Smart Wearable Device for Child Safety by Using IOT

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Abstract - Now-a-days we can see that human life is becoming very fast. Moreover, the city life is getting very busy day- by- day. So in the daily busy schedule it is becoming very difficult for the parents to monitor their children closely. This paper discusses about a smart wearable device like a wristband which tracks the child from time to time to ensure their safety. If any problem occurs it would alert parents through the cell phone so that they can take immediate action. This paper focus on the SMS text enabled communication. Parents can send SMS with some keywords and the device reply back. The device can detect the child's approximate location, it can detect the body temperature and the surrounding temperature, humidity and also the heartbeat of a child. For the emergency situation, the device would have some measures like an alarm buzzer, SOS light which will notify the bystanders to help the child. So this paper is all about the safety and security of a child to help them to recover from any type of difficulty.

Keywords = Wearable, wristband, child safety, IoT, location, SMS

1.INTRODUCTION

This paper is based on Internet of Things (IoT)[1]. IoT means a collection of systems and devices which are interconnected with the actuators and sensors(real-world) to Internet. Examples of some IoT based smart systems are smart city, smart lighting system, smart traffic control system, home automation etc. This paper also focuses on Wireless Sensor Networks [2] and used many sensors. The usage of these smart systems are increasing day by day. The main motivation that works for this device is security and safety of a child who can face any trouble like lost in a crowded area, not finding their parents etc. This device helps the parents to track the child and to find them. There are quite a few wearable devices in Medical Internet of Things and their comparative analysis [3] which could be used as a base framework for designing the proposed device.There are many such wearable devices available today which tracks child's location, body temperature etc.using sensors through Wi-Fi[4] and Bluetooth[5].But these two communication medium proved to be unreliable medium. One of the existing work like Wristband Vital[6] uses Bluetooth 4.1 module as a communication medium which is a very unreliable source. So another mode of communication is introduced which is SMS text enabled communication between parents and children in the GSM platform. In GSM platform the rate of failure is relatively small. Some works like Design and implementation of Microcontroller Based Short Message Control System[7], Child safety wearable device[8] uses SMS platform as a communication medium. This paper uses Arduino[9] Uno platform. Arduino GSM Shield provides all the functions like SMS send and receives calls etc. Parents can send SMS with some keywords and the device reply back. The device can detect the child's approximate location , it can detect the body temperature and the surrounding temperature to approximate the child's physical condition. some allergy in high humid conditions then it can send an alert to notify the situation by measuring the humidity. The device can also measure the heartbeat of the child to track the child's level of physical exertion. Parents can send SMS with some keywords and the device reply back. The device can detect the child's approximate location , it can detect the body temperature and the surrounding temperature to approximate the child's physical condition. If a child has some allergy in high humid conditions then it can send an alert to notify the situation by measuring the humidity. The device can also measure the heartbeat of the child to track the child's level of physical exertion. There is a secondary module added like SOS light and Alarm Buzzer.

When a parent sends an SMS to the device it makes the SOS light ON to alert the bystanders. SOS is programmed with Arduino. Similarly the Alarm will also work in this way. This design also includes some filtering of any kind of interference created due to skin friction or other environmental effects[10]. So the proposed wearable device will use SMS as a communication medium to ensure secured communication. The device could be customized as per the requirements by programming the Arduino System.

2. RELATED WORKS

Many wearable devices are available today. Some existing works like Design and implementation of Microcontroller Based short Message Control System[7] which exposes some applications of SMS technology other than call and sending and receiving SMS. This system gives some solution of some problems of daily life like home appliances(television, light)controlling, water pumping machine, ON/OFF of a switch etc. remotely when the user is not in house. These solutions are cost effective. The messages which are allowed by Short Message System(SMS) on a GSM platform has a length maximum of 160 characters. The main target of this paper is to designing a embedded device.

