RESEARCH ARTICLE

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Employing an efficient Child Tracking System using the Internet of Things

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Abstract

The main concept of this paper talks about the idea of Child Tracking (CT) System for the safety of kids. Our purpose in this work is to track and secure the child at any place, over a command via SMS to communicate between device and parent with the help of GSM module wired to Arduino Mega Board. The proposed system provides the real-time location, child body temperature, environment temperature, humidity of the environment and alarm to the parents so that they can rescue their child from strangers. The proposed CT system combines technologies and sensors to easily monitor the child and get the information. This paper provides the comfort of taking care over the children remotely at an instance of time.

Keywords: Arduino, Child Tracking, GSM, Safety, SMS.

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Introduction

The Internet of Things (IoT) is a system of physical devices embedded with softwares, sensors, and the ability to exchange data over a network without human-to-human interaction. The Internet of Things senses and controls the objects present remotely across existing network infrastructure and helps in improved efficiency and economic benefit.[1] IoT plays an important role in systems like smart homes, smart cars, portable devices, human implanted devices and lighting control to measure the world around them. The idea for a system like child tracking has come based on the increased need for safety of small kids in present times as there can be situations of the child getting missed in the unknown and crowded areas.[2,3]

This paper focuses on the key aspect such that the location of missed children can be found and parallelly, paper also plays an important role in the safety of children so that the child can be rescued from strangers. Nowadays, most of the devices that focus on safety provide children's location and activity to their parents through Bluetooth and Wi-Fi, but Wi-Fi and Bluetooth devices are not so reliable for exchanging information.

Literature Review

Mobile wearable device communication creates new challenges and also covers the short-range. It gives peer-to-peer communication or client-server fashion communication with smartphones, tablets, and gateway nodes.[1] Women safety devices give protection and women themselves want to intimate their dangerous situation by pressing the buzzer in the device. In this, a person with a particular application will receive a woman's current status in a danger situation.[4] The system provides an alert message for the small range and it can be received only through mobile phones.[5] The existing system uses a Wi-Fi module to intimate the parents about their child's condition. Parents can get the Personal details of children by giving keywords like Body temperature, location to the concern device.[6]

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Proposed System

After analyzing the drawbacks of the existing system, we have proposed a Child Tracking System using sensors and electronic components to detect the child's location. It also gets the details about the child's body temperature, surrounding temperature near the child, humidity of the environment, and if a child is in danger, it creates an alarm to the parents.

The proposed system consists of these different components:

A. Arduino Mega Unit
B. Temperature Sensor
C. Body Temperature Sensor

D. GSM and GPS Module
E. Buzzer

In Figure 1, we have shown the architecture of the child tracking system. We have described each component of this architecture in the current section.

A. Arduino Mega Unit

It is a microcontroller board which is based on the ATmega2560. This Mega Board has input/output pins in digital manner, a USB connection, a power port, analog inputs, an ICSP header. In Figure 2, we have shown Arduino mega2560. It has different power pins:

- Vin - this pin is used for input voltage to the board
- 3V3 - 3.3 voltage supply that is generated by the on-board regulator
- IOREF - microcontroller operates with the help of the voltage reference that is provided by it

