

Child Safety and Vitals Tracking using IoT

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Abstract - The basic operation of the proposed child tracking system is that when a violation of child safety is detected, a pulse and temperature sensor in the child module will produce a signal. The safety device monitors the health status of a child using sensors such as temperature sensor, pulse sensor. These sensors produce a signal when violation of child safety is detected. It is incorporated with GPS module to provide location tracking of the device. Parents receive alert through connected devices. Parents receive alerts through connected devices, allowing them to promptly respond to emergencies, track movements, and monitor vital signs. The device can detect the child's approximate location, it can detect the body temperature and the surrounding temperature, and pulse rate of a child.

1. INTRODUCTION:

Child Safety is a paramount concern for parents. Violent acts against the children have increased unprecedentedly and the victims are found in dangerous conditions, where they cannot take the cell phone to contact the family members or police.

Essential signs are often considered to be the baseline indicators of a child's health and mental repute. Vital signs are never stagnant, as they may be stimulated through a variety of internal and outside factors, which include sickness, anxiety, pain, workout, and so forth.

Unusually high heartbeat, abnormal skin temperature and high pulse rate helps to detect the abnormal movement of the child while he/she is victimized. Real time monitoring of vitals has been made possible with various applications in the domain of IoT. Combining vitals monitoring and child safety strategies represents a comprehensive approach to caregiving. Child safety and vital monitoring using IoT involves creating technological solutions to enhance the safety and well-being of children. These solutions utilize IoT devices, such as wearables and sensors, to provide real-time tracking and monitoring. Monitoring a child's vital signs can aid in early detection of health problems, prevent accidents.

Child safety devices with GPS capabilities enable real-time tracking of a child's location in any kind of emergency. Locations and vitals monitoring gives parents the confidence to allow their children to explore the world, without the stress and fear of their child security. Using Voice Recognition to identify children's distress and send a SOS to parent.

2. OBJECTIVES:

- To monitor Health status of a child using temperature sensor and pulse rate sensor.
- Tracking location of the child using GPS module incorporated in the child safety device.

- To display the health vitals (temperature, humidity, blood pressure and oxygen levels) on an LCD.
- Alerting parents through SOS message and live location of the safety device in latitude/longitude format.
- A buzzer is integrated with the system to provide alert in any health emergency.

3. LITERATURE SURVEY:

[1] Design of Wearable Device for Child Safety: The Proposed device relates to server via internet, which helps to real time tracking of their children. The intended solution proceeds the advantage of finding the absolute location of the child by GPS service and the information is updated to the end user. This model tracks the location of the children in terms of latitude and longitude which can additionally track using Google maps. The major work behind this project is to design and formulate a gadget which is so condensed that provide the advantages of the own safety method specially for the children. This design is proposed to solve most of the dangerous disputes challenged with child and will help them to be protected. It is used to locate the lost children in any time with the real time location and send the notification to their parent or guard.

[2] IoT-Enabled Smart Child Safety Digital System Architecture: IoT- enabled smart child tracking digital system to assist with the safety of a child during public events. The model includes few technologies from the digital ecosystem such a IoT, Cloud, Mobile application and GPS. This model discusses three things: the research background, research method, and the proposed architecture model. Research background discusses the integrated digital ecosystem of IoT, cloud, Mobile and GPS technologies. IoT is needed to interconnect the devices and collect the data relevant to the subject. Cloud computing, on the other hand, provides a platform to accommodate virtual infrastructure that allows necessary computing along with the integration of IoT devices. Various mobile applications can be connected to a range of IoT devices and cloud for real time situation awareness. GPS is a type of LBS (Location Based Services) that is offered to determine the geographical

location of an object. Design Research (DR) method has been applied here to develop the proposed architecture model. Architecture Model: An architecture model has four major elements: people, information, process, and digital technology. People are the users who can monitor their children's activity and children are their point of interest and wear the tracking device. Information-Digital technology connects people with the information. Master-detail and Look-up relationships are created. The process element demonstrates the necessary steps to be considered for child tracking IoT based cloud platform, Android mobile application, and GPS technology.

