remaining unobtrusive.

IDEA 2:

Our proposed system is based on the Internet of Things-based Smart Child Safety Wearable Device System designed as an efficient and low-cost IoT based system for monitoring infants in real-time. This system plays a key role in providing better care for the lost children until they reconvene with the parents. In this present

era, most of the wearable devices today are designed based on the location , activity , temperature, pressure, etc of the child and inform the parents via GPS. Therefore it is intended to use voice call as the way of communication between the parent mobile and child's wearable device. The system operates on the microcontroller board and the functions of sending and receiving notifications , calls, voice messages via GPS.

IDEA 3:

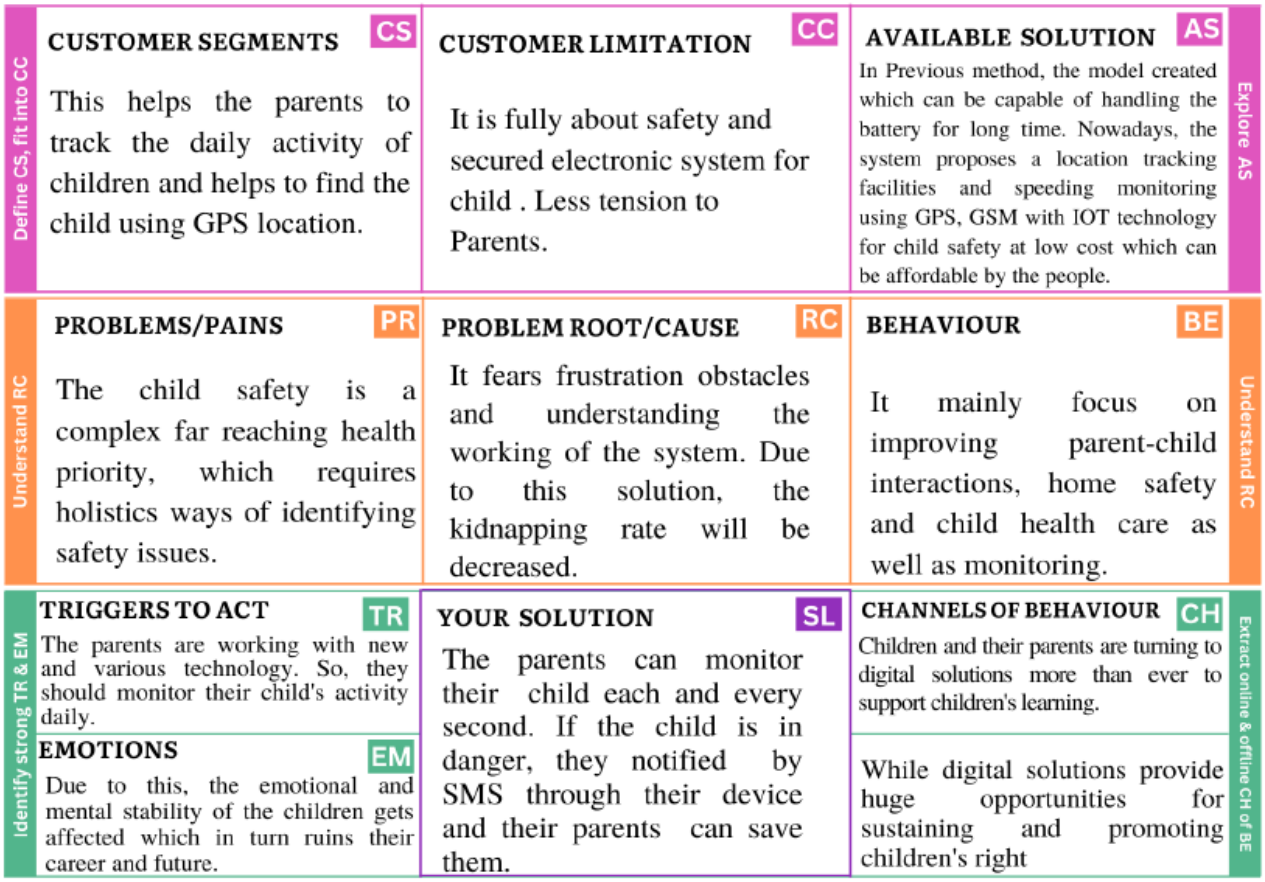
A portable device which will have a pressure switch. As soon as an assailant is about to attack the person or when the person senses any insecurity from a stranger, he/she can then put pressure on the device by squeezing or compressing it. Instantly the pressure sensor senses this pressure and a conventional SMS, with the victim's location will be sent to their parents/guardian cell phone numbers stored in the device while purchasing it, followed by a call. If the call is unanswered for a prolonged time, a call will be redirected to the police and the same message will be sent. Additionally, if the person crosses some area which is usually not accessed by the person then a message with the real-time location is sent to the parent/guardian's phone via conventional SMS.