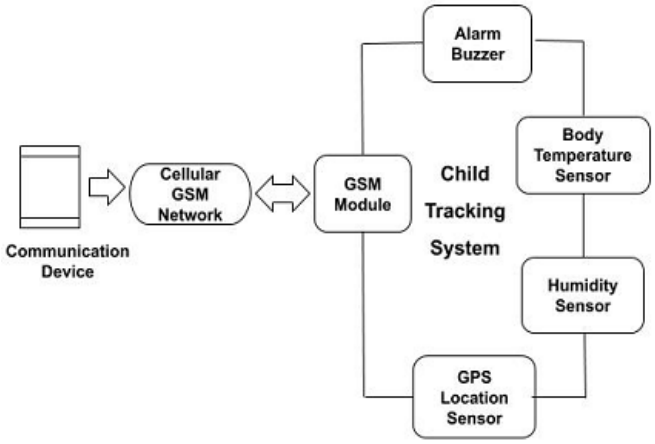

Figure 1: Architecture of Child Tracking System

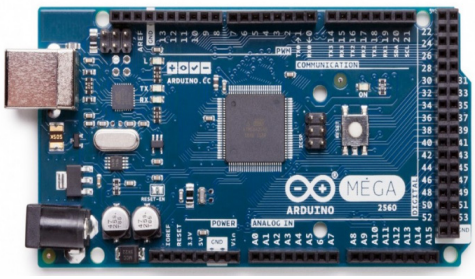

Figure 2: Arduino mega2560

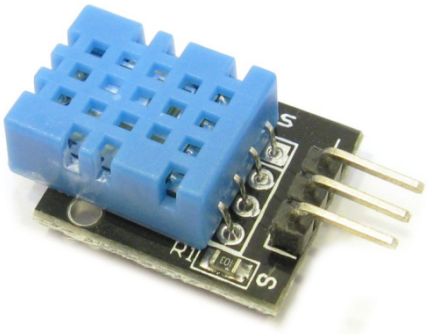

Figure 3: DHT11 Sensor

B. Temperature Sensor

The DHT11 sensor, shown in Figure 3, is a digital temperature and humidity sensor with low cost. Here, the value of the temperature is stored in a string getTemp(a), where "a" is of integer type.

Technical details

- having Low cost
- it has 3V to 5V power supply and I/O
- It is good for 20 to 80% humidity readings
- Good for the 0 to 50°C temperature readings having ±2°C accuracy

C. Body Temperature Sensor

The temperature of the human body is an important factor in maintaining health, so it is necessary to monitor it regularly. There are so many temperature sensors to measure body temperature. LM35 sensor, shown in Figure 4, is a precision integrated circuit sensor in which the output voltage is directly dependent to the temperature.[7, 8] In the CT System if the body temperature varies drastically, then it can trigger the module for rescue.

D. GSM and GPS Module

GSM800c, shown in Figure 5(a), is used for sending data from the control unit to the base unit. GSM takes advantage of both FDMA & TDMA. 992 speech channels are available in GSM800c at any instance of time.[4,5]

Figure 4: LM35 Sensor

Figure 5(a): GSM 800c Module

Global positioning system (GPS) determines the longitude and latitude of the receiver after calculating the time difference from different satellites to reach the receiver.[9] In Figure 5(b), we have shown a GPS sensor. When a user triggers a text SMS "LOCATION" from the smartphone, the Arduino GSM module receives the text sent by the user through the smartphone. After that GSM activates the Arduino Uno to execute the GPS code to fetch the accurate and the current location of the GPS module. Finally, the results for latitude (lat) and longitude (lng) are given into the below URL format:

http://maps.google.com/?q=<lat>, <lng>

For example:

Received Reading: 12.131835, 78.197479

SMS that is sent to the user's Phone:

http://maps.google.com/?q=12.131835,78.197479

E. Buzzer

Piezo electric buzzer, shown in Figure 6, is used to create sound to take care or track the child in crowded areas. In this, we use the command "BUZZER ON" to generate an alarm type sound. In this Tone, an Arduino Library is used to produce the square-wave of any specified frequency.

Result

In this result section, we have shown the performed experimental tests for determining the components in the proposed portable device.

The below Figure 7 is showing the child's location and we have taken this image from a mobile sms screen. In this we have used the command *LOCATION# to get the sensor location.

In Figure 8, we have shown the screenshot of the location that we have got after applying the command *LOCATION# to the system.