[3] Intelligent Child Safety System using Machine Learning in IoT Devices: The system is designed to continuously monitor the location and body vitals of children. It can automatically detect a distress situation. The electronic system comprises of an Arduino controller, Raspberry Pi and sensors to detect parameters such as temperature, BVP (Blood volume pulse). It also uses a GSM and GPS module. It involves three stages, data acquisition, data classification and alert notification. Value of body vitals are obtained using sensors, classification of obtained data is done and finally, an alert notification is sent when the classification is abnormal. It uses ATmega328 microcontroller to accept the analogue signals from various sensors, sends them to Raspberry Pi for classification. Optical Pulse Sensor works on the principle of PPG (PhotoPhethysmoGraphy). LM35 temperature sensor is used to capture the skin temperature. GSM and GPS modules are used for communication and location tracking. It uses LED and buzzer as its output devices.

[4] Smart Child Safety Wearable Device: This system is designed to track real-time location, heart rate and temperature of a child remotely over a Wi-Fi network. Whenever, the child is in an emergency, he/ she can press an SOS button to alert the parent. A heart sensor and temperature sensor is available, to let the parents monitor their vitals even in their physical absence. The data related to child's health and location is stored in a cloud over a Wi-Fi network. This IoT based device brings a revolutionary change in the current problems regarding child safety issues.

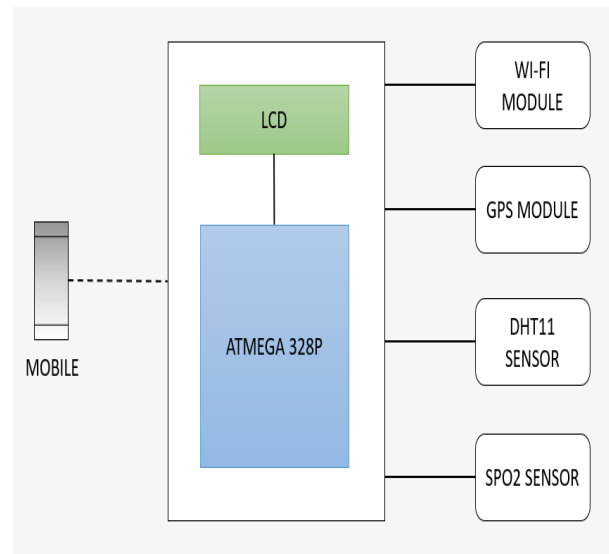
[5] Multi-sensor Wearable for Child Safety: This paper presents a wristband wearable device for child

safety, periodically tracking the child and alerting parents via SMS in case of problems. It focuses on SMS-based communication, allowing parents to send commands for information. The device can detect the child's location, body temperature, surrounding temperature, humidity, and heart rate. In emergencies, it features an alarm buzzer and SOS light to seek assistance, emphasizing child safety and security. This device utilizes SMS communication for interaction and features multiple sensors for tracking a child's whereabouts. It can respond to a "LOCATION" message with the child's approximate location. The device employs a DHT11 sensor to monitor temperature and humidity, sending alerts for unfavorable conditions. A heartbeat sensor assesses the child's physical exertion, responding to "HEARTBEAT" SMS commands. The Arduino UNO microcontroller manages these sensors, and emergency features like an SOS light and alarm buzzer can be activated via specific SMS commands for bystander assistance.

4. PROPOSED SYSTEM:

Child safety and vital monitoring uses IoT to enhance the safety and well-being of children. It utilizes three major features to ensure child safety they are, Vitals monitoring, Location tracking and alerting in emergency. Firstly, the child's health vitals are recorded by our system. The health vitals include temperature, pulse rate (BP), humidity and oxygen levels. All of these are done with the help of sensors and the data is collected from the microcontroller. Secondly, the alerting feature provides the parent with accurate and timely alerts on their mobile application through messages and voicemail. Lastly, the GPS location tracking feature is incorporated for the parents, to check the location whenever they want to, in latitude/longitude values. Apart from these major functionalities, we have also included buzzer and LED for more security.