3.3. Proposed solution

S. No.	Parameter	Description
1.	Problem Statement	Many families are spending time on work and social duties, hence away from their children. This causes increased concern towards their child's safety and whereabouts, and has made keeping a track of their activities quite challenging. So the parent/ guardian need to ensure the safety of their children by receiving notifications and tracking to continuously monitor the child's location.
2.	Idea/Solution Description	A safety gadget to monitor the child's activity. By creating geofence, the GPS coordinates of the child will be sent to the IoT platform. Location of the child can be viewed in the web application. The web application will check if the child is inside the geofence or not. Notifies the parent if the child goes outside the geofence.

3.	Novelty	• Accurate GPS coordinates are shared. • Notifications are sent immediately via SMS or e-mail if the child is out of geofence.
4.	Social Impact	• Reduction in crime rates. • Information is sent to parent when the child is out of geofence.
5.	Business Model	• This device can be used in safety of women through wearables like watches and spectacles. • This device can also be used for vehicle tracking using GPS.
6.	Scalability of Solution	• Location accuracy can be improved. • Size of the device can be decreased.

3.4. Problem Solution Fit



4. REQUIREMENT ANALYSIS

4.1. Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Logging in via LinkedIn
FR-2	User Confirmation	Email Confirmation OTP Confirmation
FR-3	User login	Logging in via their respective username and password
FR-4	App Permission	Grant the permission for he app to access location, contact etc..,
FR-5	Interface with the Device	Connecting the device with the registered app with the device ID.
FR-6	Setting Geo-location	Creating the Geo-location area in the map

