

Iot Based Safety Gadget for Child Safety Monitoring and Notification

PROJECT REPORT

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CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

Child tracking system is an app that can track and monitor the child location. The aim of the project is to create a system to allow the parents to keep track of their kids when their child is out of their view. However, with the child tracking system the parent can track and monitor their child location in just a simple app when the parent is in office. A study on few existing tracking system have been done to gather the information and existing problem.

This project focused on how parents can keep track their children movement to avoid child missing, kidnapping and etc. By using GPS as a tracking tool where it allows to determine the exact location (longitude and latitude) of the children. Every an hour, the location of the children will be recorded in the system to keep track the children.

1.2 PURPOSE

The parent is not possible to always stay beside of children as most of the parents needs to go for work. By having this child tracking system, parents can track the location of their children. Using GPS as a tracking tool where it allows to determine the exact location (longitude and latitude) of the children. The technology can allow parents to track child whereabouts. Parent can keep track their children movement when they were at outdoor and also current location of the child.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

“Nowadays, crimes always occur. This scenario not involves by adults only, but also happen to children. Parents concern more about serious cases such as missing children, abduction and rape. The crime also involve by school children have been reported in newspapers. Although the school have guards that posted on school grounds 24 hours a day, that simply not enough to monitor the student. To overcome these problems the authorized need to provide additional security measure”

“Some parents do not have the privilege to send or fetch their children at school. Parents usually give a hundred percent of trust to their children to travel themselves. Those children would have to travel by bus, bicycles or walking. Children who travel to and from school by themselves without monitor by their parents are exposed to danger along the way.” Besides that, parents usually received late information if anything happen to their children such as accidents or involved in criminals.

2.2 REFERENCES

- [1] (Omer & Abdullah, 2013) Omer, E., & Abdullah, M. F. A. (2013). GPS and SMS-Based Child Tracking System Using Smart Phone. *Internasional Journal of Electrical, Computer, Electronic and Communication Engineering*, 7(2), 171–174.
- [2] (Pawade & Gaikwad, 2015) Pawade, R. H., & Gaikwad, A. N. (2015). Android Based Children Tracking System, 4(6), 2088–2092.
- [3] (Pham, Drieberg, & Nguyen, 2013) Pham, H. D., Drieberg, M., & Nguyen, C. C. (2013). Development of vehicle tracking system using GPS and GSM modem. In 2013 IEEE Conference on Open Systems, ICOS 2013 (pp. 89–94).
<https://doi.org/10.1109/ICOS.2013.6735054>
- [4] (Rycroft, 1997) Rycroft, M. J. (1997). Understanding GPS. Principles and applications. *Journal of Atmospheric and Solar-Terrestrial Physics*, 59(5), 598–599.
[https://doi.org/10.1016/S1364-6826\(97\)83337-8](https://doi.org/10.1016/S1364-6826(97)83337-8)
- [5] (Sarjana & Ii, 2012) Sarjana, P., & Ii, M. (2012). GSM & GPS BASED SCHOOL

KIDS TRACKING SYSTEM NG WOON CEA This Report Is Submitted In Partial
Fulfilment of Requirements for the Award of Bachelor Degree of Electronic Engineering
(Industrial Electronic) With Honours Faculty of Electronic Engineering.

[6] (Salihoglu & Widom, 2013)Salihoglu, S., & Widom, J. (2013). Gps. Proceedings of
the 25th International Conference on Scientific and Statistical Database Management
SSDBM, 1. <https://doi.org/10.1145/2484838.2484843>

2.3 PROBLEM STATEMENT

The parent is hardly to keep a watch on their child without the use of technology, especially when the child is in the outdoor. The parent even cannot avoid the negligence that will make by children in the future day.

There are very limited application available for tracking child when they are out of parents control and let kidnapping or missing cases occurred.

CHAPTER 3

IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION AND BRAINSTORMING

3.2.1 BRAIN STORMING

Madhivadhanan B R

Implement
Child
tracking
mechanism

Create a geo
fence

Develop
ability of
child to alert
the parent.

