Children's Safety Monitoring System

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ABSTRACT

Child abuse has become a major issue in the world today, with approximately 80% of cases being reported. Out of this percentage, 74% are girls and the remaining 26% are boys. Every 40 seconds, a child goes missing, which highlights the severity of the situation. Children are the backbone of a nation and their well-being is crucial for the growth and development of a country. Abusing can have serious emotional and mental effects on children, which can negatively impact their future and career. Unfortunately, due to economic conditions and parents' focus on their child's future and career, they are unable to monitor their children all the time. Our system aims to provide a solution to this problem by allowing parents to monitor their children in real-time, regardless of their location. The system uses a concealed device, equipped with GPS technology, worn by the child, which is connected to the parents' smartphone using a mobile network. This Child Monitoring system offers important features such as Heart beat monitoring, Temperature monitoring, Discrete Panic Button, and Real-Time Tracking, which helps parents to ensure the safety of their children.

Keyword: *GPS, Temperature, ThinkSpeak, BPM, IoT.*

1. Introduction

In the contemporary era, child safety has become a critical concern as children are susceptible to physical and sexual abuse, violence, and fear of danger, making it difficult for them to venture out of their homes at any time. Despite the rapid advancements in technology and the development of new gadgets in the 21st century, children and girls continue to face difficulties. Children possess the ability to mobilize various groups to pursue a common goal, transcending ethnic, religious, political, and cultural barriers to promote freedom. While we all acknowledge the importance of child safety, it is imperative to ensure that they are adequately protected. Children are not as physically strong as men, and during an emergency, they would require assistance from a helping hand. The most effective approach to reduce the likelihood of falling victim to violent crime such as robbery, sexual assault, rape, or domestic violence is to recognize, defend and seek help from available resources during hazardous situations. Suppose you find yourself in a predicament or become separated from your friends during a night out and do not know how to find your way back home. In that case, a device that you carry with you can protect you and reduce your risk while summoning assistance when you need it. Several apps reduce the risk of sexual assault on women by notifying the control center and their associates through SMS, but this device has a more efficient method of informing those responsible individuals and also provides a defensive system that existing apps cannot provide. The Internet of Things (IoT) refers to the set of interconnected devices and systems that are connected to the internet

with real-world sensors. Child safety has been threatened over the years, and it is vital to provide a technology-based solution that will help them during panic situations and monitor them using a smart gadget. An "Embedded System" is a hardware and software unit that is integrated to create a system that facilitates design objectives such as speed and efficiency. The major advantage of embedded systems is the ability to choose the desired hardware and software components to construct the desired system that achieves the intended goal. Our project is based on the benefits of the embedded system outlined above. To track a child's location and critical health metrics in real-time while they are in an emergency, wearable technology that is lightweight and consumes very little power is required. IoT simplifies and accelerates the monitoring process, enabling faster decision-making. The ESP-01 serves as a gateway to transmit sensor information to an IoT cloud called ThingSpeak for faster display and response.

2. Literature Review

[1] The Link-It ONE board was utilized to create the system, which was coded in embedded C and connected with sensors such as temperature, heartbeat, and touch. Additionally, modules for GPS, GSM, and a digital camera were interfaced with the system. The unique aspect of this project is that it can notify the parent or caretaker via SMS when their child needs immediate assistance during an emergency.

[2] This device is designed to assist parents in easily locating their children. Currently, there are numerous wearables available on the market that can track a child's daily activities and utilize Wi-Fi and Bluetooth services to locate the child.

[3] In this paper, a model for ensuring child safety through smartphones is introduced. This model enables parents to track their children's location and, in the event of an emergency, allows children to send a rapid message along with their current location via Short Message Services (SMS).

[4] The focus of this paper is to offer an Android-based solution to enable parents to monitor their children's location in real-time. Multiple devices are linked to a single device through internet channels, and the relevant device is connected to a server via the internet. This device can be utilized by parents to monitor their children's location in real-time or for enhancing women's safety. The suggested solution leverages the location services provided by the GSM module.

3. Methodology

If a child or girl is in a dangerous situation, they can press a panic button that is connected to an Arduino board. The board will trigger an alarm and send an alert to the nearest police station through a Wi-Fi module that is connected to GPS. This information is then sent to a cloud server. If the child has a health issue, the system will upload their body temperature to an IoT cloud. A system block diagram is designed to monitor the location and health of children, along with environmental analysis. The system uses an Arduino Uno that requires a fast connection. Processors are combined with important sensors to track health status, such as body temperature and heart rate sensors. The GPS receiver records the child's position in terms of latitude and longitude, and stores it in the memory of the microcontroller. To pinpoint the exact location of an area, a GPS receiver measures and compares the signals received from GPS satellites in orbit. A keyboard can be utilized to send out an emergency signal. Additionally, IoT is utilized to transmit crucial data related to the child's health and overall status to the parent's mobile device. The parent can monitor the child's location and health status using GPS technology and IoT-integrated software on the base station system. The LCD screen displays the child's body temperature, heart rate, and location coordinates. The heart rate and temperature sensors output, along with latitude and longitude, are sent to the ThinkSpeak cloud for further analysis and processing.

Fig-1: Connections

This System Consists of :

Location Tracking System

To track the exact location of a child in real-time, a PS module is employed. By linking the arduino uno and GPS module, the system can obtain location data from the GPS module, which collects location information from various satellites. Every 15 seconds, the child's location is updated in the ThinkSpeak cloud. When the panic button is pressed, the arduino uno retrieves the GPS module's precise and current location by executing the GPS code.

