Project Report

1. INTRODUCTION

1

Internet of Things (IoT) plays a major role in every day to day life. The major difference between IoT and embedded system is that a dedicated protocol/software is embedded in the chip in case of embedded system, whereas, IoT devices are smart devices, which are able to take decisions by sensing the environment around the device. The development of sensors technology, availability of internet connected devices; data analysis algorithms make IoT devices to act smart in emergency situations without human interventions. So, IoT devices are applied in different fields such as agriculture, medical, industrial, security and communication applications [1]. IoT systems are useful within a system to do deeper automation, analysis, and integration. IoT contributes to technology by advances in software, hardware and modern tools. It even uses existing and upcoming technology in the fields of sensing, networking and robotics. IoT brings global changes by its advanced elements in the social, economic, and political impact of the users. 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.

1.1 Project Overview

It is observed that more families are now spending time on work and social duties, resulting in a lack of interaction with their children. This causes increased concerns towards their safety and whereabouts which has made keeping a track of their activities quite challenging. Also, crimes against children are increasing rapidly around the world. According to a study, roughly 60,000 children go missing in India every year [1]. There is an assumption that every 10 minutes, a child goes missing. Cities like Mumbai and Delhi have the highest rate when compared to other metro cities. With the lack of availability of affordable child monitoring systems, it is hard to monitor the whereabouts of children. The safety of children is very critical since they cannot protect themselves. A momentary lack of parental supervision should be combated with an appropriate IT solution in context. Therefore, the proposed system must alert the parents when the child walks too far away and/or outside the "circle of safety" in their absence. The solutions that are available in the market today are not able to address all the issues in one device. There are a few ways that the existing solutions work. First, with the use of a smart phone. This method might seem handy, but providing a young child with a smart phone in hand is not an ideal case, counter to the monetary investment for the phone, and the additional responsibility that the child has to take to handle and take care of the phone. This makes it a less feasible solution. The other way is via smart watches that a child wears on the wrist. This may seem like an ideal solution, but the problem with this arises when the kidnapper is aware of such a device, and immediately removes the device from the child's wrist and destroys it. With the proposed solution, we make a discreet-looking device that doesn't look like a tracking device but is always with the child. Because of the way it looks, it does not distract the child, and with its small size, it can be easily attached to any part of the child's clothing.

1.2 Purpose

When a violation of child safety is identified, a certain sensor in the child module will emit a signal, which is the main function of the suggested child tracking system. These sensors and WFPS will send this signal to the microcontroller, which will then send it to the transmitter, which will then send it to the parent module. The decision will be made by the parent module, and the violation handling procedure will begin. The kid tracking system's functionality necessitates hardware between the child and parent models, which comprises a drive circuit for the sensors' activation.

2.LITERATURE SURVEY

1. **Smart IOT Device for Child Safety and Tracking**

Author : M Nandini Priyanka, S Murugan, K N H Srinivas, T D S Sarveswararao, E KusumaKumari.

https://www.ijitee.org/wp-content/uploads/papers/v8i8/H6836068819.pdf

Child safety and tracking is a major concern as the more number of crimes on children are reported nowadays. With this motivation, a smart IoT device for child safety and tracking is developed to help the parents to locate and monitor their children. The system is developed using Link It ONE board programmed in embedded C and interfaced with temperature, heartbeat, touch sensors and also GPS, GSM & digital camera modules. The novelty of the work is that the system automatically alerts the parent/caretaker by sending SMS, when immediate attention is required for the child during emergency. The parameters such as touch, temperature &heartbeat of the child re used for parametric analysis and results are plotted for the same.

2.Monitoring and Prevention of Child Abuse Using IoT

Authors: Mrs. P Chitra, Aarthi S, Anitha K, Angammal R, Abinaya D

https://doi.org/10.22214/ijraset.2022.44449

The word future has a similar meaning to the word children. Today's children are tomorrow's youngsters, and it is vital to preserve their dreams and lives for the future, as Dr. A.PJ. Abdul Kalam said, "Youngsters are the future pillars of one's nation". As a result, every parent should look after their own children. Without allowing them to descend into the abyss of abuse. In today's global computing environment, child and female harassment, chain snatchings, kidnappings, sexual harassments, eve teasing, and other forms of abuse are on the rise, making people feel more scared and powerless.

3.Child Safety & Tracking Management System

Author : Aditi Gupta , VibhorHari

https://ieeexplore.ieee.org/document/7546695

Today, technology is growing rapidly and providing all essential and effective solutions for every requirement. Now a day's child security is an important area of concern. This model is developed to rectify the worries of parent regarding their child security. In this scenario, our system ensures maximum security and ensures live tracking for their kids because parent worries are genuine. This paper proposed a model for child safety through smart phones that provides the option to track the location of their children as well as in case of emergency children is able to send a quick message and its current location via Short Message services. This proposed system is validated by testing on the Android platform.

4.Wearable Safety Device for Children

Authors: Mr.Ragavendrachar S, SunainaNayak, Vishnupriya D, Ruba Abdul Rahman, Krithika K N

Attacks on children have been on the rise at an unprecedented rate in recent years, with victims finding themselves in perilous situations with little chances of contacting their families. The main goal of this project is to create a smart wearable device for children that uses advanced technology to ensure their safety. As a result, this strategy is perceived as sending and SMS from the children's wearable to their parents or guardians. This project employs cutting-edge technology to protect the youngster through the use of a GSM module, ensuring that the child does not feel abandoned while dealing with such social issues. An Arduino Nano, GSM, GPS, temperature sensor, heartbeat sensor, and a panic button will be included in the wearable. The heartbeat sensor detects the child's heart rate and delivers it to the guardian on regular basis. If the child falls suddenly, the accelerometer detects it and alerts the parents. As a result, the parent has a sense of security.

https://doi.org/10.22214/ijraset.2022.41432

2.1 Existing problem

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. Through this, child safety can be ensured and crime rate will be reduced.

2.2 References

[1] H. Times, 30 August 2019. [Online]. Available: https://www.hindustantimes.com/india-news/with-60-
 000-children-going-missing-in-india-every-year-social-media-has-propelled-child-lifting-fear/story-AvL4yvASeN4fgXQPoAkBKP.html. [Accessed August 2021].

[2] N. Projects, August 2012. [Online]. Available: https://nevonprojects.com/child-monitoring-system-app/. [Accessed August 2021].