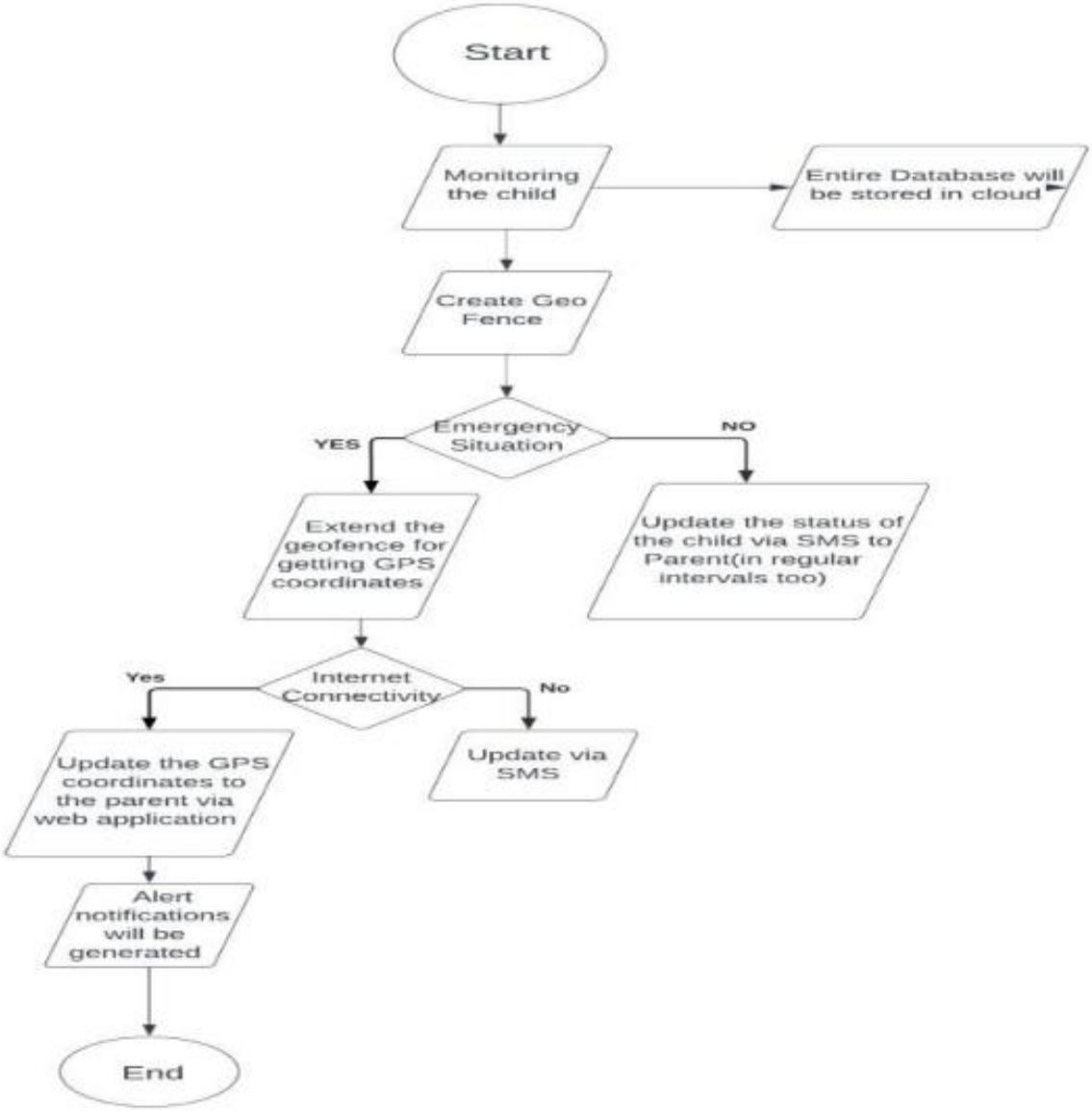
4.2. Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It is very useful for parents to monitor their children from anywhere remotely. They can guard their children from unknown person .so that safety can be ensured and crime rate will be reduced.
NFR-2	**Security**	This device is mainly used for the security purpose of the children .This device sends an SMS when the child reaches out of particular location to the parents.
NFR-3	**Reliability**	This device provides maximum reliability.it alert the parents by sending SMS and through the buzzer sound.
NFR-4	**Performance**	The performance of device is very good. It provides more safety when the parents are not nearer to the child.
NFR-5	**Availability**	This device is more economical and provides maximum safety for the children. It is sufficient to the parents who wants to ensure their child's safety.
NFR-6	**Scalability**	This device is very small and easy to wear. The child does not feel any in secureness.

