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# IOT Based Gadget for Child Safety Monitoring and Notification

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**ABSTRACT**-The Internet of Things (IoT) has revolutionized the way we interact with technology, and child safety is an area that has benefited greatly from its development. This paper presents an IoT-based gadget that provides real-time monitoring of child safety and sends notifications to parents or guardians in case of any potential danger. The gadget is designed to track the child's location and monitor their vital signs, such as heart rate and body temperature. It also includes a panic button that the child can press in case of an emergency. The gadget is connected to a cloud-based platform that stores the child's data and sends notifications to the parents' or guardians' smartphones via an app. The system is designed to be user-friendly and highly customizable, with various settings that allow parents to tailor the gadget's functionality to their specific needs. The gadget has been tested and shown to be highly effective in ensuring child safety, providing peace of mind for parents and guardians.

**KEYWORDS:** IOT, Arduino, Android & iOS, GPS, Cloud, Web Application, GSM, Tracking, Real time, Application, Mobile application, Sensors,WIFI module, Node MCU.

## I. INTRODUCTION

Internet of Things (IoT) is a set of systems and devices interconnected with real-world sensors and actuators to the Internet. It is able to make decisions via detecting the surrounding environment without human interaction. In this research, IoT is applied to propose a wearable smart band which helps parents to monitor and get known of their child's condition at anywhere and anytime even if they are not by their children side. Via the IoT smart band, children safety is guaranteed, and crime rate is reduced as immediate actions can be taken in case the child is in danger. Besides, unlike existing smart band, which is less focusing on child security aspect, the proposed system emphasizes in getting as much data as possible so that actual situation can be identified. The use of IoT in this device is motivated by the need of child security system in Malaysia due to child safety issues resulting from increasing cases on child related crime. In fact, IoT has been applied in domains such as smart home, smart city, smart factory, supply chain, retail, agriculture, lifestyle, transportation, emergency, health care, environment, energy, culture and tourism.

However, it is seldom used to monitor child's safety in Malaysia. Actually, there is a need to use IoT-based child security system since the safety of children has become a major concern. In fact, crimes on children keep increasing despite actions have been taken by the government. the overall percentage of child abasements worldwide is about 80% nowadays, out of which 74% are girls and the remaining are boys. For every 40 seconds, a child is gone missing in the world.

Due to that, parents are worried for their children and perhaps, a hard challenge for them to guarantee safety of their children when they are out.

To cope with the issue, the system is proposed with these objectives:

- Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more.
- To show the child's actual data with reference values.
- Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations.

- To trigger the alarm and enable automatic video recording whenever the emergency button is pressed. Then, emergency notification along with real-time video will be sent to and display in the parents' mobile apps.
- Develop a prototype of IoT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace.

## 1.2 Purpose

Approximately 80% of all reports of child abuse are made nowadays, with 74% of the victims being girls and the remaining 20% being males. In this world, a child goes missing every forty seconds. Children are the foundation of a country; if their future was threatened, it would have an effect on the development of the whole country. The emotional and mental stability of the children is compromised as a result of the abuse, ruining their futures and careers. The things that happen to these defenseless kids are not their fault. Therefore, parents are in charge of raising their own children. However, parents are compelled to seek money because of the state of the economy and their desire to concentrate on their child's future and job. Consequently, it becomes challenging for them to constantly cling to their kids. We have created a setting in our system where this issue can be effectively solved. It enables parents to keep a close eye on their kids in real time while concentrating on their own careers without having to take any physical action. In essence, kids cannot tell their parents about the abuse they experience on a regular basis. They are too young to really comprehend what truly occurs to them. Parents find it challenging to recognize when their children are being abused. So, the main objective of this module is to help working parents to be free from worry about their children by tracking their movements at any time. An autonomous real-time monitoring system is required for every child worldwide in order to stop attacks on children.

## II. IDEATION AND PROPOSED SOLUTION

### 2.1 Ideation and brainstorming

Idea 1: A compact wearable gadget with a pressure switch. The user can apply pressure to the device by squeezing or compressing it as soon as an attacker is preparing to attack the person or as soon as the person perceives any insecurity from a stranger. Instantaneously the pressure sensor detects this pressure, and a call is placed to the victim's parents' or guardian's mobile phone numbers that were put in the device at purchase, along with a regular SMS that includes the victim's location. The identical message will be delivered to the police if the call goes unanswered for an extended period of time. Further, a message with the person's current location is sent to the parent or guardian's phone by standard SMS if the person enters an area that is typically off-limits to them.