Develop ability
for parents to
know if child
crossed the
geo fence

Mohan J

Store and
display the
location
history of
child

Create
Faster and
efficient
application

Develop the
ability to know
weather
conditions of
child location

Buy Best
fitted -low
cost
hardwares

Madhan Raj M

Make the
product
water proof

Create a
long lasting
product

Make the
product
rechargeable

See the child
surrounding
location via
camera

Develop web
application
using node -
red

Krishna Kumar K

Make
product
highly robust

Develop ability
of child to
communicate
with its parent

Beeping
sound if
crossed geo
location

Develop the
ability of
parent to
communicate
with child

3.2.2 IDEA PRIORITIZATION



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<p>*As we all know, kids are the heartbeat of every parent, and when it comes to a child with special needs, parents have to be extra careful. They have to take extra care of the child.</p> <p>*Parents will not be able to monitor their children's whereabouts at all times and can't relax without knowing the exact location of them.</p> <p>*Parents cannot know if their children are in a hazardous or unsafe environment.</p> <p>*Parents cannot know the previous location history of their children to find any lost belongings of them.</p> <p>*Parents can neither contact nor instruct their children when they are far away from them.</p>
2.	Idea / Solution description	<p>*Child tracker helps the parents in continuously monitoring the child's location. They can simply leave their children in school or parks and create a geofence around the location.</p> <p>*By continuously checking the child's location notifications will be provided if the child crosses the geofence. Notifications will be sent according to the child's location to their parents or caretakers. The entire location data will be stored in the database.</p> <p>*Child can also initiate emergency notifications to the parents incase of unsafe situation.</p>
3.	Novelty / Uniqueness	<p>*Easily understandable UI</p> <p>*Economical</p> <p>*24/7 monitoring</p> <p>*Waterproof</p> <p>*Fast tracking</p>
4.	Social Impact / Customer Satisfaction	<p>*Cases of child disappearances, kidnapping , child accidents can be reduced drastically.</p> <p>*Provide liberty for children, especially children with special needs.</p> <p>*Parents can be relaxed knowing their child's status especially when they are at a far distance from them.</p> <p>*Parents can act quickly when their children are in a danger.</p> <p>*Economical and waterproof features , long - lasting battery and consistent performance of the tracker improves customers satisfaction.</p>

5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> *Selling the product directly to the parents(Device + Monthly subscription) *Selling the product to child care organizations or centers. *Selling the product via e-commerce.
6.	Scalability of the Solution	*Increase and decrease of resources like memory and computing power with the help of cloudant db.

3.4 PROBLEM SOLUTION FIT

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Our customers are mainly parents who are unable to monitor their children as they need to go to work. Some of our customers includes the guardians of children of age 0-7 with special needs whose activities must be monitored every now and then for their safety.	6. CUSTOMER CONSTRAINTS CC The constraints of the customers includes the high cost of these devices, the knowledge about these gadgets that are available in the market, the connectivity issues and its inefficiencies due to various reasons leading to low sales performance.	5. AVAILABLE SOLUTIONS AS The available solutions provide some benefits like real time tracking, safe zone alerts, panic button, etc. Though these devices come with such advantages, the increasing costs of such devices, its connectivity issues and the parents no proper knowledge about these gadgets leads to low sales of these items in the market.	Explore AS, differentiate
Focus on J&P, tap into	2. JOBS-TO-BE-DONE / PROBLEMS J&P The parents must be able to track the child's location every now and then and receive notifications if he/she is in an emergency situation. Parents should also be able to ensure that their child is in a safe zone and must be provided with options like tracking the child's location and forecasting the weather for safety measures.	9. PROBLEM ROOT CAUSE RC The root cause for the need of child tracking devices in the market the rising cases of child disappearances, abuses, kidnappings and accidents. To prevent these unfortunate incidents parents are now aware of devices like these that ensures the protection of their children.	7. BEHAVIOUR BE Some of the customers behaviours that leads to buying these child tracking gadgets includes the insecurity they suffer when their children are left alone in their house when they go to work. When their children are travelling or playing with their friends the parents are always concerned about the child's environment and the weather conditions and the use of these devices can reduce their tension in their working place.	Focus on J&P, tap into C
Identify strong TR & EM	3. TRIGGERS TR The increasing cases of child disappearances, child abuses, kidnappings and accidents triggers the parents to use child tracking gadgets for their child safety and to work peacefully.	10. YOUR SOLUTION SL A child tracking device which is capable of monitoring the child's location, the weather conditions, notifications features to make sure their children does not move out of his safe zone and the history of child's locations to find out his/her lost belongings can provide solutions to the existing child's safety problems.	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE When the parents are online they can always keep an eye on their children using their live location. They can also check for the weather conditions using the child's location.	Extract online & offline CH of BE
	4. EMOTIONS: BEFORE / AFTER EM The parents are very anxious about the condition of their children when they are all alone in a house or playing with their friends in some places. The growing insecurity leads them to perform badly in their work and causes a lot of mental problems. With the help of these child tracking gadgets, the parents can feel secure about their child's conditions and his activities and can always keep an eye on their location.		8.2 OFFLINE When the parents are present physically they can often visit their child's location to ensure they are safe and the climate looks optimal.	

CHAPTER-4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

- The system shall allow the user or family's to register phone number.
- The system shall provide report for the ongoing day to day activity both for the schools and families.
- The system should provide all the sensed data from each sensor send by text message.
- The system shall check the sensed data with the threshold value of each input.
- The system shall notify the user while the input value exceed or become below the threshold value.