Temperature Sensor(LM35)

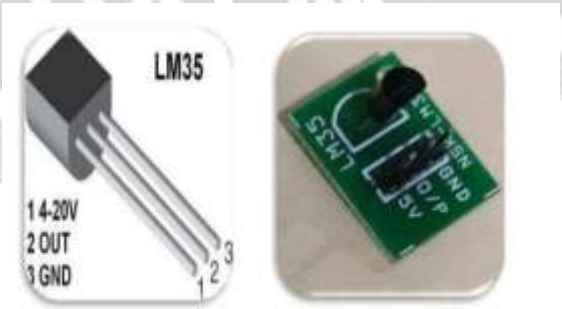

Fig-2: Temperature Senor(LM35)

LM35 is a temperature sensor that can be integrated with IoT devices for monitoring temperature changes in real-time. This sensor has a linear output voltage that is proportional to the temperature. It can accurately measure temperature in the range of -55°C to 150°C with an accuracy of ±0.5°C. By integrating this sensor with IoT devices, temperature data can be transmitted to cloud servers, which can then be used for analysis and decision-making. This technology can be used in various applications, such as home automation, industrial automation, and agriculture, to monitor and control temperature changes remotely.

ThinkSpeak (IoT Cloud)

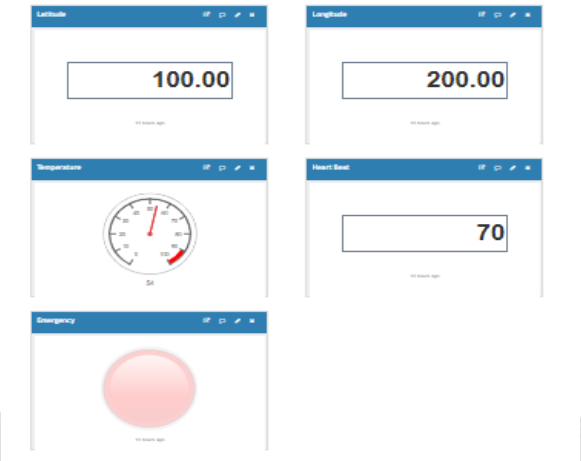

Fig-3: Sample interface of ThinkSpeak

The ThinkSpeak platform is used to record and display the GPS location, temperature, and heartbeat rate data of an individual. The GPS module is utilized to collect the location information and it is updated every 15 seconds on the ThinkSpeak cloud platform. The temperature data is measured using the LM35 sensor, and the heartbeat rate is determined by a sensor. Both temperature and heartbeat rate data, along with the GPS coordinates, are sent to the ThinkSpeak platform, where they can be monitored and analyzed. This system allows for the continuous tracking and monitoring of an individual's location and health status in real-time.

4. Result

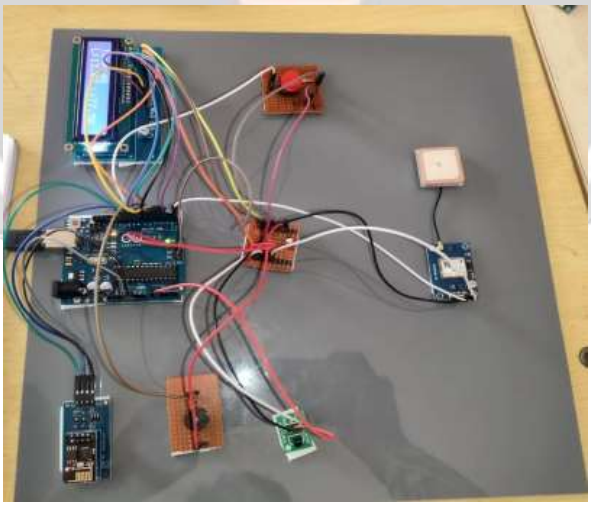

Fig-4: Final Setup

Data Collection

Sensor data is obtained and transmitted to Think Speak. GPS acts as a location tracking sensor that records the child's present location. The heartbeat sensor is an effective means of monitoring heart rate and is available in

various sizes and shapes. It provides instant measurements of the heartbeat, which is recorded in beats per minute or BPM, signifying the number of times the heart contracts or expands in a minute. By placing a finger on the sensor , the LCD displays the heart rate, which is also periodically updated on the application.

Final Output in ThinkSpeak

Fig-5: Output in ThinkSpeak when child presses the button

To gather and store data, the sensors send the information to the ThinkSpeak platform. The GPS sensor tracks the child's location in real-time, while the Heartbeat Sensor provides an effortless and quick method of measuring the heartbeat rate. The BPM or beats per minute measurement indicates how many times the heart contracts or expands in a minute. The LCD displays the heartbeat rate when the sensor is placed on the finger, and the information is regularly updated in the application. The accumulated data is transmitted to the ThinkSpeak platform for further analysis and visualization .When the panic button is pressed or when the heart beat increases above 150bpm the longitude and latitude and heart rate and body temperature is updated in ThinkSpeak cloud and red light is turned on in the cloud indicating that child is in danger.

5. CONCLUSION

The system has presented a Smart safety device for child monitoring that utilizes Internet of Things technology to provide efficient monitoring of the child through GPS. The proposed system facilitates communication between parent and child, offering real-time location, heart rate, and a distress alarm buzzer for the child's surroundings, as well as the ability to locate the child or alert bystanders in an emergency. With periodic updates on the child's status, the system ensures that parents are always aware of their child is in danger.

6. FUTURE ENHANCEMENT

Possible future improvements for child safety monitoring systems could involve utilizing biometric recognition technology for precise identification, implementing machine learning algorithms for more effective threat detection, adding wearable devices to track health and location more accurately, integrating augmented reality for real-time visual feeds and alerts, and including advanced communication features. In addition, geo-fencing could be used to

establish virtual boundaries, and emergency response times could be improved through integration with emergency services. Prioritizing energy efficiency and privacy and security is also important.

7. REFERENCES

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