Idea 2: By creating a device that can be followed using GPS locations and has a panic button to inform the parent via a GSM module, this invention is primarily focused on improving child safety. An Android app for parents is created to control and monitor the device at any time. Smart gadget device is always connected to parents' phone, which can receive and make phone calls as well as SMS on gadget via GSM module. Additionally, wireless technology is implemented on the device, which is useful to bind the device within a region of monitoring range; if the device is moving out of monitoring range, an alert will be triggered on a binding gadget, helping you maintain a virtual watch over the child. An alert will be sent to a bound device if the device moves outside of the monitoring range, allowing you to keep a virtual check on the child. Devices come with a health monitoring system that checks for factors including heart rate, pulse, and temperature. The parental app allows for the monitoring of these indicators. Using a contact switch, the device also keeps track of whether or not it is plugged in and notifies the parent the moment it is unplugged.

Idea 3: According to the latest surveys, the number of cases of child abduction and missing children in India is steadily rising. One of the primary worries for parents today is the safety of their children on school buses and outside of school premises. The suggested system makes an effort to give kids security features using new techniques that are introduced to the current safety system for better defense. A portable unit, a cloud platform, and an Android application make up the proposed system. A raspberry pi 2 model B, a GPS receiver with antenna, and a pulse rate sensor make up the portable device. Using a GPS receiver and a heartbeat sensor, this device will track the child's location in terms of latitude, longitude, and altitude. These data are transmitted to a raspberry pi module, which uses internet connectivity to inject them into elastic-search. The android program has a user interface that displays the





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child's location on a map, the path they took, and their rate of movement. The child's heart rate is also continuously tracked by the application.

2.1 Empathy map canvas



2.4 Problem solution fit

<p><b>1. CUSTOMER SEGMENT</b></p> <ul style="list-style-type: none"> <li>• Caretaker</li> <li>• Parent</li> </ul>	<p><b>6. CUSTOMER CONSTRAINTS</b></p> <ul style="list-style-type: none"> <li>• Easy to use</li> <li>• compatible and weightless</li> <li>• low cost</li> </ul>	<p><b>5. AVAILABLE SOLUTION</b></p> <ul style="list-style-type: none"> <li>• Knowledge about setting geofence</li> <li>• Device</li> <li>• Internet</li> </ul>
<p><b>2. JOBS-TO-BE-DONE/ PROBLEMS</b></p> <ul style="list-style-type: none"> <li>• To manage data store</li> <li>• network connectivity?</li> <li>• To alert the parents in case of emergency</li> </ul>	<p><b>9. PROBLEM ROOT CAUSE</b></p> <ul style="list-style-type: none"> <li>• Crimes</li> <li>• missing children</li> <li>• Irresponsible parents</li> </ul>	<p><b>7. BEHAVIOUR</b></p> <p>Tracking devices for kids provide you with real-time GPS details of your child's location. This is extremely useful tool when your child is walking to a friends house from any instant distance where your child's current whereabouts could be uncertain.</p>
<p><b>8. TRIGGERS</b></p> <ul style="list-style-type: none"> <li>• social media neighbour places fear of losing child</li> </ul> <p><b>4. EMOTIONS: BEFORE/ AFTER</b></p> <ul style="list-style-type: none"> <li>• Parents are panic that they lost the child They felt happy after they find the child</li> </ul>	<p><b>10. YOUR SOLUTION</b></p> <ul style="list-style-type: none"> <li>• Gadget ensure the safety and tracking of children.</li> <li>• The android app use GPS and mobile service to find the child location and securely stored accurate location without knowing the children</li> </ul>	<p><b>3. CHANNELS OF BEHAVIOR</b></p> <ul style="list-style-type: none"> <li>• ONLINE             <ul style="list-style-type: none"> <li>• web application/GPS module communication</li> </ul> </li> <li>• OFFLINE             <ul style="list-style-type: none"> <li>• Distance Calculations gadget using time</li> </ul> </li> </ul>

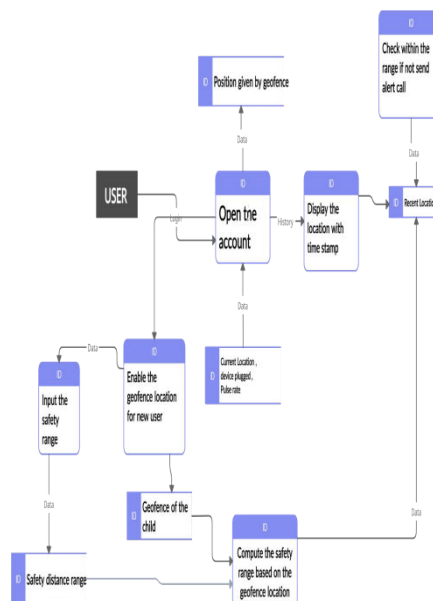


2.3 Proposed solution

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	To prevent children for abuse and make them safe.
2	Idea / Solution description	Compact wearable gadget with pressure butt on which can the parents can find the attacker easier.
3	Novelty / Uniqueness	Pressure butt on with Gsm.
4	Social Impact / Customer Satisfaction	It is useful to working parents when they are leaving children.
5	Business Model (Revenue Model)	Wearable gadget
6	Scalability of the Solution	Compact and easy to use.