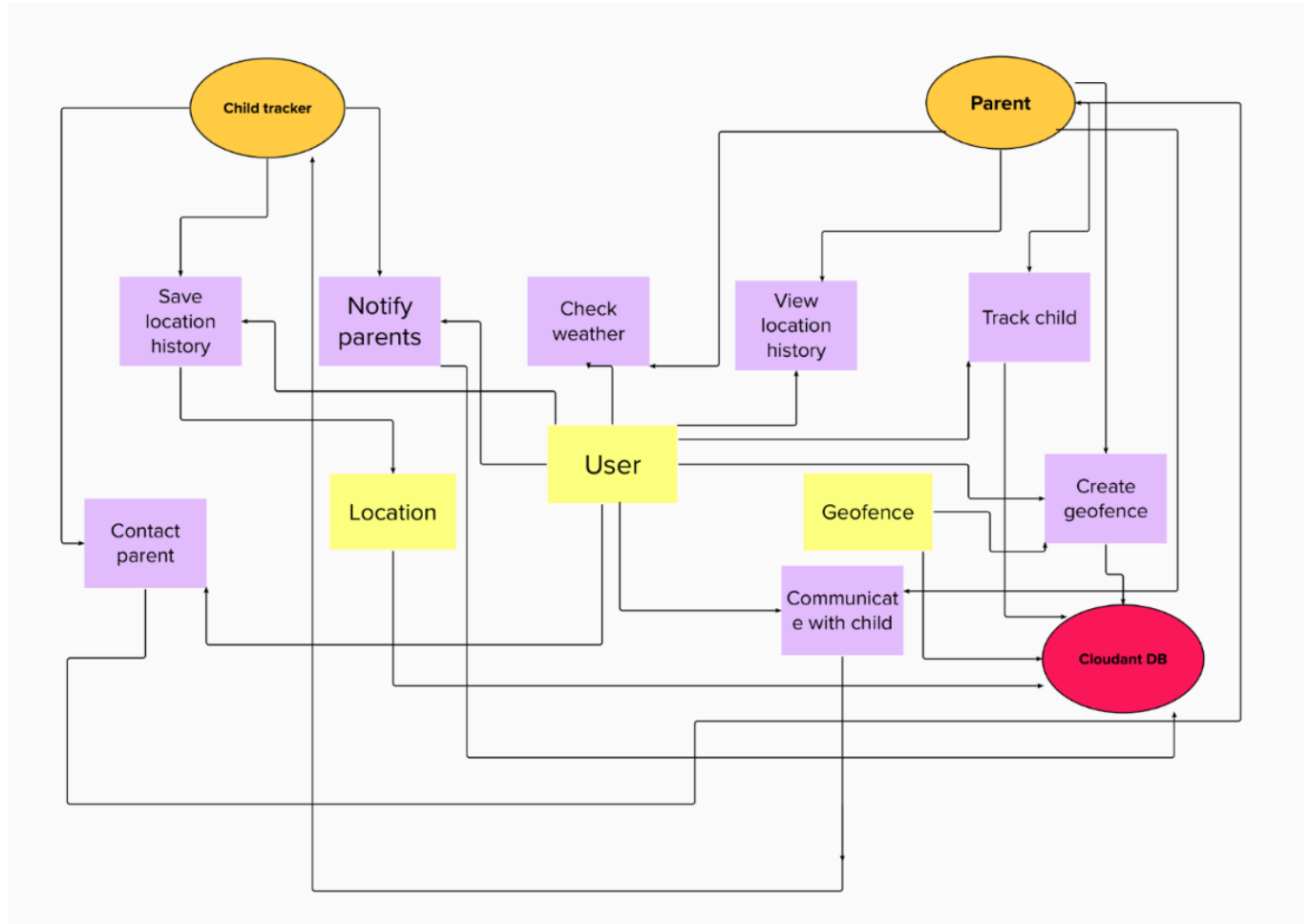
4.2 NON-FUNCTIONAL REQUIREMENTS

- The system shall give the accurate result for different factors using sensing material as a result their will not be any distractive damage.
- The system shall be maintainable whenever faller occurs.
- Sometime the GPS module works on rainy condition.
- The system is cost effective comparing to the features it provides.
- The system shall be usable within a few minutes training.

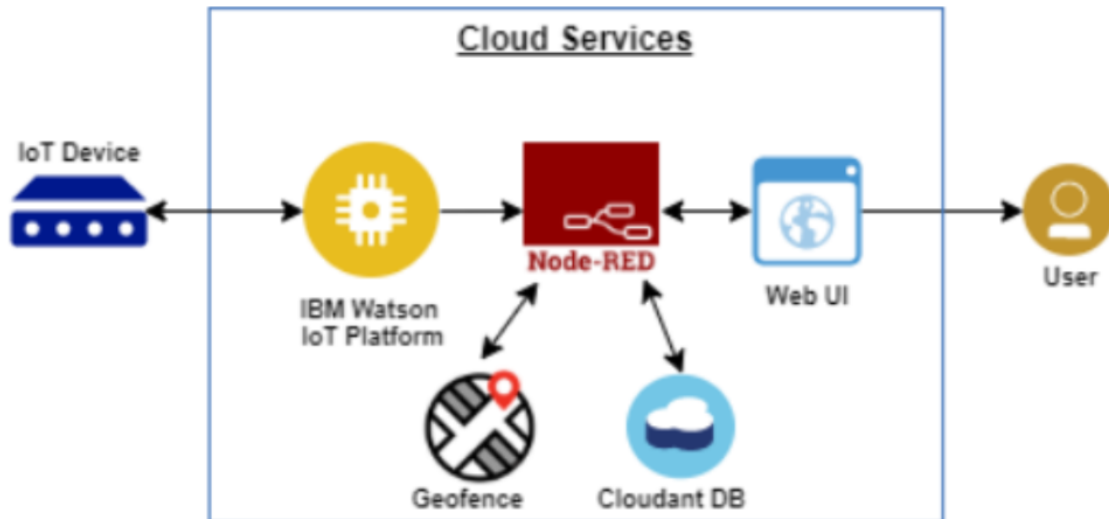
CHAPTER 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION AND TECHNICAL ARCHITECTURE