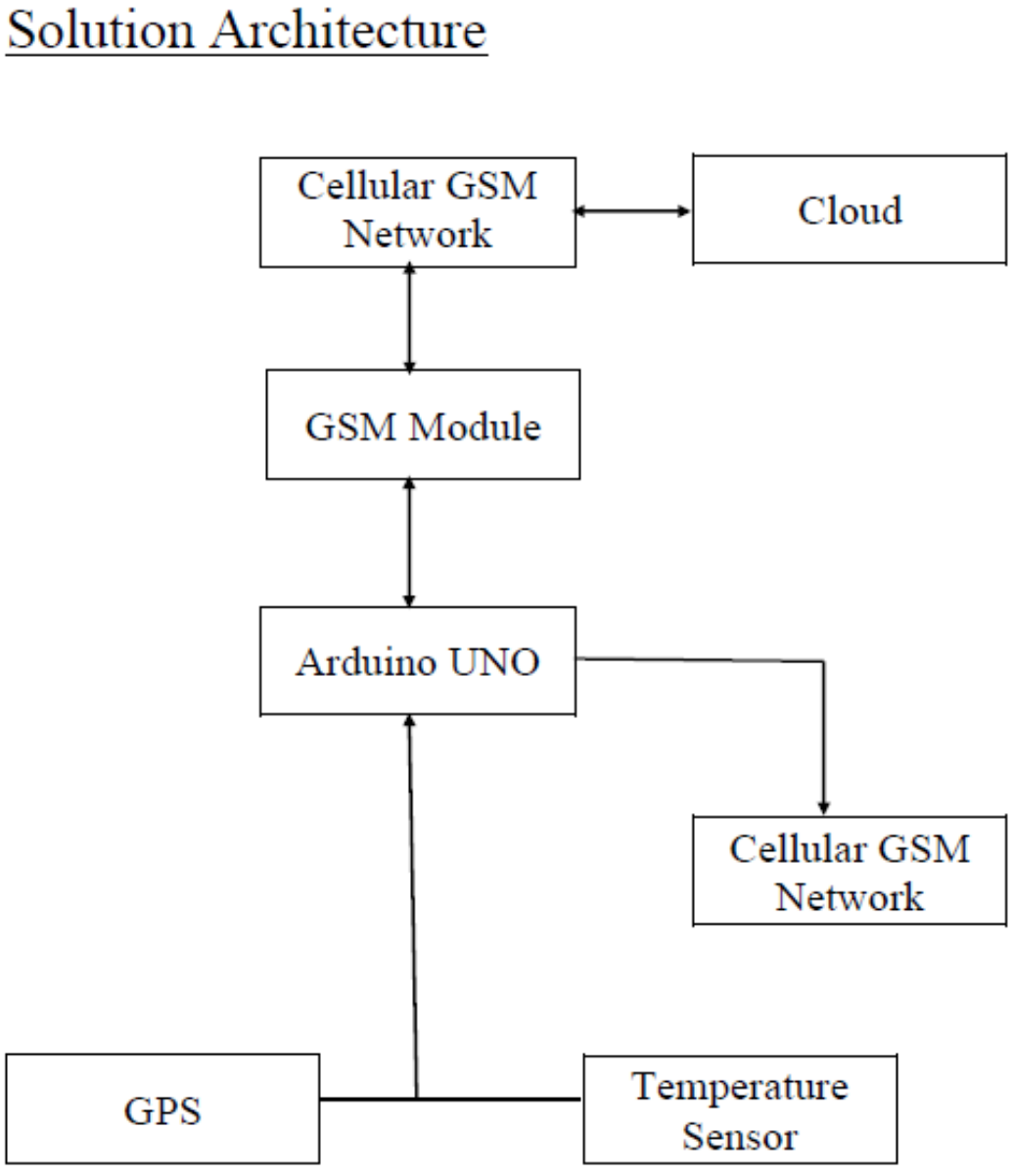
5. PROJECT DESIGN

5.1. Data Flow Diagrams



5.2. Solution & Technical Architecture

The Deliverable shall include the architectural diagram as below.



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation emailonce I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with IBM Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer Care Executive	login		As I enter I can view the working of the application and scan for any glitches and monitor the operation and check it all the users authorized.	I can login only with my provided credentials.	Medium	Sprint-3
Administrator	login		Maintaining and making sure the database containing the locations are secure and accurate and update constantly.	I can login only with my provided credentials.	High	Sprint-4
Customer (web user)	login		As a user, I can register for the application byentering my email, password, and confirmingmy password.	I can access my account / dashboard	High	Sprint-2

6. PROJECT PLANNING & SCHEDULING

6.1. Sprint Planning & Deliverable

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	4	High	Kanishka Karthikeyan
Sprint-1	Confirmation Email	USN-2	As a user, I will receive confirmation email and SMS once I have registered for the application	3	High	R.Kavi Priya
Sprint-2	Authentication	USN-3	As a user, I can register for the application through Email ID and Mobile App.	2	Low	G.Lakshmi Priya
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password.	2	Medium	A.Mehala Devi
Sprint-1	Dashboard	USN-5	As a user, I can monitor, measure, analyze relevant data in key areas.	8	High	A.Mehala Devi
Sprint-2	Notification	USN-1	As a user, I should be able to receive notification when the child is in emergency situations.	9	High	Kanishka Karthikeyan
Sprint-2	Store data	USN-2	As a user, I need to store the location data and child information into the database.	10	High	R.Kavi Priya
Sprint-2	Communication	USN-3,1	The child and the parent should be able to communicate.	7	Medium	G.Lakshmi Priya
Sprint-3	IoT Device	USN-1,4	We automatically monitor the child in real time using Internet of Things, with the help of GPS, GSM, and Arduino.	6	Medium	Kanishka Karthikeyan