5. SYSTEM ARCHITECTURE:



System Architecture

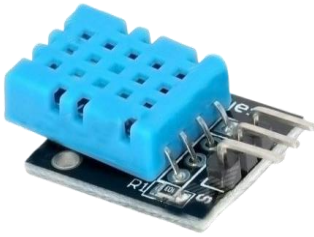
6. COMPONENTS:

6.1 Micro Controller: We are using ATMEGA328p, they can be programmed to be timers or to control a production line and much more.



ATMEGA328p

6.2 DHT11 Sensor: DHT11 stands for Digital temperature and humidity sensor. It is used to sense the surrounding temperature around the device. It detects when the temperature reaches above a threshold. The humidity sensor also alerts when the humidity is above a threshold value.



DHT11



ESP8266

6.3 SPO2 Sensor: It detects the higher pulse rate and low oxygen levels, and alerts the system in that case.

6.6 LM016 LCD: A 16 x 2 LCD, to display the humidity, temperature, pulse rate and oxygen levels.



SR011



LM016 LCD

6.4 GPS: GPS stands for Global Positioning System, is a radio navigation system that allows land, sea, and airborne users to determine their exact location, velocity, and time 24 hours a day, in all weather conditions

7. WORKING:



GPS

6.5 WIFI Module: The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability.

- **Sensor Monitoring:**
The Temperature Sensor continuously monitors the child's body temperature. The Pulse Sensor measures the child's pulse rate.
- **Violation Detection:**
If the sensors detect abnormal vital signs or any distress (a sudden increase in temperature or an irregular pulse rate), a signal is generated.
- **Microcontroller Processing:**
The Microcontroller receives the signal and processes the data. It determines the severity of the violation based on predefined thresholds.
- **Emergency Handling Activation:**
In case of a severe violation or distress, the Microcontroller initiates the emergency handling procedure. It activates the GPS Module to determine the child's real-time location.

- **Communication with Parent Module:**

The Microcontroller communicates with the Parent Module using the GSM Module. It sends vital sign data, the nature of the emergency, and the child's location (latitude and longitude).

- **Parental Alert:**

Parents receive real-time alerts on their connected devices (e.g., smartphones). The alert includes information about the child's vital signs, location, and the nature of the emergency.

- **Continuous Monitoring:**

The system continuously monitors the child's vital signs, location, and environment. It provides real-time updates to parents and ensures quick responses to any safety concerns.

8. FUTURE SCOPE:

The child safety device can be improved in the following ways:

1. **Feature Enhancement:** Explore additional features such as geo-fencing, behavior tracking and other health vitals to further enhance child safety and provide more comprehensive monitoring capabilities.
2. **Mobile Application Development:** Develop an advanced mobile application for parents to access historical data and analytics, apart from location tracking and real-time alerts.
3. **Cloud Integration:** Integrate with cloud platforms for data storage, analysis, and remote access, enabling scalability, data security, and advanced analytics capabilities.
4. **Machine Learning and AI Integration:** Incorporate machine learning and artificial intelligence algorithms for advanced analytics, anomaly detection, and predictive modeling to enhance safety monitoring and response.

9. CONCLUSION:

Child safety device plays a crucial role in enhancing the security and well-being of children in today's fast-paced and technologically driven world. It offers parents a sense of peace of mind by providing location tracking, temperature sensing, pulse rate sensing, humidity and

oxygen levels sensing, and emergency communication features. It empowers parents to monitor their child's location and receive immediate alerts in case of potential dangers. Locations and vitals monitoring gives parents the confidence to allow their children to explore the world, without the stress and fear of their child security.

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