IoT Device :

IoT devices are the non standard computing devices that connect wirelessly to a network and have the ability to transmit data. Here we use IoT devices like microcontroller , sensors for input and buzzers , LED light for output.

IBM Watson IoT Platform :

Clean and simple UI where you can simply add and manage the devices and control access to the IoT devices and monitor the usage of the devices. Here we add up all the devices that our application need , monitor them and connect with api calls to the node - red platform.

Node - RED :

Node - RED is a programming tool for wiring the hardware , API and online services in new and interesting ways. It is a low code platform where you can easily create the application by just drag and drop . We can keep on adding features to our application without worrying about the internal operations. In our application , node red helps to interact with the db (Cloudant db) , store and manage data in the cloud db.

Geofence :

A geofence is a virtual perimeter of a real world - geographical area . A geo world can be dynamically created or match a predefined set of boundaries. In our application , the geo fence is created by the parents using node - red.

Cloudant DB :

Cloudant is an IBM software product, which is primarily delivered as a cloud-based service. Cloudant is a non-relational, distributed database service of the same name. Cloudant db is the datastore where we store every data of this application.

Web UI :

Web is a place where every device in the internet can communicate with each other. Web UI is the application layer for our application where users can interact with their devices , monitor their child , check the location history and check the future and current weather conditions of the child location.

User :

User can be parents or guardians who are responsible to monitor the child.