III. PROJECT DESIGN

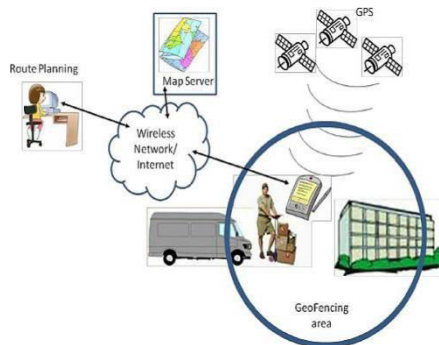
3.1 Data Flow Diagrams



### 3.2 Solution & Technical 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: 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 tech solution to solve existin 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.



### IV. USER STORIES

- (FATHER) As a user, I can register by entering my email, and password, and confirming my password. I can access the location of my children using the credentials provided as a Father. I can access my account/dashboard and receive a confirmation email & click confirm.
- (MOTHER) As a user, I can register by entering my email, and password, and confirming my password. I can access the location of my children using the credentials provided as a Mother.
- (GUARDIAN/CARETAKER) As a user, I can monitor and I can access my account/dashboard and children's activities receive a confirmation using a safety email & click confirm gadget monitoring system.
- (Dashboard) As a user, I can fix the geo-fence for my child's location so that I will receive alerts if my child crosses the geo-fence and monitor the child's pulse and check whether the device is plugged in or not.

### V. CODING & SOLUTIONING

(Explain the features added in the project along with code)

#### 5.1 Feature 1 (Adding Geofence)

- Geofence is like a round wall covering the given location. So parents can use them to mark the location where their children are going.
- Multiple Geofence can be added.  

```
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.getLocalisedMessage();

```

### 5.2 Feature 2 (Alert Notification)

- Once geofence is added , when the child enters the geofence a notification will be 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";
    @Override public void onReceive(Context context, Intent intent)
    {
        // TODO: This method is called when the BroadcastReceiver is receiving// an Intent broadcast //.
        /*Toast.makeText(context, "GEOFENCE_ENTERED", Toast.LENGTH_SHORT).show();
        final Toast mToastToShow;
        int toastDurationInMilliseconds = 120000; mToastToShow = Toast.makeText(context,
"GEOFENCE_EXITED", Toast.LENGTH_LONG); // Set the countdown to display the toast
CountDownTimer toastCountDown;
        toastCountDown = new CountDownTimer(toastDurationInMilliseconds, 10000)
        {
            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<Geofence> 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;
}
}
```

### 5.3 APP INDEX

#### SOURCE CODE

```
import json

import wiotp.sdk.device

import time

myconfig = {

"identify": {

"orgId": "948e13",

"typeId": "childSafety",

"deviceId": "731736810"

},

"auth": {

"token": "SwoZoaA@ikppxUR9sG"

}

}
```



```
client.wiotp.sdk.device.DeviceClient(config=myConfig, longHandlers=None)

client.connect()

while True:

name="Smartbridge"

#in area location

#latitude=11.165198

#longitude=77.6037642

#out are location

latitude=11.165198

longitude=77.6037642

myData={'name':name,'lat':latitude,'lon':longitude}

client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0, onPublish=None0)

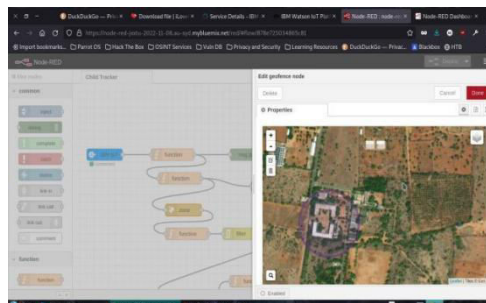
print("Data published to IoT platform:",myData)

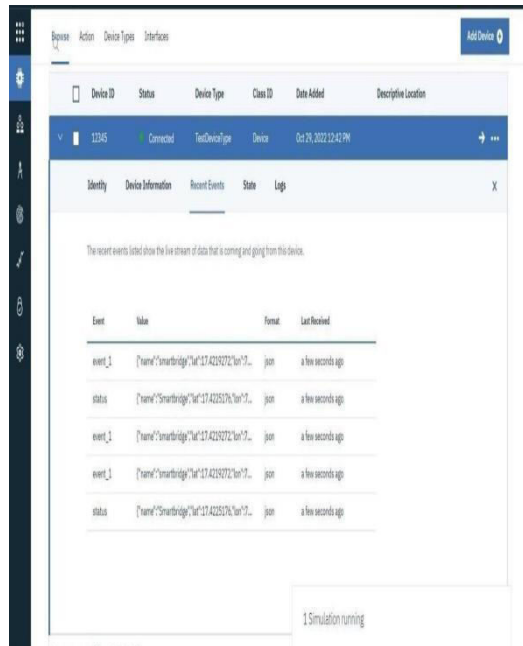
time.sleep(5)