Sprint-3	Node RED	USN-5,2	The data stored in IBM Cloud should be integrated properly.	8	High	G.Lakshmi Priya
Sprint-4	User Interface	USN-1,4	The point of human-computer interaction and communication in a device.	7	Medium	R.Kavi Priya
Sprint-4	Geofencing	USN-2,3,5	Based on the geographical coordinates, the geofence of the child can be done.	8	High	A.Mehala Devi

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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

Velocity:

$$AV = \frac{sprint\ duration}{velocity}$$

AV = 6/10 = 0.6

6.2 Milestone Activity Plan

Remaining tasks (Milestones & Activities) to be completed

Milestones	Activities
Project development phase	Delivery of sprint- 1,2,3,4
Create and configure and IBM cloud services	Create IBM cloud account
	Create IBM Watson
Create and access deep learning	Create v1 to interact with app deploy
	Create IBM and connect with python
Create & database in cloudant DB	Launch the cloudant DB and Create database
Develop the python flask	Install the python software
	Develop python code
Create the web application	Develop the web application
	To intensity and showcase on open CV window

Finished Tasks (Milestones & Activities)

Milestones	Activities	Description
Ideation phase	literature	Literature survey on the selected project & information gathering
	Empathy Map	Prepare empathy map to capture the user pains & gains, prepare list of problem statement
	Ideation	Organizing the brainstroming session and priorities the top 3 ideas based on feasibility & importance
Project design phase I	Proposed solution	Prepare proposed solution document which includes novelty, feasibility of ideas, business model, social impact, scalability of solution
	Problem solution fit	Prepare solution fit document

	Solution Architecture	Prepare solution architecture document
Project Design Phase II	Customer journey	Prepare customer journey map to understand the user interaction & experience with the application
	Functional requirement	Prepare functional & non functional requirement document
	Data flow diagram	Prepare Data flow Diagram
	Technology Architecture	Draw the technology architecture diagram
Project planning phase	Milstones & Activity list	Prepare milstones and activity list of the project
	Sprint delivery plan	Prepare sprint delivery plan

7. CODING & SOLUTION

7.1 Feature 1: (Python Code)

In Area Code:

```
import wiotp.sdk.device
import time
import json
myConfig = {
    "identity": {
        "orgId": "crmwpw",
        "typeId": "childdevice",
        "deviceId":"CHILD"
    },
    "auth": {
        "token": "1234567890"
    }
}

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    name="smartbridge"
    #in area location

    latitude=11.651145
    longitude=78.156674
    #out area location

    #latitude=11.651165
    #longitude=78.158672
    myData={'name':name, 'lat':latitude, 'lon':longitude}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None)
    print("Published data Successfully: %s", myData)
    time.sleep(5)
client.disconnect()
```

Out Area Code:

```
import wiotp.sdk.device
import time
import json
```

```
myConfig = {
   "identity": {
      "orgId": "crmwpw",
      "typeId": "childdevice",
      "deviceId":"CHILD"
   },
   "auth": {
      "token": "1234567890"
   }
}

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
   name="smartbridge"
   #in area location

   #latitude=11.651145
   #longitude=78.156674
   #out area location

   latitude=11.651165
   longitude=78.158672
   myData={'name':name, 'lat':latitude, 'lon':longitude}
   client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
onPublish=None)
   print("Published data Successfully: %s", myData)
   time.sleep(5)
client.disconnect()
```

7.2 Feature 2: (Adding Geofence)

```
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(Geofence geofence)
{
 return new GeofencingRequest.Builder()
.addGeofence(geofence)
.setInitialTrigger(GeofencingRequest.INITIAL_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)
.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";
}
}
return e.getLocalizedMessage();
```