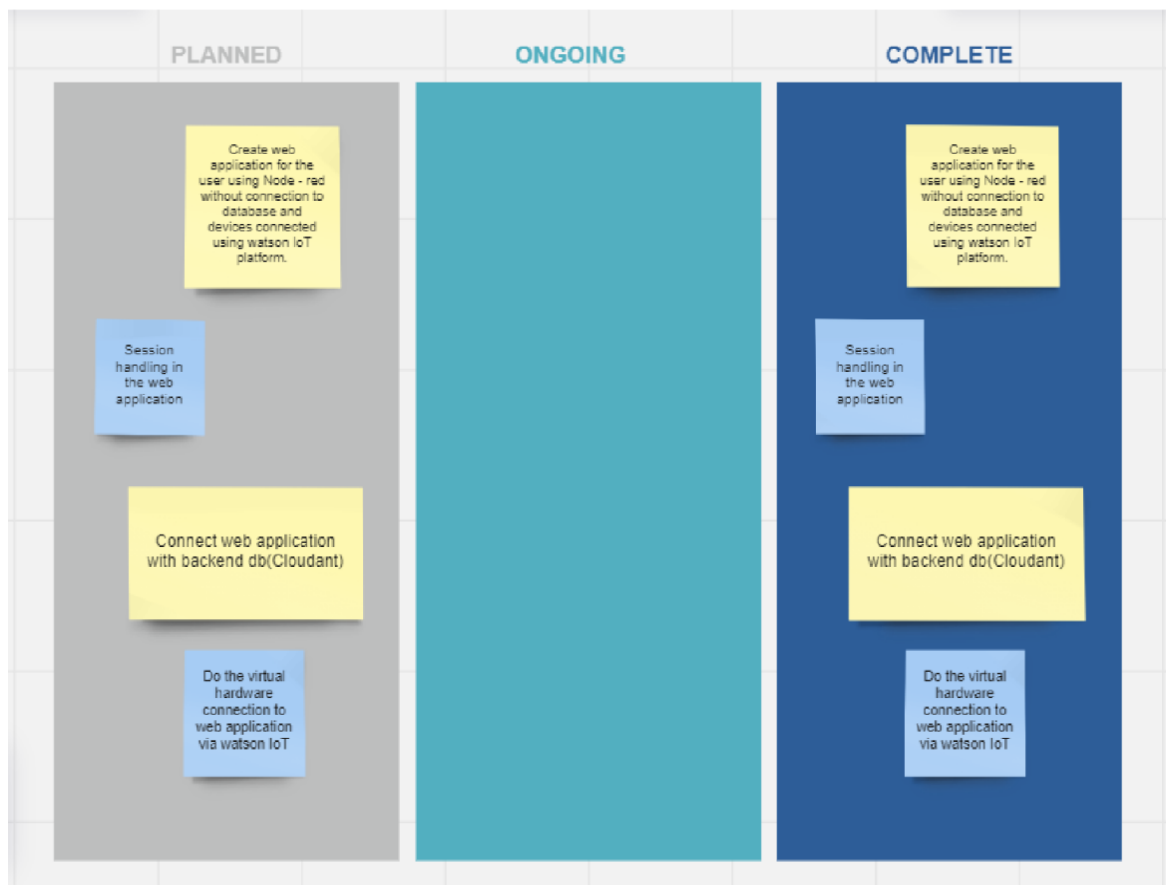
5.3 USER STORIES

Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points
Web application flows	USN-1	Create web application for the user using Node - red without connection to database and devices connected using watson IoT platform.	20
Session handling	USN-2	Session handling in the web application.	20
Connect web application to db	USN-3	Connect web ui with backend db(Cloudant).	20
Simulate the hardware devices	USN-4	Do the virtual hardware connection to web application via watson IoT.	20

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION



6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Web application flows	USN-1	Create web application for the user using Node - red without connection to database and devices connected using watson IoT platform.	20	High	Mohan , Krishna kumar,M adhivadhanan
Sprint-2	Session handling	USN-2	Session handling in the web application.	20	High	Madhan raj
Sprint-3	Connect web application to db	USN-3	Connect web ui with backend db(Cloudant).	20	High	Mohan
Sprint - 4	Simulate the hardware devices	USN-4	Do the virtual hardware connection to web application via watson IoT.	20	High	Madhivadhanan , Krishna kumar

CHAPTER 7

CODING & SOLUTIONING

7.1.1 FEATURE 1 : LOGIN

Algorithm :

1. Enter the credentials and hit enter (email and password).
2. If already logged in user is taken to home page
3. Else , check for validity of credentials entered using query to cloudant db.
4. If wrong credentials entered , notification displayed to user and user stays in login page.
5. On correct credentials , user is taken to home page.

Login checker :

```
if(msg.req==null){
    email = msg.payload.email;
}
else{
    var email = msg.req.params.email;
}
msg.enteredPassword = msg.payload.password;
msg.payload={
    "selector":{
        "email":{
            "$eq":email
        }
    },
    "fields":["email","password"]
}
return msg;
```

7.1.2 FEATURE 2 : SIGNUP

Algorithm :

1. Enter the signup form fields (name , email , password , re-enter password , date of birth) and hit enter.
2. All credentials are validated at client side.
3. Email is checked if already registered or not in the database.
4. If already registered , notification displayed. Or else, the user is taken to the successful

signup page.

Query to check if email is registered or not :

```
var email = msg.enteredFields.email;
msg.payload={
  "selector":{
    "entry-type":"user",
    "email":{
      "$eq":email
    }
  },
  "fields":["email"]
}
return msg;
```

7.1.3 FEATURE 3 : HOME

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. Home page buttons are displayed (Live tracker , Recent emergency notifications , Location history , Change password , Logout)
3. If buttons are clicked , the user is taken to the requested page.

7.1.4 FEATURE 4 : LIVE TRACKER

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. GPS sensor data is received via IBM IoT Watson platform , the location marker is displayed in the world map.
3. Location data is stored to db every 1 minute.

7.1.5 FEATURE 5 : LOCATION HISTORY

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. The location table contents are displayed in the table by querying the database.

Location query getter :

```
msg.payload =
{
  "selector":{
    "entry-type":{
```

```

        "$eq": "location"
    },
    },
    "fields": ["lat", "lon", "time", "description"]
}

```

7.1.6 FEATURE 6 : RECENT NOTIFICATIONS

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. The notification table contents are displayed in the table by querying the database.

Recent notification getter :

```

msg.payload =
{
    "selector": {
        "entry-type": {
            "$eq": "notification"
        }
    },
    },
    "fields": ["lat", "lon", "time"]
}

```

7.1.7 FEATURE 7 : CHANGE PASSWORD

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. User is asked to enter the new password twice and click the change password button.
3. Passwords are validated , and password of requested user is changed by querying the database.

7.2 DATABASE SCHEMA

User			Location		
name	string		lat	float	
email	string		lon	float	
password	string		description	string	
dob	date		time	datetime	
entry-type	string		entry-type	string	
Add field			Add field		

Notification		
lat	string	
lon	string	
time	string	
description	string	
Add field		

CHAPTER 8

TESTING

8.1 TEST CASES

1. Login button click with wrong credentials entered.
2. Signup with already registered mail ID.
3. Signup with wrong form data entered.
4. Entering home page with logged out session.
5. Clicking home page buttons with logged out session.
6. Invalid data entered in change password page and requested for change in password.

