



## Invention Disclosure Form

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## **Section B: Your Invention**

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### **A. PARENT AND CHILD TRACKING SYSTEM FOR ENHANCED SAFETY AND SECURITY**

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#### **B. PROBLEM STATEMENT:**

In today's fast-paced world, parents often face challenges in ensuring the safety and security of their children, especially in crowded or unfamiliar environments. The inability to monitor a child's whereabouts in real-time can lead to anxiety for parents and potential risks for children. There is a significant need for a tracking system that allows parents to keep an eye on their children's location, ensuring they are safe and secure at all times. This system should utilize advanced geolocation technology to provide accurate, real-time tracking, constant connectivity, and user-friendly features. The implementation of such a device could greatly enhance parental peace of mind, empower children to explore their surroundings safely, and facilitate quicker responses in case of emergencies.

#### **C. EXISTING SOLUTIONS / PRIOR ART/RELATED APPLICATIONS & PATENTS:**

1. Development of GPS-enabled wearable devices specifically designed for child tracking.
2. Integration of mobile applications that provide real-time location sharing between parents and children.
3. Utilization of geofencing technology to create safe zones and alert parents when children leave these areas.
4. Implementation of Bluetooth and RFID technology for close-range tracking in crowded places.
5. Enhanced communication features that allow for direct contact between parents and children through the tracking device.

## **D.DESCRPTION OF PROPOSED INVENTION:**

The proposed invention aims to develop a smart tracking system designed for parents and children, integrating advanced geolocation and monitoring features to ensure child safety and enhance parental peace of mind. By leveraging modern technologies, this device will allow real-time tracking, health monitoring, and communication between parents and their children, especially in emergency scenarios.

This smart tracking device uses GPS/GNSS technology to provide precise, long-range location tracking, ensuring parents can keep track of their child's whereabouts at all times. In addition to location monitoring, the device incorporates health monitoring features like heart rate sensors, temperature sensors, and motion detection to detect falls or unusual activities, enhancing child safety.

The device is equipped with wireless communication technologies such as Bluetooth, Wi-Fi, and cellular service, enabling seamless data transmission to a centralized platform or smartphone application. Parents can access real-time location data, activity alerts, and health monitoring updates via a user-friendly mobile or web interface.

### **Key Features:**

#### **1. Location Tracking:**

- Real-time location updates using GPS or GNSS technology.
- Geofencing alerts to notify parents if a child leaves a designated safe zone.
- A history log of the child's movements for review.

#### **2. Health and Activity Monitoring:**

- Built-in sensors (e.g., accelerometers, gyroscopes) to detect unusual movements or falls.
- Continuous heart rate and temperature monitoring for signs of distress or illness.

#### **3. Emergency Alerts:**

- An SOS button on the device that a child can press in case of danger, immediately alerting the parent or guardian.

- Automatic fall detection or panic mode activation based on abnormal health or movement patterns.

#### **4. Two-Way Communication:**

- A built-in speaker and microphone for direct communication between the child and the parent.
- Emergency instructions or reassurance can be provided to the child in real-time.

#### **5. Data Security and Privacy:**

- Robust encryption protocols to ensure all transmitted data remains secure and adheres to privacy standards.
- Cloud-based storage with access control for parents to monitor activity while protecting sensitive data.

#### **6. Parental Customization:**

- Tailored notifications for geofence breaches, inactivity, or unusual health patterns.
- Adjustable settings for individual child needs or family requirements.

### **Workflow of Parent and Child Tracking System:**

#### **1. Data Collection:**

Gather real-time data from sensors, including location, heart rate, body temperature, and motion detectors.

#### **2. Health and Movement Monitoring:**

Continuously monitor physiological data and motion patterns to detect unusual activities, such as falls or signs of distress.

#### **3. Real-Time Location Updates:**

Provide continuous location tracking, with periodic updates sent to the parent's application.

#### **4. Data Analysis and Alert System:**

Analyze data in real-time to identify abnormalities (e.g., rapid heart rate, geofence breaches, or falls). Trigger alerts to notify parents immediately.

#### **5. Parent Communication Interface:**

Provide parents with access to the child's data through a secure mobile or web application. This includes real-time location tracking, historical activity logs, and health status.