(Alert Norification)

```
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
//. /*
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(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 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_ENTER:
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

1					Date	03-Nov-22				
2					Team ID	PNT2022TMID18987				
3					Project Name	Project - IoT Based Safety Gadg				
4					Maximum Marks	4 marks				
5	**Test case ID**	**Feature Type**	**Compon ent**	**Test Scenario**	**Pre-Requisite**	**Steps To Execute**	**Test Data**	**Expected Result**	**Actual Result**	**Stat us**	**Commnets**
6	LoginPage_TC_ 001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	https://shopenzer.com/	Login/Signup popup should display	Working as expected	Pass	
7	LoginPage_TC_ 002	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	https://shopenzer.com/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Pass	Steps are not clear to follow
8	LoginPage_TC_ 003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: child@gmail.com password: Test@ 123	User should navigate to user account homepage	Working as expected	Pass	
						1.Enter URL(https://shopenzer.com/) and click go	Username: child@gmail password: Testing123	Application should show 'Incorrect email or password ' validation message			

8.2 User Acceptance Testing

Defect Analysis

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

Test Case Analysis

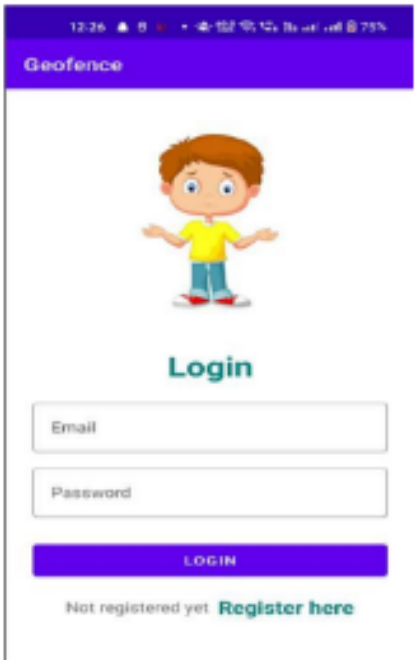
Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULT

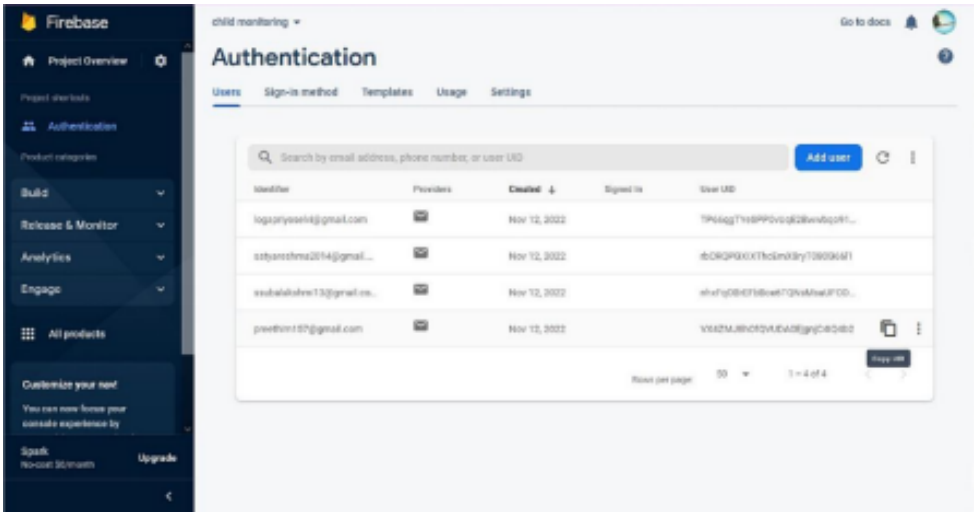
9.1 User Login:

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 occur.

Login page:



User Details:

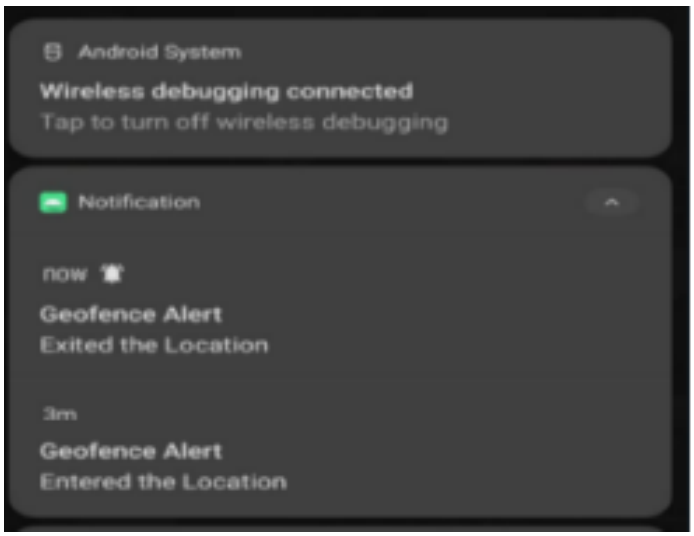


9.2 Adding Geofence and Alert Notification :

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 & DISADVANTAGES

Advantages:

- Easy Availability and Affordability
- Tracking of missing kids can be made easily
- High Data accuracy
- Guarantees peace of mind for parents
- High reliability , efficiency
- Short response time and high accuracy.

Disadvantages:

- Gadgets release a form of radiation referred to as Electro Magnetic Frequency (EMF), which has been cited as a form of carcinogen–a substance capable of causing cancer in living tissue.
- High Cost but once it is implemented the expenses can be reduced

11.CONCLUSION

IoT is bound to be an effective technology in the future, and IoT enabled devices are likely to be all-pervasive, from industry to households. The future scope of IoT is bright and varied, and it is only a matter of time before the above applications of the technology are realized.

Due to various technological advancements and users' ability to connect technologies such as smartphones with household computers, the future of IoT is virtually limitless. Wi-Fi has allowed people and machines to communicate on land, in the air, and at sea. As we approach the Fourth Industrial Revolution, both businesses and governments must have ethics in mind . Since there will be too much data flowing from device to device, technology protection will need to expand at the same rate as bandwidth to keep up with demand. Governments would undoubtedly have to make difficult choices about how far the private sector can go in terms of robotics and data sharing. The prospects are exciting; productivity will rise, and incredible things will result from global connectivity.

12. FUTURE SCOPE