client.disconnect()
```

## VI. RESULTS

### OUTPUT IN CLOUD

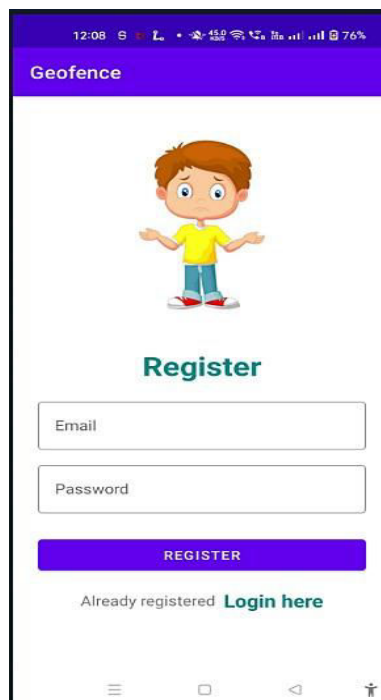




### 6.1 User Registration :

Users get registered to the app using their mail and create their password. On the user is registered a verification mail will be sent to the user mail id. The user needs to verify the account. All user details are stored in the firebase and verification mail is sent by firebase authentication.

### Registration Page :

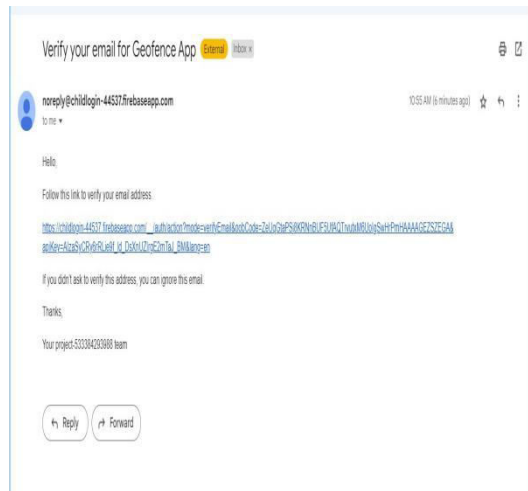




**User Login:**

Users with their registered mail and password will login to the account . As the details are stored in firebase, when invalid email or password is entered a message say invalid email or password occur .

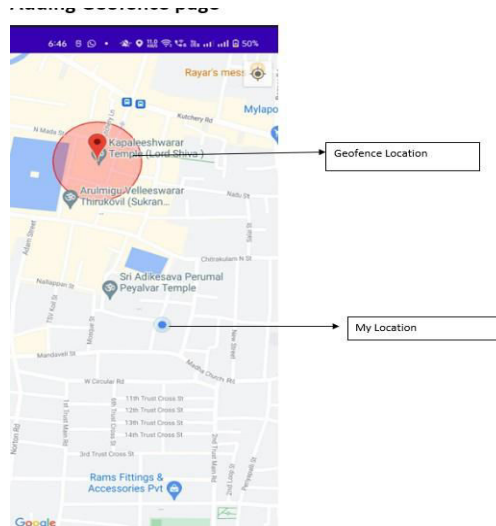
**Verification mail:**



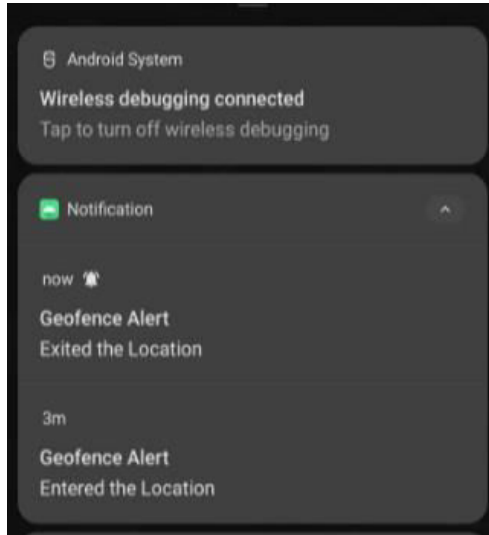
**Adding Geofence and Alert Notification:**

Users can add geofence in the location where they want to add or where their child is going to play so they can monitor the child location . Once the child enters the geofence alert notification says entered the location will be displayed . When the child leaves the geofence alert notification says exited the location will be displayed.

**Geofence:**



**Notification:**



**VII. ADVANTAGES AND 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 disadvantages of this system are that the child could not produce the exact alert command during a panic condition. The command produced may not match the previously stored command. This project requires manual intervention.

**VIII. 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 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.

**IX. 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.

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