## 6. Emergency Response and Communication:

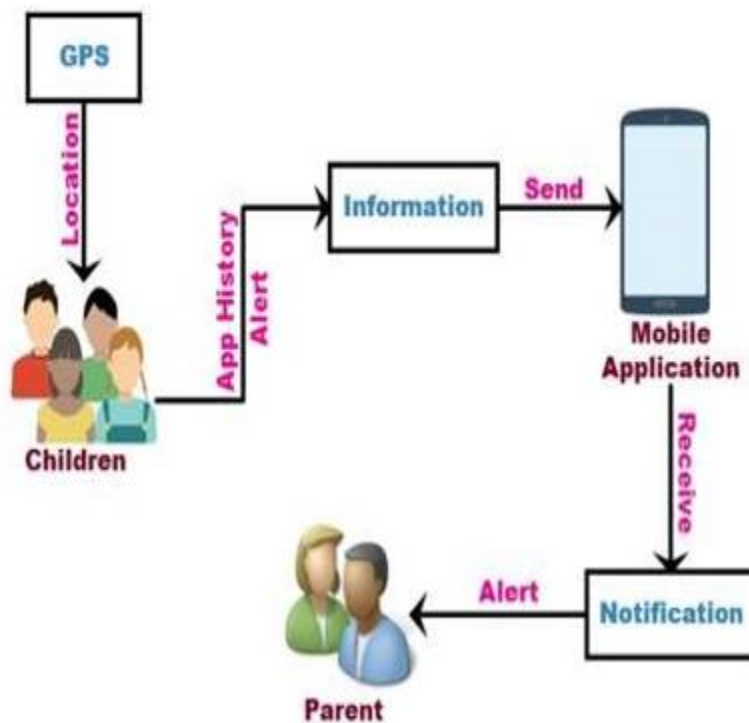
- Enable two-way communication for emergencies.
- Dispatch emergency notifications to parents and caregivers if danger is detected.

## 7. Software Maintenance and Updates:

Regular updates ensure the system's reliability, functionality, and data security while addressing user feedback for improved performance.

This smart system, designed for convenience, reliability, and security, ensures comprehensive child safety while fostering stronger connections between parents and children in both day-to-day and emergency scenarios.

## ARCHITECTURE DIAGRAM:



## **E. NOVELTY:**

### **1. Customizable Alerting System:**

The device is specifically designed to enhance safety for children. It alerts parents about unusual events such as geofence breaches, falls, or inactivity. The system can be tailored to provide customized notifications based on the child's age, routine, and specific needs. This personalized approach helps parents respond quickly to potential emergencies and ensures the child's well-being.

### **2. Integration of Long-Distance Geolocation Capabilities:**

By incorporating advanced GPS/GNSS technology, this tracking device offers precise and reliable long-range location tracking. Parents can monitor their child's real-time location even when they are far away. This feature is particularly helpful for keeping children safe during outdoor activities, school commutes, or crowded events, allowing for prompt action if the child ventures into unsafe areas.

### **3. Wireless Connectivity and Remote Monitoring Platform:**

The device uses modern wireless communication technologies like Bluetooth, Wi-Fi, and cellular networks to seamlessly connect with a remote monitoring platform. This platform enables parents to access real-time data, receive instant alerts, and view historical location and activity logs. The connectivity ensures that parents remain informed, no matter where they are, and can make timely decisions to ensure their child's safety.

### **4. User-Friendly Interface and Accessibility:**

Designed with simplicity and usability in mind, the device features an intuitive interface suitable for both children and parents. It includes clear notifications, easy-to-use buttons, and an engaging display. The companion mobile application or web interface is straightforward, with easy navigation, visual cues, and customizable settings. This ensures that parents and children alike can interact with the device effectively, improving their overall experience.

This novel system combines advanced technology, safety-focused design, and user-friendly features to create a reliable solution for ensuring child safety and supporting parents in real-time decision-making.

## **Invention Addresses, Focusing on Existing Safety Concerns For Children :**

### **1. Child Abductions:**

Child abductions remain a significant global concern. Traditional methods like verbal warnings or supervision can fail due to human error or unforeseen circumstances. This system offers real-time location tracking, enabling parents and authorities to respond swiftly in emergencies.

### **2. Getting Lost:**

Children can easily wander off in crowded or unfamiliar environments, such as shopping malls, amusement parks, or public events. The system provides precise geolocation, helping parents quickly reunite with their children and reducing stress in such scenarios.

### **3. Outdoor Safety Risks:**

Outdoor activities expose children to potential dangers like wandering into restricted areas, encountering hazardous environments, or facing adverse weather conditions. The tracking system includes features such as geofencing and alerts, notifying parents when children move outside predefined safe zones.

By integrating advanced tracking technologies, this invention enhances child safety through continuous monitoring, proactive alerts, and efficient rescue coordination, mitigating the risks associated with these common safety concerns.

## **Limitations of current systems:**

### **1. Limited Accuracy and Reliability**

- **GPS Trackers:** Standard GPS devices may struggle with signal reception in indoor or densely built environments like malls or urban areas, causing inaccurate location data.
- **Mobile Phones:** Phones rely on network coverage, which can be unreliable in remote or rural areas, leading to tracking gaps.

### **2. Short Battery Life:**

- Many existing tracking devices have limited battery life, requiring frequent recharging. This compromises their reliability during long outdoor activities or emergencies.