[3] Ijesc, 2019. [Online]. Available:
https://ijesc.org/upload/4ae0fee98320daeb099ea96feea47ab0.Child%20Monitoring%20System%20
(1).pdf. [Accessed November 2021].

[4] Citeseerx, June 2009. [Online]. Available:
https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.332.9054&rep=rep1&type=pdf.
[Accessed October 2021].

[5] IRJET, June 2020. [Online]. Available: https://www.irjet.net/archives/V7/i6/IRJET-V7I6756.pdf.
[Accessed August 2021].

[6] R. Gate, January 2019. [Online]. Available:
https://www.researchgate.net/publication/337309815_Child_Safety_Monitoring_System_Based_on_Iot

2.3 Problem Statement

More families are now spending time on work and social duties, hence away from their children. This causes increased concerns towards their safety and whereabouts, and has made keeping a track of their activities quite challenging. Crimes against children are increasing Year on Year. According to a study, roughly 60,000 children go missing in India every year [1]. There is an assumption that every 10 minutes, a child goes missing. Mumbai and Delhi have the highest rate when compared to other metro cities. With the lack of availability of affordable child monitoring systems it is hard to monitor the whereabouts of Children [2]. Safety of children is very critical since children cannot protect themselves. A momentary lack in parental supervision should be combated with an appropriate IT solution in context. Therefore, it is necessary for the proposed system to alert the parents when the child walks too far away and/or outside the "circle of safety" when they are away .In case of an emergency, or in a situation of panic, the child must be able to communicate with their parents .If in case the child does go missing or has a fall, the aid of technology can increase efficiency and decrease the time necessary to locate and reach the child.

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

An empathy map is a simple , easy-to-digest visual that captures knowledge about a user's behavior and attitudes .It is useful tool to helps teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it . The exercise of creating the map helps participates consider things from the user's perspective along with his or her goals and challenges .

Empathy Map
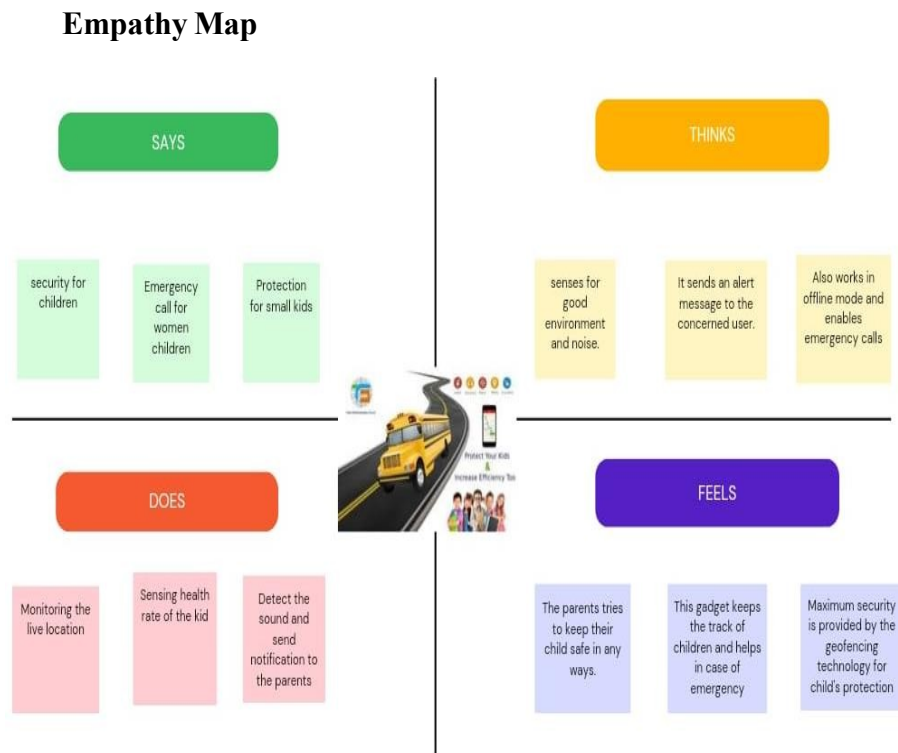
3.2 Ideation & Brainstorming

Ideation is a creative process where designers generate ideas in sessions(e.g., brainstorming, worst possible idea). It is The third stage in the design thinking process. Participants gather with open minds to produce as many ideas as they Can to address a problem statement in a facilitated, judgment-free environment. Ideation is the creative process of generating , developing, and communicating new ideas is understood as a basic element of thought that can be either visual, concrete, or abstract. Ideation comprise all stages of a thought cycle, from innovation , to development , to actualization

Dhanalakshmi M

- Creation of mobile application
- Integration with smart watch
- Geofencing the child's movements
- Satellite call to child in case of emergency

Priyadharshini K

- Creation of web application
- Integration with mobile as PWA
- Geofencing child's movements through APIs
- RFID based additional tracking

Gayathri M

- Brilliant UI/UX design for web application
- Good UI/UX design for mobile application
- Smart design of smart watches
- Integration with Cloud services

Deepika M

- Creation of any application
- Integration with parent's mobile
- Integration with police in case of emergency
- RFID based home in and out tracking

Pavithra P

- RFID based tracking for school
- GPS integrated bag/watch
- GPS integrated shoe
- Creation of any end user application

Top 3:

- Creation of mobile application
- Geofencing child's movements through APIs
- Integration with Cloud services

3.3 Proposed Solution

Proposed Solution :-

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Parents who are engaged with with busy lifestyle who have no time to monitor their children and nowadays the misbehaviours against children are increasing at an exponential rate.They are under the threat of easily being kidnapped.So the parents needs a way to monitor their children continuously and detect early if there is any abnormal behaviour in their children surroundings so that they can do their duties efficiently rather than worrying about their children, This will indeed reduce the worries of the parents and create a safe environment.
2.	Idea / Solution description	Parents need a way to monitor their children continuously and detect early if there is any abnormal behaviour in their children's surroundings so that they can do their duties efficiently rather than worrying about their children. This will indeed reduce the worries of the parents and create a safe environment.

