IOT Based Safety Gadget for Child Safety Monitoring & Notification

IBM - DOCUMENTATION

UNDER THE GUIDANCE OF

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ABSTRACT

This paper is mainly streamed towards child safety solutions by developing a gadget which can be tracked via its GPS locations and also a panic button on gadget is provided to alert the parent via GSM modul calling for help. Parental android app is developed to manage and track the device anytime. Smart gadget device is always connected to parental phone which can receive and make phone calls and also receive SMS on gadget via GSM module, also a wireless technology is implemented on device which is useful to bound the device within a region of monitoring range, if device is moving out of monitoring range then an alert will be triggered on binding gadget, this helps you keep a virtual eye on child. Health monitoring system on gadget checking for parameters like heart beat/pulse rate and temperature is included which can be monitored on parental app. Gadget also monitors whether it is plugged on hand or not using contact switch and alert the parent as soon as it is unplugged.

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IOT BASED SAFETY GADGETS FOR CHILD SAFETY MONITORING & NOTIFICATION

1. INTRODUCTION :

1.1 Project Overview :

- 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 LinkIt 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 are used for parametric analysis and results are plotted for the same. The above system ensures the safety and tracking of children.

1.2 Purpose :

- 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.

2. LITERATURE SURVEY:

2.1 Existing problem:

The child safety wearable device is capable of acting as a smart IOT device. It provides parents with the real-time location, surrounding temperature, UV radiation index and SOS light along with Distress alarm buzzer for their child's surroundings and the ability to locate their child or alert bystanders in acting to rescue or comfort the child. The smart child safety wearable can be enhanced much more in the future by using highly compact Arduino modules such as the LilyPad, Arduino which be sewed into fabrics. Also a more power efficient model will have to be created which will be capable of holding the battery for a longer time.

2.2 References:

[1]. Smart IOT Device for Child Safety and TrackingM Nandini Priyanka, S Murugan, K N H Srinivas, T D S Sarveswararao, E KusumaKumari. https://in.docworkspace.com/d/sIJrayuSPAfiQ4psG

[2]. CHILD SAFETY WEARABLE DEVICE V .Lavanya1 , C.Meenambigai2 , M.Suriyaa3 , S.Kavya.

[3]. Survey on Child Safety Wearable Device Using IoT Sensors and

Cloud Computing [1]Prakriti Agarwal, [2]R Ramya, [3]Rachana Ravikumar, [4]Sabarish G.

[4]. IOT-based Child Security Monitoring System Lai Yi Heng1,* Intan Farahana Binti
Kamsin2.

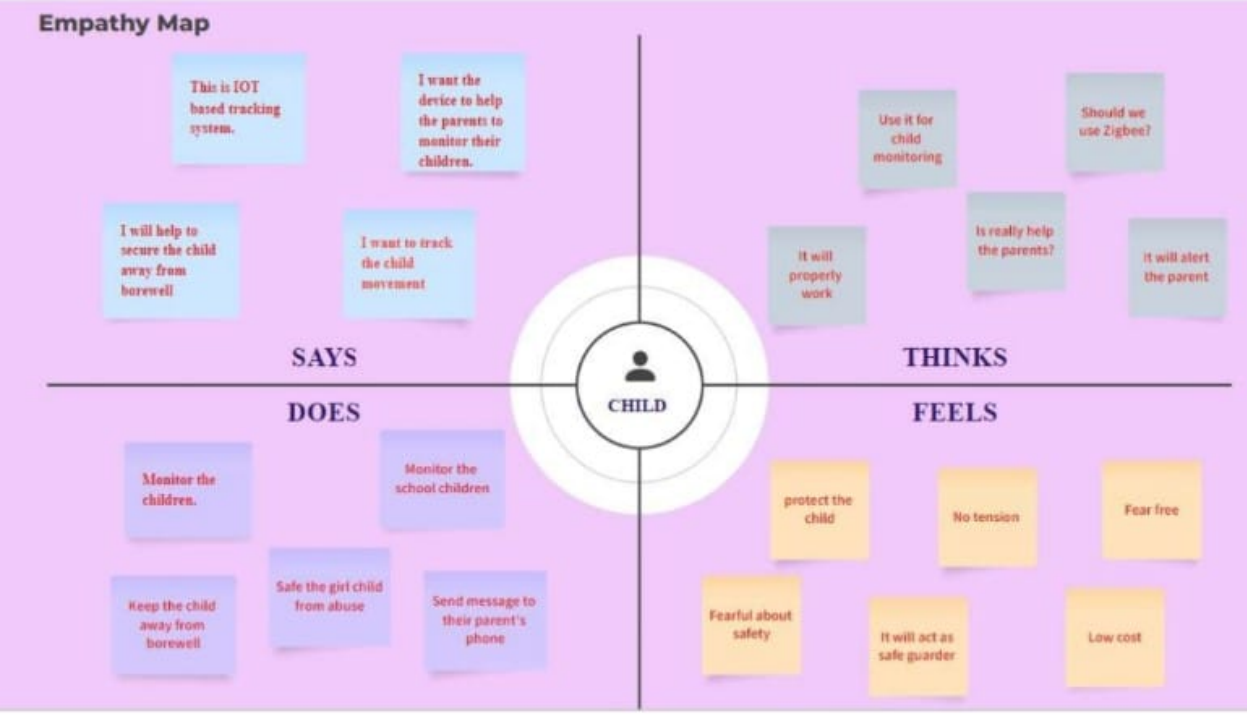
[5]. Child safety wearable device(Published on June 23,2022).