8.2 USER ACCEPTANCE TESTING

S.NO	TEST CASE	REQUIRED OUTPUT	RESULT OUTPUT	STATUS
1	Login button click with wrong credentials	Wrong credentials entered notification	Wrong credentials entered notification	ACCEPTED
2	Signup with already registered mail ID.	Email already registered notification	Email already registered notification	ACCEPTED
3	Signup with wrong form data entered.	Wrong credentials entered notification	Wrong credentials entered notification	ACCEPTED
4	Entering home page with logged out session.	Take user to login page	Take user to login page	ACCEPTED
5	Clicking home page buttons with logged out session.	Take user to login page	Take user to login page	ACCEPTED
6	Invalid data entered in change password page and requested for change in password.	Wrong form data entered notification	Wrong form data entered notification	ACCEPTED

CHAPTER 9

RESULTS

9.1 PERFORMANCE METRICS

1. Planned value : Rs.4000
2. Actual value : Rs.1300
3. Hours worked : 50 hours
4. Stick to Timelines : 100%
5. Stay within budget : 100%
6. Consistency of the product : 75%
7. Efficiency of the product : 80%
8. Quality of the product : 80%

CHAPTER 10

ADVANTAGES AND DISADVANTAGES

ADVANTAGES :

1. Low cost.
2. Simple UI.
3. Faster response due to single page web page.
4. Capability of adding many features with ease and less cost.

DISADVANTAGES :

1. Lack of efficiency . Efficiency of the product needs to be improved.
2. Consistency of the product is not 100%.
3. Not a compact sized product. Size needs to be decreased.

CHAPTER 11

CONCLUSION

The product can be easily made into a business model. With the help of this product, customers can have a happy life , since it is economical and offers a simple user interface to monitor their child . Children can have a safe place to live with the help of this product. This product has the capability of impacting the market if further improvements have been done , due to its low price since , the cost of child safety gadgets in the market is of high cost.

CHAPTER 12

FUTURE SCOPE

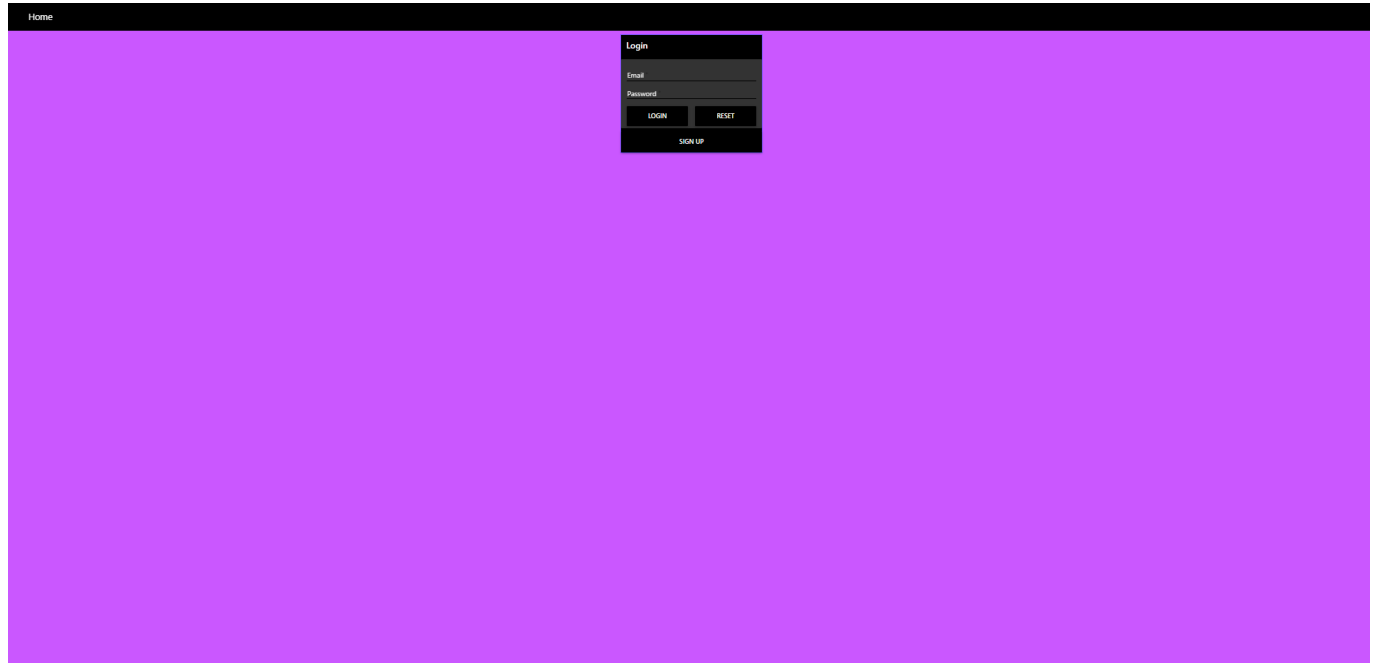
The product can include many other additional features like checking the weather forecast of the child location, interacting with the child etc. If we improve the efficiency of the code and reduce the size of our product , the market will be able to find a new child tracker gadget with low cost and high quality.