3

3.	Novelty / Uniqueness	Even though there are many existing solutions for this problem they failed to satisfy the needs of customer.Some of the solutions are only detecting some particular issues where some other failed to alert the parents and other solution with some delays.Our solution not only notify the parents but also notify the persons who are nearer to the childlike teachers so that they can take control over the situation and our solution will alert the persons who are closer to the child's parents.
4.	Social Impact / Customer Satisfaction	Our solution will be very helpful for the society and the people who are worrying about their child's safety.Our solution will prevent many problems which are faced by childrens and we can able to stop crime.Through this project the parents mental pressure will be reduced and it is very helpful to provide a safer environment for the children.
5.	Business Model (Revenue Model)	The main target of our solution is Parents who are worrying about their children so we planned to visit workplaces and explain about the positives of our product.So that they can be aware of the importance of this solution and use it.
6.	Scalability of the Solution	Our solution can be integrated for further future use because the solution we have provided will be lay on the basics or initial stage of any upgraded version

3.4 Problem Solution Fit

1. CUSTOMER SEGMENT(S) CS

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 anytime to look after their children . If the case so they are in need of something to make their children under the surveillance of them.

6. CUSTOMER CONSTRAINTS CC

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 disefficiencies. Giving a second thought , price to be afforded for buying the developed solution kit might be the one they could not afford.

5. AVAILABLE SOLUTIONS AS

Of course the solutions are available readily in the market such as angel monitoring system , Child GPS Tracking System , Child Safety GSM Kit , etc .,, One such constraint the customers facing are cost and inefficiencies in the working once purchased.

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.

9. PROBLEM ROOT CAUSE RC

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)

7. BEHAVIOUR BE

The proposed solution always keens/tends to make the gadget work in an efficient way so that it is not supposed meet up with any further constraints . Also the solution tries to ensure that efficient functionalties are to be provided to the fullest to the customers

3. TRIGGERS TR

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 also tend to ensure their child safety.

10. YOUR SOLUTION SL

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.

8. CHANNELS of BEHAVIOUR CH

Our proposed solution has the modes of working in both offline and Online . In case of any disconnectivities happen the gadget which has been developed might tend to work on a plan B ehich includes the backup of the failure of actual working kit .

4. EMOTIONS: BEFORE / AFTER EM

Customers(Parents) are being frustratesd 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 .

References:

1. https://www.ideahackers.network/problem-solution-fit-canvas/
2. https://medium.com/@epicantus/problem-solution-fit-canvas-aa3dd59cb4fe

4.REQUIREMENT ANALYSIS

Requirement functions include device configuration ,security ,command dispatching ,operational control ,remote monitoring and trouble shooting .The organization will need to account for these functions ,even if the cloud provider doesn't offer the required device management components.

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 Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Authentication	Only the authorized person for that product will know Ensures security
FR-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
FR-5	Notification	Notified through mobile and mail

4.2 Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-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.
NFR-2	Security	Database security and ensuring the safety of the product while in use.
NFR-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.
NFR-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.
NFR-5	Availability	The data must be available whenever needed and the product should be able to use at any time.
NFR-6	Scalability	The process must be flexible to use at anytime and versatile.

5.PROJECT DESIGN

Internet of things is the coming together of internet and physical devices in a network of unlimited possibilities using microcontrollers ,arduino and raspberry pi. IoT allows for physical devices to wirelessly communicate over networks which has led to a growing number of applications for IoT devices.