### **3. Ease of Removal or Tampering:**

- Wearable GPS trackers and phones can be easily removed, lost, or damaged, making them ineffective in certain situations like abductions or accidents.



#### **4. Lack of Real-Time Alerts and Features:**

- Many current systems offer only basic location tracking. They often lack advanced features like real-time alerts, geofencing notifications, or SOS emergency functions, delaying parental response during critical situations.

#### **5. Privacy and Data Security Risks:**

- Some systems lack robust data security protocols, exposing sensitive location data to potential breaches or misuse.

#### **6. Dependency on User Interaction:**

- Mobile phone-based systems require children to carry and operate the device, which may be unrealistic for younger children or in emergencies.

### **Tracking System Works in Real-time, Including Communication Technologies**

The Parent and Child Tracking System for Enhanced Safety and Security operates in real-time by integrating multiple communication technologies and data transmission protocols for precise and reliable tracking.

#### **1. Device Pairing and Initialization**

- The system includes wearable devices for children and a companion app for parents.
- Devices are paired using Bluetooth Low Energy (BLE) for initial setup and short-range monitoring.

#### **2. Location Tracking**

- **GPS (Global Positioning System):**
  - The child's device continuously acquires real-time location coordinates from GPS satellites.
  - This ensures precise outdoor tracking with minimal signal interference.
- **Wi-Fi Positioning:**
  - In indoor environments where GPS signals may be weak, the device uses Wi-Fi hotspots for approximate location data.
- **Cellular Networks:**
  - If the child moves beyond Bluetooth or Wi-Fi coverage, cellular networks (2G/3G/4G/5G) provide continuous tracking by transmitting GPS data.

### **3. Data Transmission and Cloud Integration**

- **Data Transmission Protocols:**
  - Collected location data is encrypted and transmitted securely using protocols such as HTTPS or MQTT (Message Queuing Telemetry Transport) for lightweight, reliable communication.
  - Devices support LTE-M or NB-IoT (Narrowband IoT) for energy-efficient, wide-area communication.
- **Cloud Integration:**
  - Real-time location data is sent to a secure cloud server where it is processed and stored.
  - The parent's mobile app retrieves this data through encrypted API requests, displaying the child's live location on a map interface.

### **4. Alerts and Notifications**

- **Geofencing:**
  - Parents can set safe zones. If the child exits these areas, the system triggers an instant alert through push notifications or SMS.
- **SOS and Emergency Alerts:**
  - The child's device has an SOS button for emergencies, instantly notifying parents with location details and initiating two-way communication if supported.

### **5. Backup and Data Security**

- **Data Backup:**
  - Location history is stored in the cloud for future reference.
- **Security Features:**
  - End-to-end encryption and secure authentication mechanisms protect sensitive data from unauthorized access or breaches.

By combining these technologies, the system ensures continuous, real-time monitoring across various environments, offering enhanced safety and peace of mind for parents.

## **Emergency Features Integrated Into The Child's Device:**

The Panic Button or Emergency Features integrated into the child's device in the Parent and Child Tracking System for Enhanced Safety and Security play a critical role in responding to emergencies swiftly. Here's how these features work:

### **1. Panic Button Functionality**

- **One-Click Activation:**
  - The device includes a dedicated panic button that the child can press in case of danger, distress, or an emergency.
- **Automatic Emergency Alert:**
  - Pressing the panic button triggers an instant alert sent to the parent's mobile app and other designated emergency contacts.

### **2. Real-Time Notifications**

- **Immediate Alerts:**
  - Parents receive a real-time notification with the child's exact GPS coordinates.
- **Location Updates:**
  - The device sends continuous location updates, enabling parents and authorities to track the child's movements after the alert is activated.

### **3. Two-Way Communication (If Supported)**

- **Voice Calling:**
  - Some advanced devices support two-way voice communication, allowing parents to call the child directly through the device after an alert is triggered.
- **Audio Recording or Live Listening:**
  - In emergency modes, the device may activate a live audio stream or record ambient sounds to provide additional context about the child's surroundings.

### **4. SOS Signal to Emergency Services**

- **Automatic Dispatch (Optional):**
  - Depending on system configuration, the panic alert can also notify emergency services, such as local law enforcement or security agencies.

- **Central Monitoring System Integration:**

- In large-scale implementations (e.g., schools or parks), the alert may be routed to a **central monitoring station** for faster response coordination.

## **5. Security and Safety Enhancements**

- **Tamper Detection:**

- If the device is forcibly removed or damaged, a tamper alert is sent automatically.

- **Silent Mode Alerts:**

- The system can send **silent alerts** if the child presses the button discreetly, ensuring they receive help without drawing unwanted attention.

## **6. System Customization**

- **Customizable Response Settings:**

- Parents can customize the panic button response actions, such as defining emergency contacts or enabling automatic call-back features.