CHAPTER 13

APPENDIX

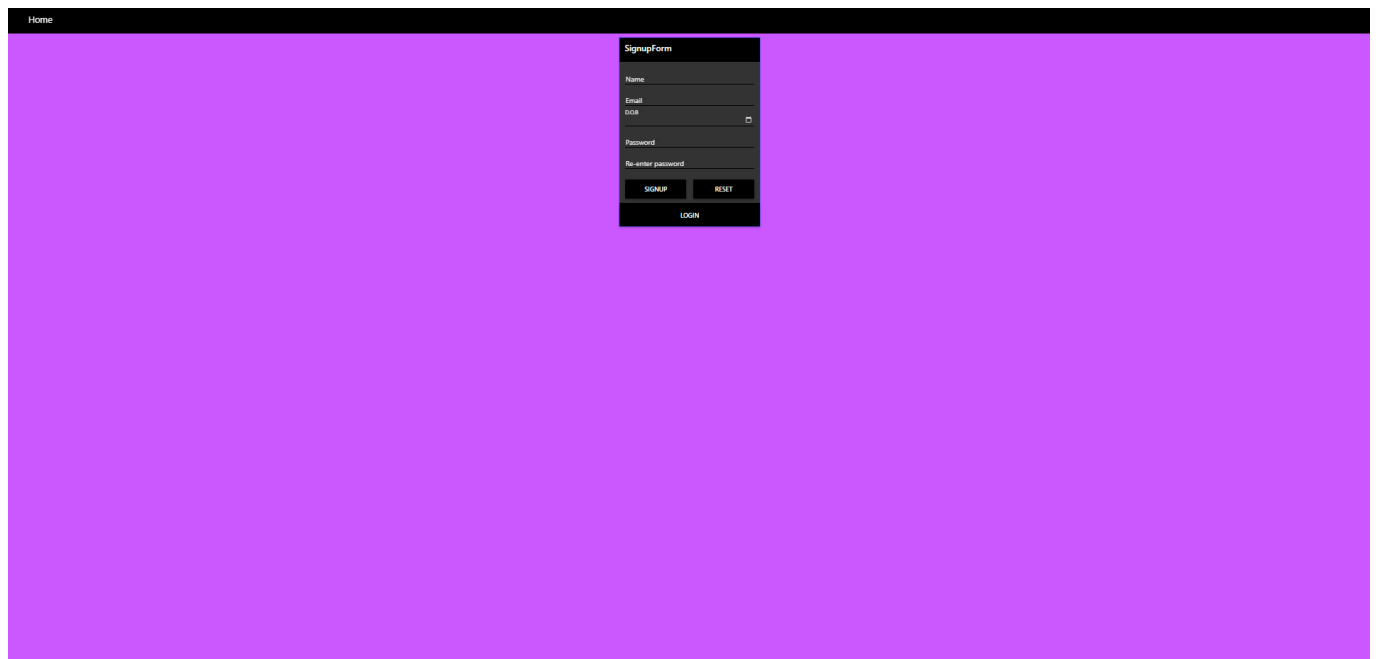
SAMPLE SCREENSHOTS :

LOGIN PAGE :



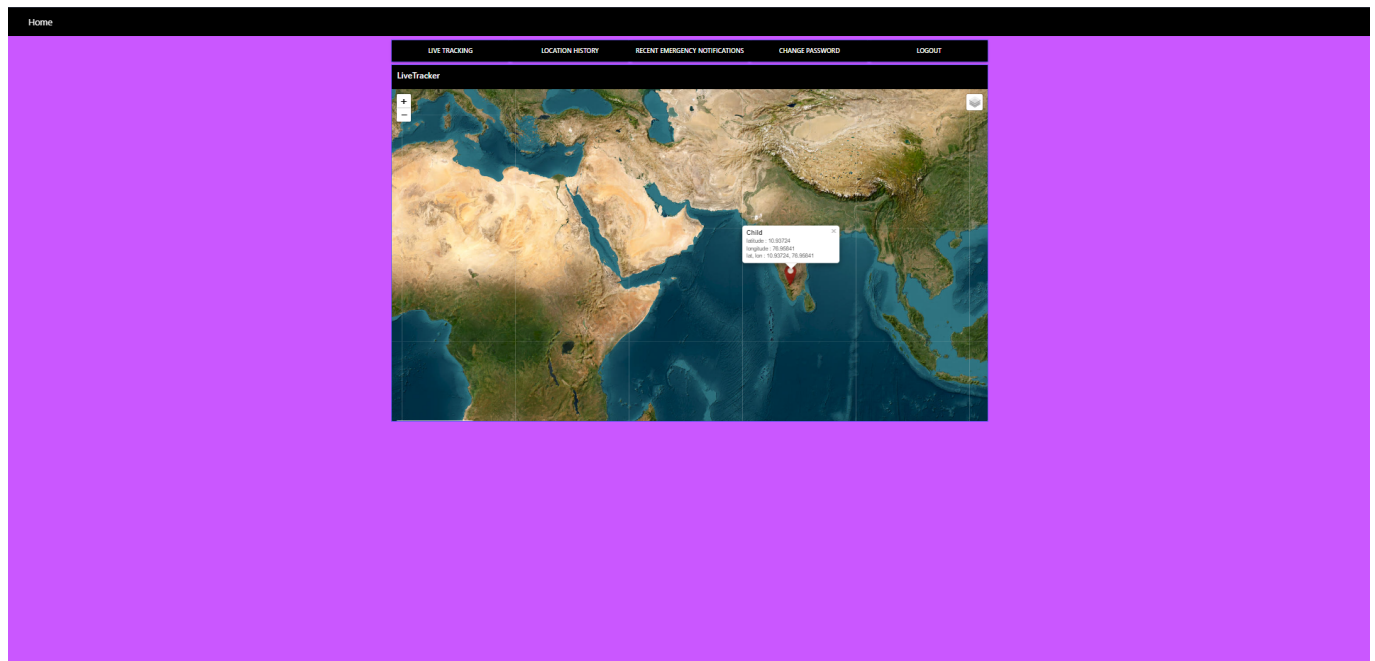
The screenshot shows a web application interface with a dark blue header bar containing a "Home" link. The main content area has a light blue background. A white login form is centered on the page. The form is titled "Login" and contains two input fields for "Email" and "Password". Below these fields are two buttons: "LOGIN" and "RESET". At the bottom of the form is a link labeled "SIGN UP".