2.3 Problem Statement Definition:

Child tracker helps the parents in continuosly monitoring the child's location. They can simply leave their children in school or parks and create a geofence around the particular location. By continously checking the childs location Notification will be generated if the child crosses the geofence. Notifications will be send according to the child location to their parents or caretakers. The entire location data will be stored in the database.

3.IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:



3.2 Ideation and Brainstorming :

Idea-1:

- Excessive worries of parents regarding their children.
- Some hazardous rays causes health issues to the child
- GPS device is not very accurate in giving locations. Accuracy problem like sudden jumps or movements even if the child is placed still.
- Alerting parent when the child passes a range

Idea-2:

- Device heat may affect the child and causes health issues.
- We can only view the last active location of the children.
- If you are using GPS on battery operated device there could also be battery failure and you will need a external power supply ,it is not always possible
- If the child gadget is affected due to any climatic condition .It causes mental illness to parents.

Idea-3:

- Body temperature pulse rate may be incorrect sometimes
- If the GPS tracking is lost the location of the child is unidentified ,so we are forced in search of other way.
- Issues conserving with accuracy takes place
- Maintain a record of the child's location.

Idea-4:

- When the database crashes, the malfunction of gadgets may occur.
- When the child unknowingly leaves the gadget somewhere ,the location will be mistracked.
- Regular monitoring of the performance is difficult.
- To reduce interrupt and to get correct information , we need advanced components.

GROUP IDEAS:

Based on location:

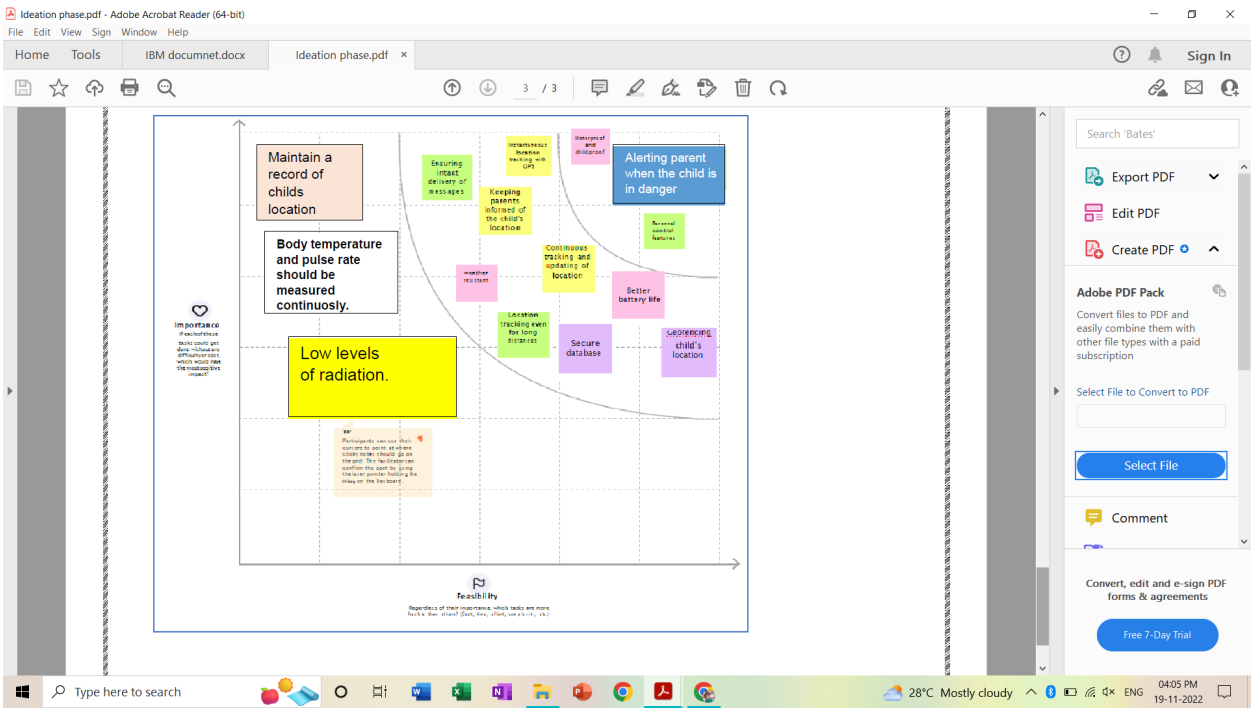
- GPS device is not very accurate in giving locations. Accuracy problem like sudden jumps or movements even if the child is placed still.

- As with any GPS enabled device there is risk and concern of hacking which is insecure for the child.
- The device should be built in such a way that the child's location access is only in the hands of the parent/guardian.

Based on data:

- Maintain a record of the child's location
- Ensure a secure database
- Geofencing child's location.