By integrating these advanced panic button and emergency features, the system enhances the child's safety by ensuring rapid, reliable, and context-aware responses in critical situations.

## **Security Measures In Place:**

The Parent and Child Tracking System for Enhanced Safety and Security implements robust security measures to protect the child's location data and ensure family privacy. Here are the key security and privacy features:

### **1. Data Encryption**

- **End-to-End Encryption (E2EE):**

- Location data transmitted between the child's device, cloud servers, and the parent's mobile app is encrypted using strong protocols such as **AES-256** or **TLS (Transport Layer Security)**.

- **Data Storage Encryption:**

- All stored data, including location history and personal information, is encrypted at rest to prevent unauthorized access.

### **2. Secure Communication Protocols**

- **HTTPS and SSL Certificates:**

- The system uses **HTTPS** for secure data transfer over the internet.

- **MQTT and Secure WebSockets:**

- Lightweight communication protocols like **MQTT** with TLS provide secure real-time updates with minimal data usage.

### **3. User Authentication and Access Control**

- **Multi-Factor Authentication (MFA):**

- Parents and authorized users must verify their identity through **MFA** before accessing the system.

- **Role-Based Access:**

- Access to location data is limited based on user roles, ensuring only approved individuals can monitor or modify sensitive data.

### **4. Data Anonymization and Minimization**

- **Data Anonymization:**

- Personal identifiers can be anonymized or pseudonymized in data records to reduce privacy risks during system operations.

- **Data Minimization:**

- Only essential data is collected, processed, and stored to reduce the chances of misuse.

### **5. Privacy by Design**

- **Parental Consent:**

- Tracking features are enabled only after explicit parental consent, ensuring compliance with privacy laws like **COPPA** or **GDPR** where applicable.

- **Location Sharing Settings:**

- Parents can control when and with whom the child's location is shared, ensuring privacy during non-essential monitoring.

By integrating these multi-layered security measures, the system ensures that sensitive location data remains confidential, protected, and accessible only to authorized users, maintaining the highest standards of privacy for children and their families.

## **F. WORKING OF PARENT AND CHILD TRACKING SYSTEM:**

After the device is delivered, both the child and their parents or guardians should complete the registration process. Each device is uniquely linked to one child, but multiple parents or guardians can register to receive notifications and access real-time information about the child's safety and location.

### **1. Location Tracking Using GPS:**

A GPS following unit is a route gadget ordinarily conveyed by a moving vehicle or individual that utilizes the Global Positioning System (GPS) to follow the gadget's developments and decide its area. The recorded area information can either be put away inside the following unit.

#### **Home Page:**



## User Information:



The screenshot shows a mobile application interface for "eMonitoring". At the top, there is a dark header with a small icon and the text "eMonitoring". Below this is an orange banner with the text "New Parent Registration". The form consists of several input fields with labels: "3" (a numeric field), "Name", "Username", "Password", "Children Username", "Children Password", "Emergency Alert Number", "E-Mail-ID", and "Address". The "Address" field is a larger text area. At the bottom, there is a green bar with three buttons: "Subn", "Back", and "Next".

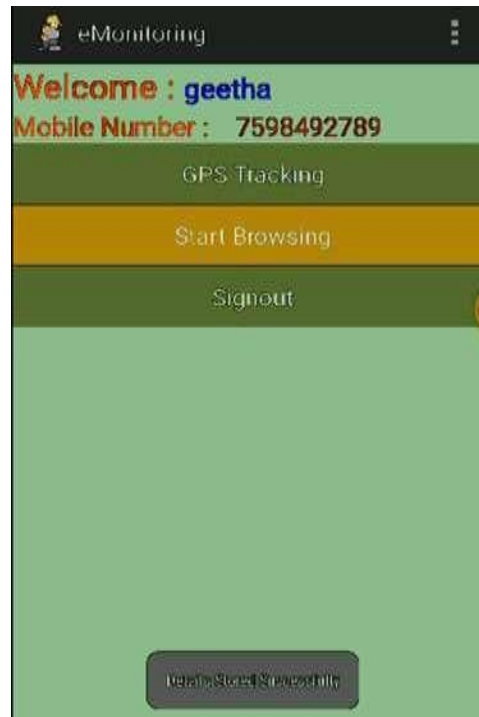
**2.Cellular Identification:** This application secure child will be very helpful to such worried parents and assures them the safety of the children. In this module, application which will take care of your child information gathered while the child is travelling to wherever GPS reading is used for tracking.

### User Login:



**3.Gathering Browsing History:** A Browsing History allows you to watch the browsing history of all user profiles in a running mobile, as well as to get the browsing history. In this module, all the browsing history of the child will be gathered.





**4. Send Notification to Parents:** In this module, child information gathered to send a message to all connected parents. Then, the parents identify to child location details

**Notification:**