Internet of Things has emerged as a leading technology around the world. It has gained a lot of popularity in lesser time. Also, the advancements in Artificial Intelligence and Machine Learning have made the automation of IoT devices easy. Basically, AI and ML programs are combined with IoT devices to give them proper automation. Due to this, IoT has also expanded its area of application in various sectors. Here, in this section, we will discuss the applications and the future scope of IoT in healthcare, automotive, and agriculture industries.

Healthcare

IoT has proved to be one of the best tools for the healthcare industry. It helps provide advanced healthcare facilities to patients, doctors, and researchers. These facilities include smart diagnosis, wearable devices for tracking health, patient management, and many more. Furthermore, IoT devices have reduced unnecessary strain on the healthcare system.

Agriculture

One of the three basic human needs is food. To fulfill the need for food, we do farming. However, now, as the population of the world is increasing, the agricultural industry is facing many challenges. Also, changes in weather conditions and climate hugely impact the agricultural industry. To meet the rising demand for food, the industry has hence adopted technology to increase productivity. It includes the use of precision farming, agricultural drones, and smart farming applications.

Precision farming

In agriculture, Information and Communication Technology is a tool used for smart farming. With the help of IoT-based devices, crop fields are observed. The technology uses sensors to calculate the moisture of soil, humidity, and temperature. Also, it uses an automated irrigation system to make efficient use of water. Precision farming helps farmers monitor their fields and boost productivity.

Agricultural drones

Drones used for agriculture and farming are one of the best applications of Internet of Things. They are used to enhance agricultural processes. We use agricultural drones for planting crops, irrigating fields, spraying of pesticides, and monitoring the fields. With the help of drones, it becomes easier to evaluate the health of crops. This is all possible with the help of smart IoT-based devices that are used to make agricultural drones.

Smart greenhouses

Farmers use greenhouse farming to enhance the productivity of crops. In greenhouse farming, the environmental factors that affect the growth of crops are controlled by manual intervention. However, manually controlling the mechanism for the growth of crops is less productive. The emergence of IoT and technological advancements has led to the creation of IoT-based greenhouses that consist of various devices such as sensors, climate controllers, etc.

These IoT devices help in measuring the various environmental conditions according to the requirements of plants. As all sensors and devices connect over the Internet servers, they provide accurate information on the environmental conditions. Then, the devices activate actuators to control heaters, fans, windows, and lighting of greenhouses to set according to the environment.

This is how the scope of IoT is enhancing the productivity of the agricultural industry .

13. APPENDIX

Source Code link

https://github.com/IBM-EPBL/IBM-Project-24356-1659941857

GitHub link

https://github.com/IBM-EPBL/IBM-Project-24356-1659941857

Video Link

https://drive.google.com/file/d/1Ybckwmj-2_rvZYytgCWp658l4_hhgBuD/view?usp=share_link