5.1 Data Flow Diagram
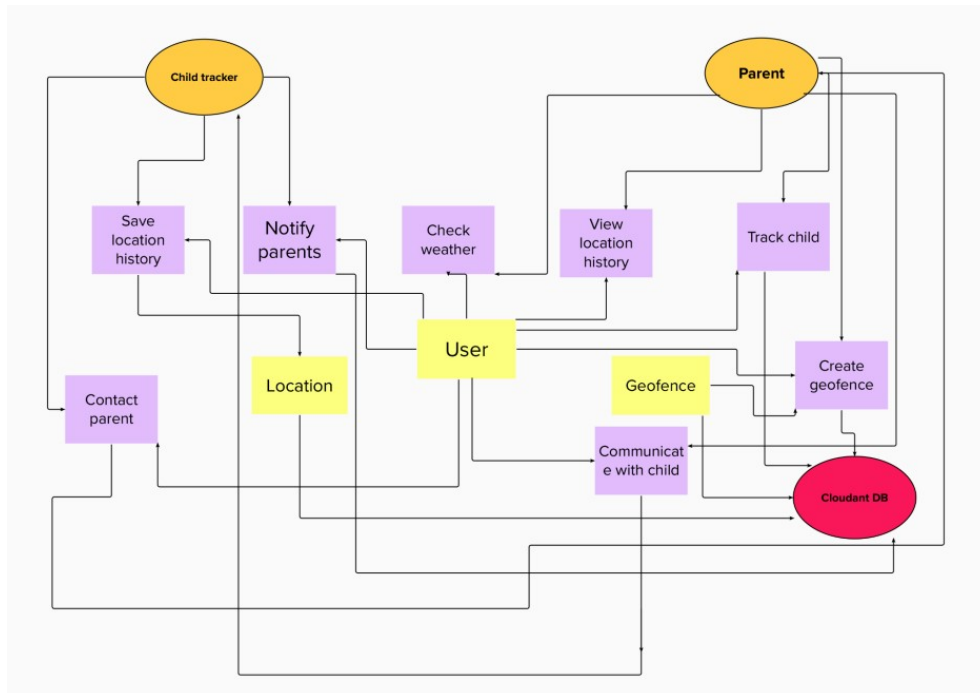
5.2 Solution &Technical Architecture

Internet of Things (IoT) solutions are a collection of assets and components divided across IoT devices ,the IoT platform ,and IoT application . Events, insights , and actions are data flow and processing pipelines that occur across these structural parts.
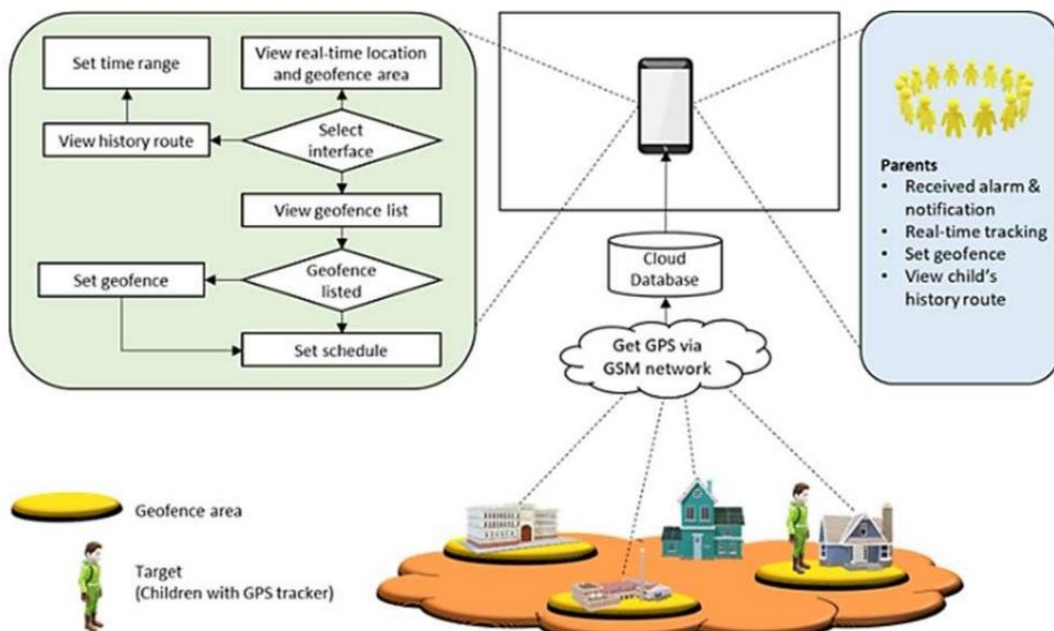
Figure : Architecture and data flow of the Child Safety Monitoring and Notification
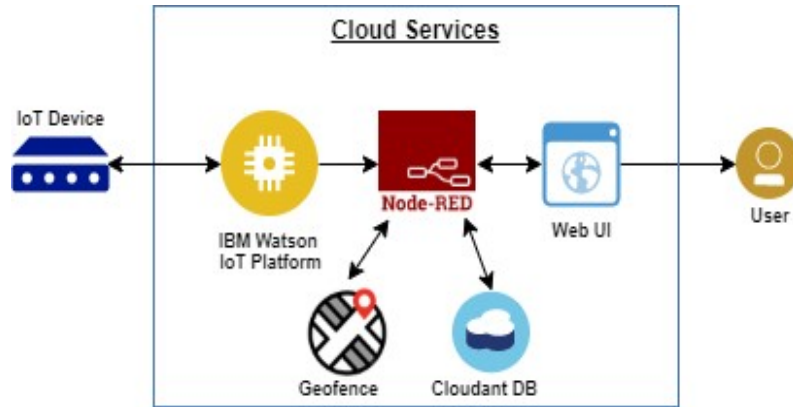
Technical Architecture

Table-1 : Components & Technologies:

S. No	Component	Description	Technology
1.	User Interface	The communication protocol being used in the proposed solution might act as an interface theway like Wi-Fi, Bluetooth and ZigBee	MIT app

S. No	Component	Description	Technology
2.	Application Logic	The data to be collected and sent to the authenticator's(parent) via GSM providing the GPS coordinates to easily locate access and monitor thechild	IBM Watson STT service, python etc
3.	Database	Data to be segregated and secured in the form of relational DBMS	MySQL
4.	Cloud Database	IBM	IBM Cloudant
5.	File Storage	File storage requirements	IBM Block Storage or Other StorageService or Local File system
6.	External API-1	To access the children location	GPS location monitoring etc
7.	Infrastructure (Server / Cloud)	Application Deployment on Local System / CloudLocal Server Configuration	Cloud Foundry

Table-2: Application Characteristics:

S. No	Characteristics	Description	Technology
1.	Open-Source Frameworks	The proposed solution being framed in the form an android application providing the end user an easy surveillance of their children (preferably users are parents)	UI/UX design development
2.	Security Implementations	The developed application should be accessible in the way it can only respond to the comments of the relevant users	Encryptions, IAM Controls.
3.	Scalable Architecture	This methodology can be further enhanced by the installation of the mini camera inside a smart gadget for exemplary security and protection so that a glimpse can be caught on the live footage on the parental phone during panic circumstances.	Multiple data storage Technologies ,Reliable Micro services , Automated Bootstrapping.
4.	Availability	The developed solution tends to be available in the market at any time. It is a site that is available online.	Temperature ,Pulse sensor ,GPS, GSM, Web Camera, Raspberry pi, Microprocessor.
5.	Performance	The Web Page's load time should be no more than one second for the user's elevated performance concerning simple abidance and security.	GSM Tracker ,High Durable, Device Battery.

5.3 User stories

Parent	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 email once 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 Gmail		Medium	Sprint-1

	Login	USN-4	As a user, I can log into the application byentering email & password		High	Sprint-1
	Dashboard	USN-5	As a user, I need to be able to view thefunctions that I can Perform		High	Sprint-1
Child	Notification	USN-1	As a user, I should be able to notify myparent in emergency Situations		High	Sprint-2
	Store data	USN-2	As a user, I need to continuously store mylocation data into the db.		Medium	Sprint-2
	Communicati on	USN-3	I should be able to communicatewith my parents		Low	Sprint-3

6. PROJECT PLANNING & SCHEDULING

After defining the objectives and the framework ,it is time to organize and implement the project .The process of planning primarily deals with selecting the appropriate policies and procedures in order to achieve the objectives of the project .Scheduling converts the project action plans for scope ,time ,cost and quality into an operating timetables.

6.1 Sprint Planning & Estimation

Sprint planning

The main goal is developing the scope of work to be performed. Planning is essential to set the pace of work.

Daily scrum

This helps work planning for the next twenty-four hours and provides an assessment of work performed ,ensuring productivity. Daily scrums also support the maintenance of the pace of work.

Sprint review

This represents the inspection of the work done ,as well as the presentation of the finished part of the product for the client.