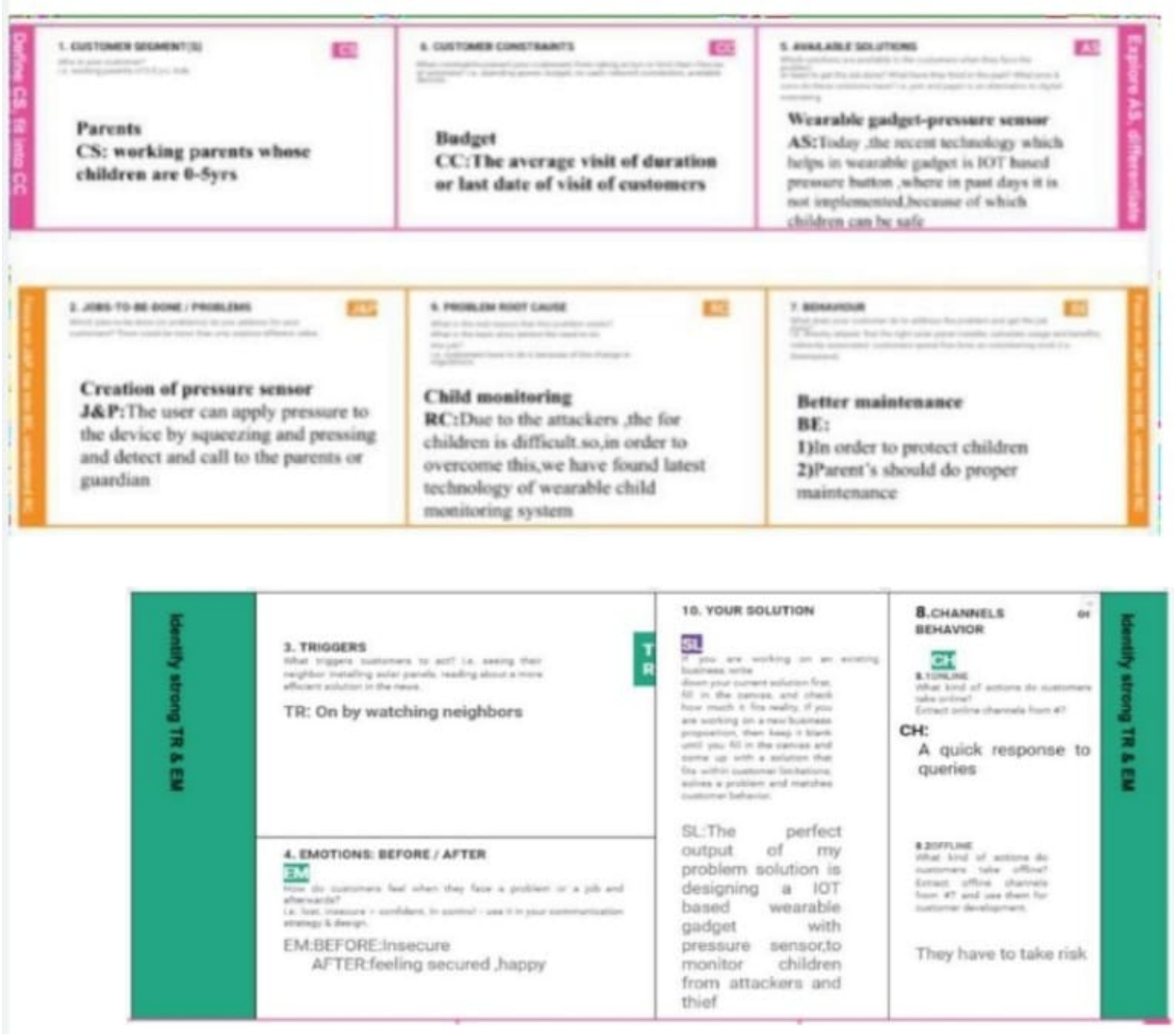
PRIORITIZE:



3.3 Proposed Solution:

S.NO	PARAMETER	DESCRIPTION
1.	Problem Statement (Problem to be solved)	Child safety and tracking is major significant as number of crimes on children occurs. hence parents are more concerned on their kids.
2.	Idea / Solution description	A smart IoT device for child safety and tracking is developed to help the parents to locate and monitor their children. Device is interfaced with temperature, heartbeat, touch sensors and also GPS, GSM & digital camera modules. Using this device parents can easily observe their children.
3.	Novelty / Uniqueness	The system automatically alerts the parents via message whenever the child is out of safety zone and sends another notification if the child comes under the safety zone. Panic button is placed in the device in order to alerts the parents if the child is in danger;
4.	Social Impact / Customer Satisfaction	This mechanism makes parents confident on their child safety and makes children feel secured.
5.	Business Model (Revenue Model)	This device is weightless, accessible, compatible and is useful for the customers. so it increases the revenue of the business.
6.	Scalability of the Solution	The ability to support an increasing number of connected devices, users, application features, and analytics capabilities, without any degradation in the quality of service

3.4 Problem Solution Fit:



4. REQUIREMENT ANALYSIS:

4.1 Functional Requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Email Registration throughMobile numberRegistration in person
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Notifications	Email and SMS message
FR-4	User Interface	Mobile app for parents Web interface for registrations, record tracking, information and payment