SIGNUP PAGE :



The screenshot shows a web application interface with a dark blue header bar containing a "Home" link. The main content area has a light blue background. A white signup form is centered on the page. The form is titled "SignupForm" and contains four input fields: "Name", "Email", "Password", and "Re-enter password". Below these fields are two buttons: "SIGNUP" and "RESET". At the bottom of the form is a link labeled "LOGIN".

LIVE TRACKER PAGE :



LOCATION HISTORY PAGE:

Home

LIVE TRACKING

LOCATION HISTORY

RECENT EMERGENCY NOTIFICATIONS

CHANGE PASSWORD

LOGOUT

LocationHistory

Serial number	Latitude	Longitude	Date	Time	Description
24	11.09648918	76.93328569	11/13/2022	12:52:38	Child is at India
25	11.09639431	76.93338911	11/13/2022	4:14:46	Child is at India
26	11.09650538	76.93333838	11/13/2022	4:20:47	Child is at India
27	11.09637783	76.93346442	11/13/2022	4:36:47	Child is at India
28	11.09647872	76.9332962	11/13/2022	4:27:47	Child is at India
29	11.09667999	76.93309704	11/13/2022	4:28:47	Child is at India
30	11.0965245	76.93318939	11/13/2022	4:29:47	Child is at India
31	11.09650788	76.93340333	11/13/2022	12:43:38	Child is at India
32	11.09644344	76.9331965	11/13/2022	12:48:38	Child is at India
33	11.09633423	76.93338911	11/13/2022	12:53:38	Child is at India
34	11.09649537	76.93320403	11/13/2022	12:58:31	Child is at India
35	11.09643485	76.93317413	11/13/2022	4:12:46	Child is at India
36	11.09629752	76.9332872	11/13/2022	4:17:46	Child is at India
37	11.09642555	76.93327348	11/13/2022	4:24:47	Child is at India
38	11.0963948	76.93337776	11/13/2022	4:39:47	Child is at India
39	11.09647959	76.93331146	11/13/2022	12:55:26	Child is at India
40	11.09645581	76.9332962	11/13/2022	12:40:38	Child is at India
41	11.09631732	76.9332872	11/13/2022	12:50:38	Child is at India
42	11.09637096	76.93328094	11/13/2022	12:54:38	Child is at India
43	11.09628994	76.93334677	11/13/2022	12:55:39	Child is at India
44	11.09627191	76.93327332	11/13/2022	4:16:46	Child is at India
45	11.09642596	76.93338911	11/13/2022	4:23:47	Child is at India
46	11.09653308	76.93327332	11/13/2022	4:33:47	Child is at India
47	11.09654871	76.9332962	11/13/2022	4:35:47	Child is at India
48	11.09649388	76.93331146	11/13/2022	12:42:38	Child is at India
49	11.09650587	76.93348352	11/13/2022	12:43:38	Child is at India
50	11.09663253	76.93318599	11/13/2022	12:46:38	Child is at India
51	11.09642446	76.93333558	11/13/2022	12:47:38	Child is at India
52	11.09643676	76.93321491	11/13/2022	12:56:12	Child is at India
53	11.09650538	76.9330465	11/13/2022	12:59:21	Child is at India
54	11.09642913	76.93331146	11/13/2022	4:13:46	Child is at India
55	11.09637477	76.93338776	11/13/2022	4:18:46	Child is at India

PROJECT DEMONSTRATION LINK : https://youtu.be/_Rwl_8xa6Bs

SOURCE CODE LINK : <https://github.com/IBM-EPBL/IBM-Project-9148-1658983674>