Sprint retrospective

Consists of the team time to, among other things, inspect the pace of work and plan improvements .So, the most important thing is to get started well. For this reason , it is worth having a ready check list.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	User Registration	USN-1	As a Parent/ Guardian ,I can register for the application by entering my email, password, and confirming my password.	2	High	Dhan alaks hmi M
Sprint-1	Registration	USN-2	As a Parent/ Guardian, I can register for theapplication through Gmail	1	Medium	Priya dhars hini K
Sprint-1	User Confirmation	USN-3	As a parent I will receive connection , location inSMS / mail once I have entered this application	1	High	Gayathri M
Sprint-1	Login	USN-4	As a parent/ Guardian , I can log into the application by entering mail and password.	2	High	Deepika M , Pavithra P

6.2 Sprint Delivery Schedule

Sprints take place over a fixed period of time, it's critical to avoid wasting time during planning and development. And this is precisely where sprint scheduling enters the equation .In case you're unfamiliar, a sprint schedule is a document that outlines sprint planning from end to end. It's one of the first steps in the agile sprint planning process and something that requires adequate research, planning, and communication.

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	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	17 Nov 2022

7. CODING & SOLUTIONING

7.1 Features

```html
<!DOCTYPE html>
<html> <head>
<meta name="viewport" content="width=device-width, initial-scale=1">
<title> Login Page </title>
<style> Body {
font-family: Calibri, Helvetica, sans-serif; background-color: #9FE2BF;
}
button {
background-color: #9FE2BF;


width: 100%; color: black; padding: 15px; margin: 10px 0px; border: none;
cursor: pointer;
}
form {
border: 3px solid #f1f1f1;
}
input[type=text], input[type=password] { width: 100%;
margin: 8px 0; padding: 12px 20px; display: inline-block; border: 2px white;
box-sizing: border-box;
}
button:hover {
opacity: 0.7;
}
.cancelbtn {


width: auto; padding: 10px 18px; margin: 10px 5px;
}
.container {
padding: 25px;
background-color: #CCCCFF;
}
</style> </head>
<body>
<center> <h1> Login Form </h1> </center>
<form>
<div class="container">
<label>Device ID/Number: </label>
<input type="password" placeholder="Enter Password" name="password" required>
```

16

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<label>E-Mail : </label>
<input type="text" placeholder="Enter Username" name="username" required>
<label>Password : </label>
<input type="password" placeholder="Enter Password" name="password" required>
<button type="submit">Login</button>
<button class="loginBtn loginBtn--facebook">Login with Facebook.</button>
<button class="loginBtn loginBtn--google">Login with Google.</button>