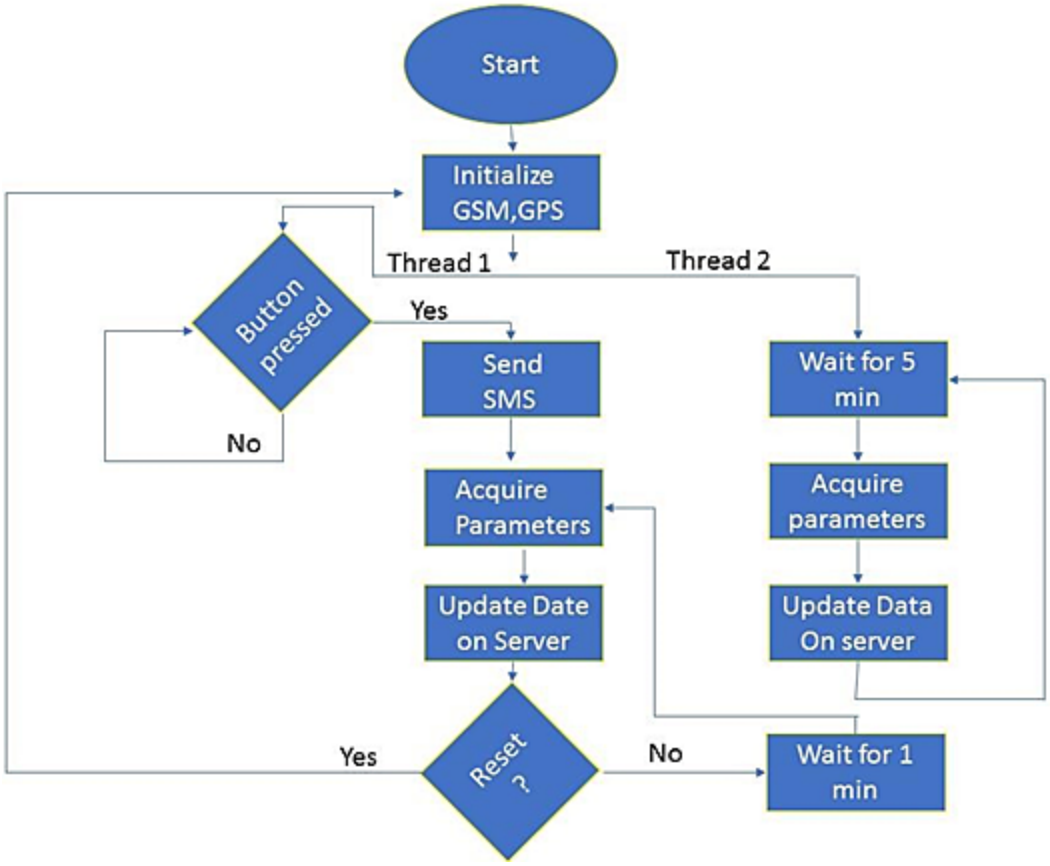
4.2 Non-Functional Requirement:

FR No	Non-Functional Requirement	Description
NFR-1	Usability	To find out whether the child crosses the geofence or not, upon which the parent/guardian of the childgets an alert.
NFR-2	Security	Database security must meet HIPAA requirements. Extra security protocols and measures are also in place
NFR-3	Reliability	Webpage gets automatically logged out unless password has been saved in the Google account. In case of server crash data

		gets backed up beforehand.
NFR-4	Performance	Site gets updated every 1 hour. Speed per transaction depends on the internet strength.
NFR-5	Availability	Available worldwide, and requires an internet source
NFR-6	Scalability	Short term scalability where memory is stored and erased, can be scaled to keep records in the future

5. PROJECT DESIGN:

5.1 Data Flow Diagrams:



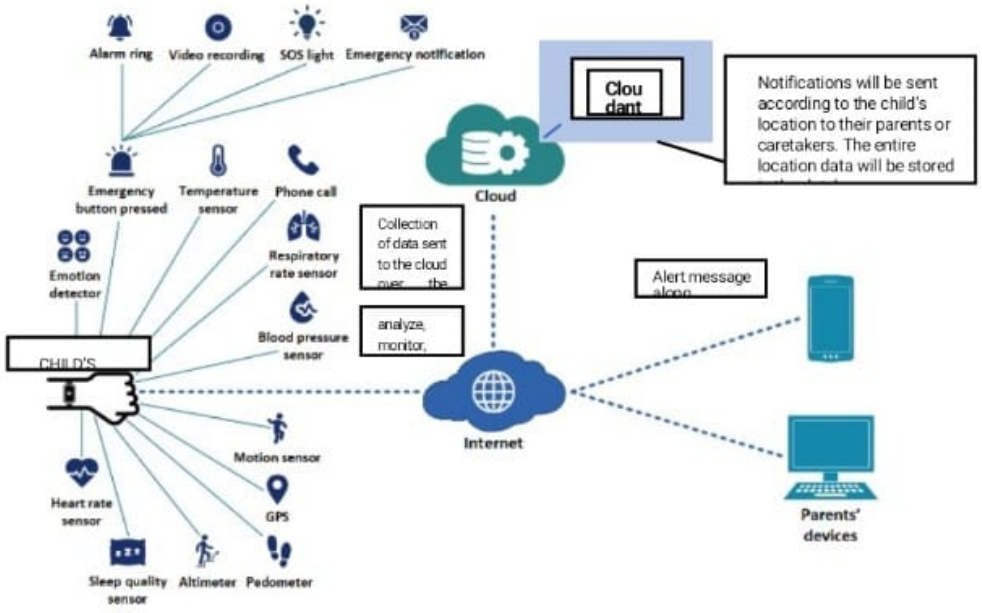
5.2 Solution & Technical Architecture:

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

5.3 SOLUTION ARCHITECTURE DIAGRAM:



6.PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning and Estimation:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a parent/guardian, I can register for the application by entering my email, and password, and confirming my password.	2	High	Kamala Varthini.G
Sprint-1	User confirmation	USN-2	As a parent/guardian, I will receive aconfirmation email oncel have registered for the application	1	High	Gayathri.K
Sprint-2		USN-3	As a parent, I will receive the connection, and location in SMS/mail once I have entered the application.	1	High	Charmathi.J
Sprint-1		USN-4	As a parent/guardian, I can register for the application through Gmail	2	Medium	Thilaga.K.S
Sprint-1	Login	USN-5	As a parent, I can log into the application by entering email & password	1	High	Gayathri.K

6.2 Sprint Delivery Schedule:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	4 Days	24 Oct 2022	27 Oct 2022	20	29 Oct 2022
Sprint-2	20	5 Days	28 Oct 2022	01 Nov 2022	20	04 Nov 2022
Sprint-3	20	8 Days	02 Nov 2022	09 Nov 2022	20	11 Nov 2022
Sprint-4	20	9 Days	10 Nov 2022	18 Nov 2022	20	19 Nov 2022

7. CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1

(Adding Geofence)

● Geofence is like a round wall covering the given location. So parents canuse them to mark the location where their children are going .

● Multiple Geofence can be added.

CODING:

```
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();

7.2 Feature 2 (Alert Notification)

- Once geofence is added , when the child enters the geofence a notification willbe sent
- When the child leaves the geofence a notification will be sent .

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"; receiving @Override public void onReceive(Context context, Intent intent){ // TODO: This method is called when the BroadcastReceiver is // 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_
ENTER", "", 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;
}
}
}
```

10 ADVANTAGES & DISADVANTAGES :

The parent can monitor their child from anywhere at any time, and also get a notification when the child goes away from the permitted radius. It also allows the parent to know if their child is in any dangerous situation. The disadvantagesof this system are that the child could not produce the exact alert command duringa panic condition. The command produced maynot match the previously stored command. This project requires manual intervention.

11. Future Scope:

In our system, we use the Internet of Things, GPS, GSM, and Raspberry Pi to automatically monitor the youngster in real time. When we utilize a web camera and GPS to actively monitor, this system needs network 33 connections, satellite communication, and a high-speed data connection. It is challenging to keep an eye out for any network problems or satellite connection problems. Additionally, there is a lag when streaming videos through the server. The Zigbee concept or accessing the system without the internet and employing high-speed server transmission can therefore be used in the future to solve these problems.

12. Conclusion:

Future is similar to the word children. Young people are the future pillars of one's nation, as Dr. A.P.J. Abdul Kalam once said, thus it is important to protect today's children's dreams and lives in order to give them a better future. Therefore, every parent should take good care of their own children to prevent them from being victims of abuse that will completely harm them on a physical, mental, and emotional level, wrecking our future. Due to the significance of our future, our product makes it simple for parents to track their kids and regularly visually monitor them, enabling them to assure their safety and lowering the incidence of child abuse