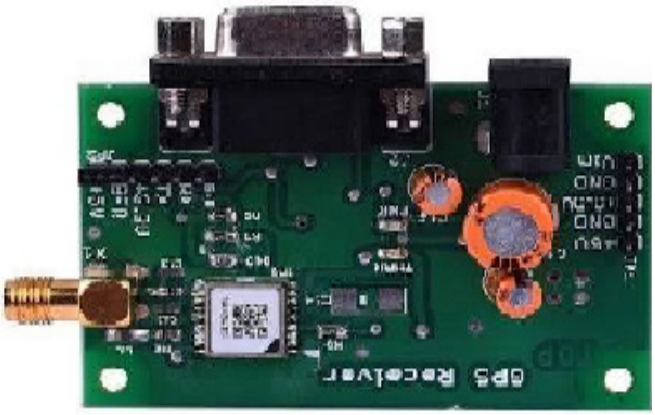

Figure 5(b): GPS Location Sensor

Figure 6: Piezo Electric Buzzer

In Figure 9, we have shown the screenshot of the temperature of environment with the help of command *TEMPERATURE# and the child body temperature with the help of command *BODY TEMPERATURE#.

In Figure 10, we have shown the screenshot of the humidity with the command *HUMIDITY# and the alarm ON/OFF with the command *BUZZER ON# and *BUZZER OFF#.

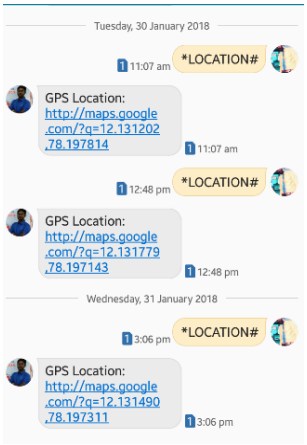

Figure 7: SMS screen of Child's Location

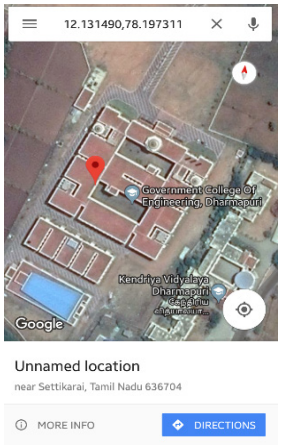

Figure 8: Google map with latitude and longitude coordinates

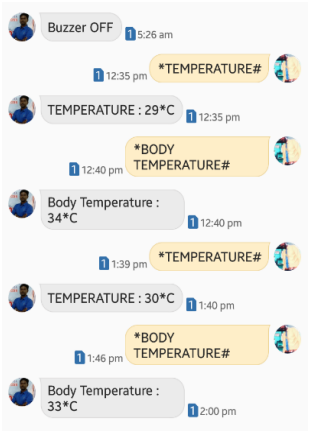

Figure 9: SMS screen of environment temperature and Body temperature

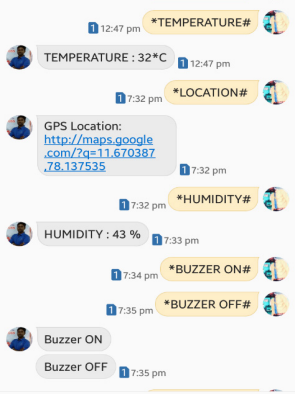

Figure 10: SMS screen of Humidity and Buzzer

In this Child Tracking (CT) System we have used Arduino Mega Board, Temperature Sensor, Body Temperature Sensor, GSM Board, GPS Board, Buzzer and Camera for finding the real-time location, child body temperature, environment temperature, humidity of the environment and alarm to rescue the children using commands:

- *LOCATION#
- *TEMPERATURE#
- *BODY TEMPERATURE#
- *HUMIDITY#
- *BUZZER ON#
- *BUZZER OFF#

Conclusion & Future Scope

The proposed CT system is the concept of a child safety device with location identification and monitoring the child's current status. It is a useful and effective method for children outside of their home. The key features of our proposed CT system are simple and easy to use.

The proposed system provides the real-time location, child body temperature, environment temperature, humidity, and Distress alarm buzzer to the parents. The proposed CT system combines technologies and sensors to monitor the child easily and get the information. The buzzer provides a sound when the child is in a dangerous situation and the camera is used to track a child current status by sending a snapshot through a mobile device.

In the future, we can improve the system by adding features like live streaming, cloud storage to the existing device for child safety, and a more powerful model to keep the battery for more time.

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