<input type="checkbox" checked="checked"> Remember me
<button type="button" class="cancelbtn"> Cancel</button> Forgot <a href="#">
password? </a>
</div>
</form>
</body>
</html>
```

8. TESTING

8.1 Test Cases

Purpose

     The project aims to create a system that allows the parents to keep a track of their children when they are out of their sight. This is done using a concealed WFPS-enabled device worn by the child which is connected to the parents' smart phone using a mobile network.

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	8	0	0	8
Client Application	45	0	0	45
Security	3	0	0	3
Outsource Shipping	2	0	0	2
Exception Reporting	10	0	0	10
Final Report Output	4	0	0	4
Version Control	3	0	0	3

8.2 User Acceptance Testing

UAT Initiation

     User Acceptance Testing (UAT) checks whether a product is the right one for the end users. It has

other names, e.g., end-user testing, operational, application, beta testing, or validation but they describe the same thing. In quality assurance, it's important to distinguish between validation and verification.
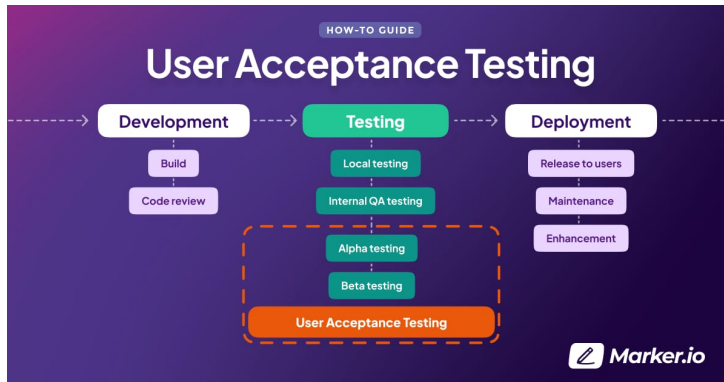

UAT Design

➢ Business scenarios to be validated are identified & documented.
➢ Relevant test data is identified.
➢ Scenarios are uploaded in the corresponding management tools.
➢ Appropriate user accesses are requested & sorted out.
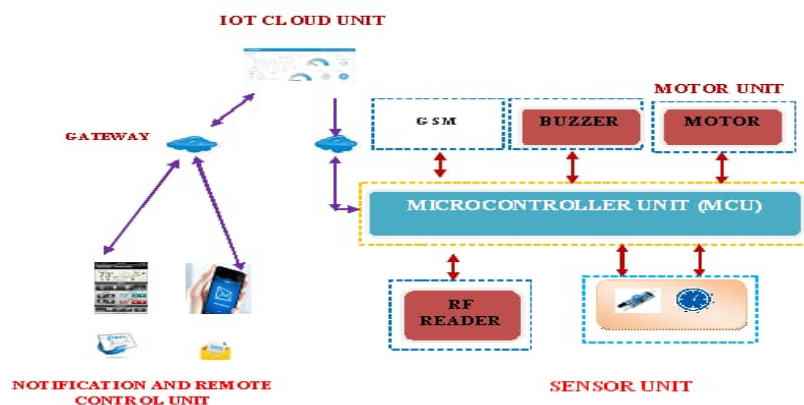
UAT Execution

➢ Test execution of the business scenarios are performed.
➢ Appropriate defects are raised in the test management tool.
➢ Defect re-testing & regression testing is performed.
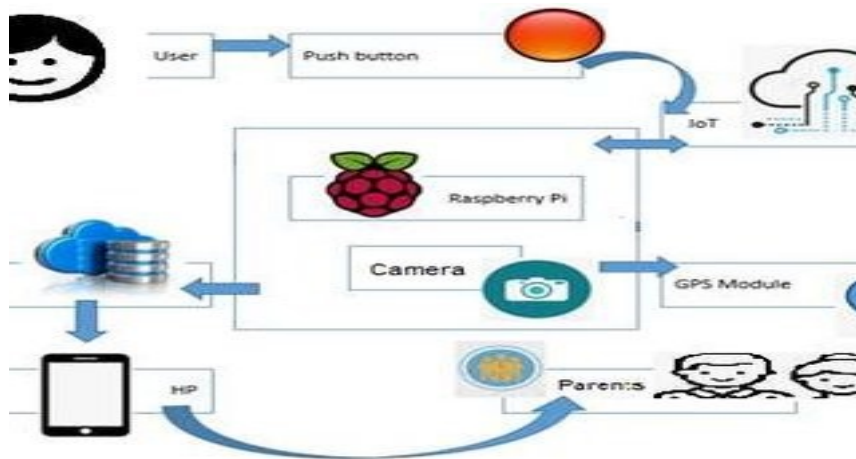
UAT Report Submission

The User Acceptance Test Report is a document that identifies the status of Discrepancy Notices (DN) as UAT progresses. Note that even when a DN is 'Closed', it must be recorded here to ensure that the final status of any DN is available throughout the UAT period.

	Gator	Explora Go	Proposed System
Wifi	✓	✓	✓
Phone Calls	✓	✓	✓
Waterproof	X	✓	✓
Camera	X	✓	✓
Video Record	X	X	✓
Text Messages	X	✓	X
Schedule	✓	✓	X
GPS	✓	✓	✓
Safety Zones	✓	✓	✓
Emergency Button	✓	✓	✓
SOS Light	X	X	✓
Altimeter	X	X	✓
Blood Pressure Sensor	X	X	✓
Emotion Detector	X	X	✓
Heart Rate Sensor	X	X	✓
Motion Sensor	X	X	✓
Pedometer	✓	✓	✓
Respiratory Sensor	X	X	✓
Sleep Quality Sensor	X	X	✓
Temperature Sensor	X	X	✓

UAT Tools Utilization

As this phase involves validating the complete end to end flows of the application, it might be difficult to have one tool to automate this validation completely. However, to some extent, we would be able to leverage the automated scripts developed during system testing
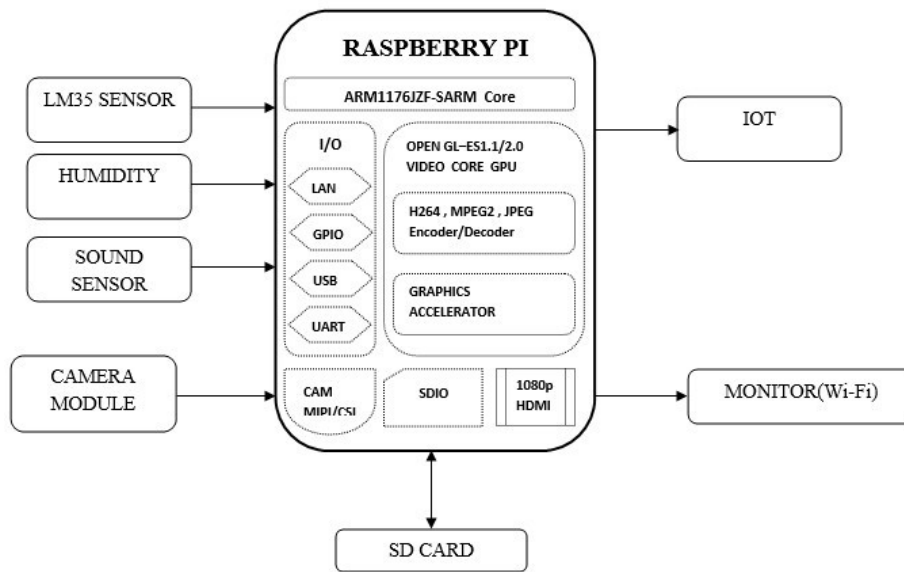
9.RESULTS

☐ On successful completion of the project, though parents are far from child they can monitor when child reached school, what child is doing in classroom and playground.

☐ And whenever child goes out of the school boundary the parents are notified about it and using GPRS parents can locate where the child is. Hence parents are aware of eachaction of their child though they are not with them.

☐ Also, the teachers can update about the child performance in school to their parents using this software.

☐ And any meeting schedules can be updated. Hence, we are trying to simplify the lives using our project.

9.1 Performance Metrics

1) Live Location Tracking: GPS is installed on gadget to track its current location can be tracked on android app and viaSMS request sent from parent phone to safety gadget.
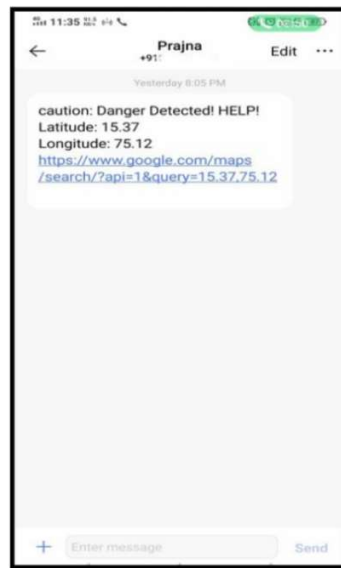
Figure 5.2: SMS sent to the registered mobile number

2) Panic Alert Systems: Panic alert system on gadget is triggered during panic situation, automatic call and SMS are triggered to parental phone. The alert is also updated to the cloud for purpose of app monitoring.
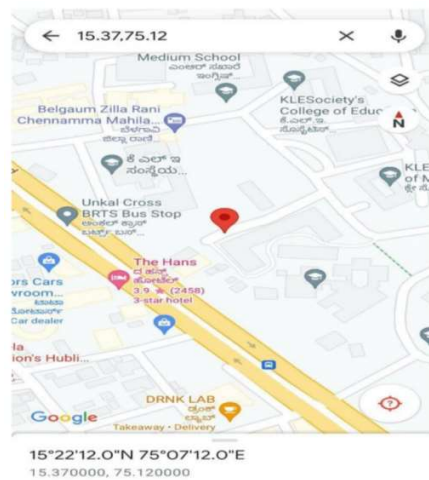

Figure 5.3: Google Map Location

3) Stay Connected Feature: Stay connected feature is used to trigger call and pre-defined SMS anytime from gadget to parental phone by just pressing a button and also parent can make SMS and call to the gadget anytime.

4) Health Monitoring System: Health monitoring system is implemented using heart beat sensor, temperature sensor which is updated to the cloud and also can be monitored via app. The current value of sensors can be obtained using SMS request sent to gadget from parent phone.
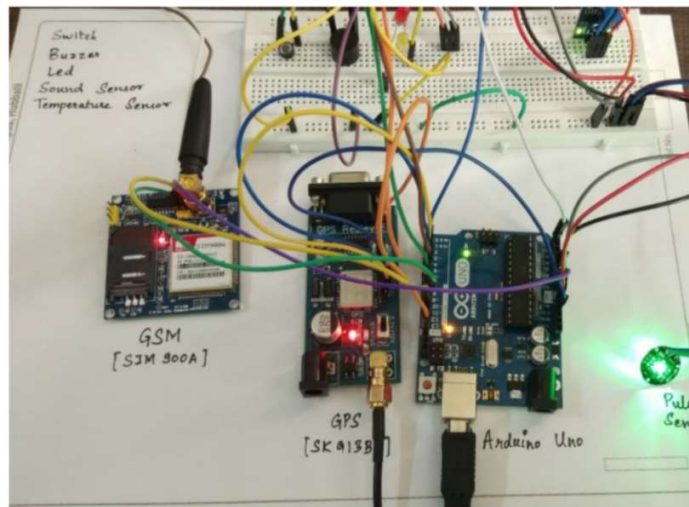
Figure 5.4: Hardware Implementation

5) Gadget Plugged or Unplugged Monitoring: Gadget plug or unplugged is monitored using contact switch installed on smart gadget, as soon as the device is unplugged, an alert is provided to parent phone via SMS and it is also updated to cloudfor app monitoring.

6) Boundary monitoring system: This is used to track the safety gadget using the binding gadget by implementing signal strength concept as soon as the safety gadget moves far away from the BLE listener gadget then an alert is provided to itself.
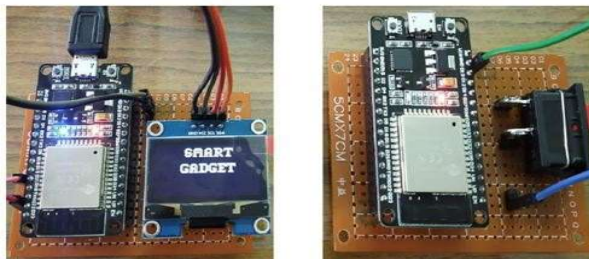
10.ADVANTAGES & DISADVANTAGES

Advantages

1 .Easy Availability& Affordability

Gone are the days when buying a GPS enabled Wearable Device for kids was considered a luxury. Today, however, the scenario is different. There are plenty of options readily available. It is easy to buy a smart watch for kids of your choice online. What's more, these magnificent tech gadgets don't burn a big hole in your pockets and make up for an affordable buy. Now a smart watch is just a click away! Besides ,these smart-watches lend a style statement to your fashion conscious kids.

2 .Tracking Made Easy

Fueled by IOT, the GPS enabled Wearable Device act as a saviour for parents who are always clouded with worries about their kids. Tracking a child was never this easy. These Wearable Device allow parents to track their children in crowded/public places or when they are out of sight say at school, picnic or an outing. Parents can use these smart-watches to track the location of their lost kids.

3.Smart watch is Technology in Disguise

No matter how tech advanced the smart watches are, they hardly look like one. Most manufacturers have worked hard to mold their tech wonders in a time piece that looks everything but a tech piece! Their childish designs and bright colour combination is perfect to disguise them. This is precisely why most people can hardly spot the difference between a smart watch and an ordinary watch. Good for kids who use them, as their adorable designs keep these watches safe from the prying eyes.

4.Watches Over Your Kids

GPS tracker watches are a boon for parents as they help in watching over your kids when either they are away or you are away from them. These devices:

1. Tracks kids when they reach school or arrive home from school.

2. Track kids when they are untraceable in a crowded space.

3. Track kids when they are away from home and out of your sight.

5. Guarantees Peace of Mind to Parents

Parents, whether at home or office, are always worried about the safety of their kids. The fear of losing your child to avoidable circumstances is the concern area for all mommies and daddies. On the other hand, a smart watch equipped kid is always traceable and reachable in case of contingencies and emergencies. This in fact, offers great solace for parents, who are relieved at the thought of maintaining an uninterrupted connectivity with their children, anytime, anywhere. Enough to of course, guarantee the much-needed peace of mind.

Limitations

❖ First, it is likely that some parents might have exhibited social desirability bias [30], as they sought to demonstrate themselves as responsible parents who care about their children's safety after figuring out the study's goal even though their parenting style is more complacent and relaxed.

❖ Second, we did not collect parents' demographic information such as income and education level, which limits our ability to further characterize our sample. We learned through interactions with parents during the interview that most parents described themselves as tech-savvy due to tech-related occupations or personal interest. Thus, our findings provide a snapshot of a small sample of parents who are generally familiar with technologies. Future studies should study larger and more diverse groups of parents with different income, educational background, and familiarity with technologies.

- ❖ Third, we recruited parents only from the US and Canada. Parents in other countries might have different perceptions of child safety in smart homes due to different cultural norms.

- ❖ Fourth, our study focused on parents' perspectives since parents tend to be smart home adopters in charge of their children's access and use [33, 46]. However, parents' perspectives may not accurately reflect children's own perceptions toward smart home safety. Further children conceptualize smart home safety, as well as how children and parents interact with
and through smart home technologies using observations to provide further insights and reveal potential tensions between children's and parents' perspectives.

11.CONCLUSION

This research demonstrates Smart IoT device for child safety and tracking, to help the parents to locate and monitor their children. If any abnormal readings are detected by the sensor, then an SMS and phone call is triggered to the parents mobile. Also, updated to the parental app through the cloud. The system is equipped with GSM and GPS modules for sending and receiving call, SMS between safety gadget and parental phone. The system also consists of Wi-Fi module used to implement IoT and send all the monitored parameters to the cloud for android app monitoring on parental phone. Panic alert system is used during panic situations alerts are sent to the parental phone, seeking for help also the alert parameters are updated to the cloud.

12. FUTURE SCOPE

A. Camera Module
For surveillance of the child surroundings, to get a clearer picture of the location or place, this wearable can also be incorporated a camera module in it. The hardware that can be used would be an ad fruit TTL serial camera or any other camera module. Since the major focus of this wearable is the GSM module which is a better alternative than Bluetooth, Wi-Fi or ZigBee due to the short range and connectivity issues. Therefore, for this project using the GSM technologies is beneficial for us as the cellular range is vast and since all the communication between the wearable and the user is taking place via SMS,therefore no internet connectivity is required. But, still, the GSM module possess the added advantage of using GPRS which enables the board to use the internet if required. Whereas for camera module which supports video streaming but due to the constraint of trying to use only SMS, therefore only four wire connections will be taking place. The red and black wires will be connected directly to +5V and GND respectively to the Arduino Uno board. Whereas for the RX pin which will be used for sending data via Arduino Uno and gsm board and for the TX pin which will be utilized for receiving incoming data via from the modules. The 10 K resistor divider, the camera's serial data pins are 3.3v logic, and it would be a good idea to divide the 5V down so that its 2.5V.Normally the output from the digital 0 pin is 5V high, the wa0y we connected the resistors is so the camera input (white wire) never goes above 3.3V. To talk to the camera, the Arduino Uno will be using two digital pins and a software serial port to communicate to the camera. Since the camera or the Arduino Uno do not have enough onboard memory to save snapshots clicked and store it temporarily, therefore an external storage source micro SD board will be used to save the images temporarily. The camera works on a standard baud rate of 38400 baud. The camera will be collecting information in the same manner as the GPS module does. It will be on standby conserving power waiting for the particular keyword "SNAPSHOT" or any other defined in the program to be sent from the user's smart phone to the GSM module will activate the camera by the Arduino Uno to start clicking a snapshot of the surrounding and save the file temporarily on the external microSD card. After which Arduino Uno will access the saved images from the SD storage and transfer it to the GSM module which send it to the

user via SMS/MMS text.

B. Android App

The idea behind the Android app has been derived from having an automated bot to respond to text message responses from the user. It will provide the user with predefined response options at just the click of a button. The user doesn't need to memorize the specific keywords to send. Also, the bot will be pre-programmed to present the user with a set of predefined keyword options such as "LOCATION," "SNAPSHOT," "SOS," etc. Whereas for the future aspect of this wearable device based on what type sensor is added to it, additional specific keywords could be added such as, "HUMIDITY," "ALTITUDE," etc. This android app provides mote interface to the user which help to understand easily. The main idea in this android app is to provide keyword button i.e. that for getting location we have a specific button, by pressing this button we get the location instead of typing the keyword which ease our work.

13. APPENDIX

Source Code

```
#include <TinyGPS++.h>
static const int RXPin = 2, TXPin = 3;
static const uint32_t GPSBaud = 9600;
int  m = 9740;
int y = 71;
TinyGPSPlus gps;
SoftwareSerial ss(RXPin, TXPin);
SoftwareSerial SIM900(7, 8);
int Buzzer = 4;
String textForSMS;
int Switch = 5;

String datareal;
String dataimaginary;
String combined;
int raw = 1000000;

String datareal2;
String dataimaginary2;
String combined2;

double longitude;
double latitude;

void setup()
{
  SIM900.begin(19200);
  Serial.begin(9600);
  ss.begin(GPSBaud);
  delay(10000);
  Serial.println(" logging time completed!");
```

```
  randomSeed(analogRead(0));
  pinMode(Switch, INPUT);
  digitalWrite(Switch, HIGH);
  pinMode(Buzzer, OUTPUT);
  digitalWrite(Buzzer, LOW);

  Serial.println(F("DeviceExample.ino"));
  Serial.print(F("Testing TinyGPS++ library v. "));
  Serial.println(TinyGPSPlus::libraryVersion());

  Serial.println();
}



void sendSMS(String message)
{
 SIM900.print("AT+CMGF=1\r");
 delay(100);
 SIM900.println("AT + CMGS = \"+918830584864\"");
 delay(100);
 SIM900.println(message);
 delay(100);
 SIM900.println((char)26);
 delay(100);
 SIM900.println();
 delay(5000);

}

void loop()
{
 int reading;

 while (ss.available() > 0)
   if (gps.encode(ss.read()))
     displayInfo();

 if (millis() > 5000 && gps.charsProcessed() < 10)
 {
   Serial.println(F("No GPS detected: check wiring."));
   while (true);
 }

 if (digitalRead(Switch) == LOW)
 {
   displayInfo();
   latitude = gps.location.lat(), 6 ;
   longitude = gps.location.lng(), 6 ;
   long datareal = int(latitude);
   int fahad = ( latitude - datareal) * 100000;
```

```
   long datareal2 = int(longitude);
   int fahad2 = (longitude - datareal2 ) * 100000;
   textForSMS.concat(fahad);
   //textForSMS = "Longitude:  ";
   textForSMS.concat(datareal2);
   textForSMS = textForSMS + ".";
   textForSMS.concat(fahad2);
   //textForSMS = textForSMS + " Latitude: ";
   textForSMS.concat(datareal);
   textForSMS = textForSMS + ".";
   sendSMS(textForSMS);
   Serial.println(textForSMS);
   Serial.println("message sent.");
   delay(5000);
 }
 else
   digitalWrite(Switch, HIGH);
 digitalWrite(Buzzer, LOW);
}


void displayInfo()
{
 Serial.print(F("Location: "));
 if (gps.location.isValid())
 {
   Serial.print(gps.location.lat(), 6);
   Serial.print(F(","));
   Serial.print(gps.location.lng(), 6);
   Serial.print(" ");
   Serial.print(F("Speed:"));
   Serial.print(gps.speed.kmph());
 }
 else
 {
   Serial.print(F("INVALID"));
 }

 Serial.print(F("  Date/Time: "));
 if (gps.date.isValid())
 {
   Serial.print(gps.date.month());
   Serial.print(F("/"));
   Serial.print(gps.date.day());
   Serial.print(F("/"));
   Serial.print(gps.date.year());
 }
 else
 {
   Serial.print(F("INVALID"));
 }
```

```
 Serial.print(F(" "));
if (gps.time.isValid())
{
  if (gps.time.hour() < 10) Serial.print(F("0"));
  Serial.print(gps.time.hour());
  Serial.print(F(":"));
  if (gps.time.minute() < 10) Serial.print(F("0"));
  Serial.print(gps.time.minute());
  Serial.print(F(":"));
  if (gps.time.second() < 10) Serial.print(F("0"));
  Serial.print(gps.time.second());
  Serial.print(F("."));
  if (gps.time.centisecond() < 10) Serial.print(F("0"));
  Serial.print(gps.time.centisecond());
}
else
{
  Serial.print(F("INVALID"));
}

 Serial.println();
}
```

Github

https://github.com/IBM-EPBL/IBM-Project-53696-1661489360/pulse