3 .PROPOSED DESIGN AND ARCHITECHTURE

The proposed system, a Smart Wearable Device for Child Safety using IoT and GPS, aims to enhance the safety and security of children in various environments. This wearable device will incorporate advanced IoT and GPS technologies to provide real-time tracking, geofencing, emergency response, and secure communication features. The GPS module in the wearable device accurately tracks the
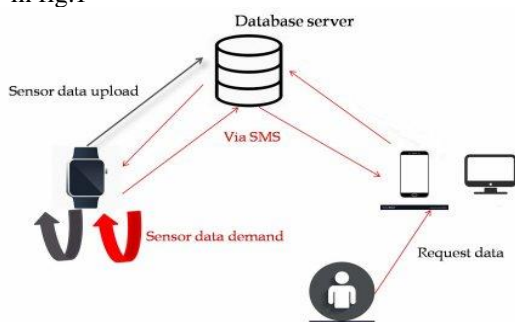
child's location in real-time. Parents can monitor the child's movements on a map through a dedicated mobile application or a web interface.

The ideal design of the proposed device will work in different ways –

1. When the value of Pulse sensor and DHT11 exceeds the threshold value then the device will send an SMS to the parent to alert them.
2. If a parent request for a specific data at a specific time then the device will send a reply SMS with the requested data. Like if a parent request the child's location at a specific time then the device will reply back with the location of the child at that particular time.
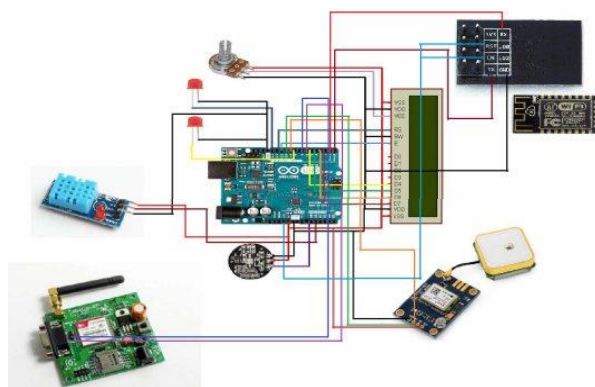
A .Control Flow Diagram

The process control flow of the proposed design is given below in fig.1

B. Circuit Diagram:-

The circuit diagram of the proposed approach is given below in fig 2

4.IMPLEMENTATION

DHT11 Sensor :-

It uses thermistor to measure the surrounding air temperature and a capacitive humidity sensor to measure the moisture content. It sends digital readings on data pin so there is no need to use an Analog to Digital Converter (ADC) chip. It is very easy to use but the only problem with this sensor is

that it sends data every 2 seconds. There are lot of resources online on hot to interface DHT11 Sensor to Arduino which will make this sensor easy to interface to any Arduino Board DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability.
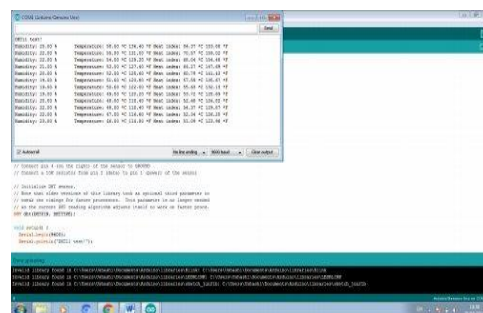

Fig 4. Output of Temperature and Humidity Sensor

● **Battery:-**
Power up your devices and projects with the high-performance 12V Lithium-ion Battery, available exclusively at RoboMart. This rechargeable battery offers reliable energy storage and is designed to meet the demands of a wide range of applications, from robotics and electronics to portable gad

Push Button:-

Push Button Switch is widely used as a standard input "buttons" on electronic projects. These work best when you mount it on PCB but can also be used on a solder less breadboard for temporary connections in prototypes. The pins are normally open (disconnected) and when the button is pressed they are momentarily closed and complete the circuit.

GPS(Global Positioning System)Module:-

Global positioning system is a navigation system based on satellite which consists of at least 24 satellites.GPS works 24hours in every condition without any subscription fees.The satellites transmits at least 2 low power radio signals. First,Establish the connection.Then Create a new instance of the TinyGPSPlus object and Connect to the Serial with a baud rate of 9600. While gpsSerial is available Get the data from the GPS. If gps encode data Get the location,lattitude and longitude and print them. So,the GPS module gives the child's approximate location as output by measuring the lattitude and longitude through which the parent can know their child's whereabouts.

Alarm Buzzer:-

Piezo buzzers are used for making beeps alarms and tones. They can be used in alarm systems, for keypad feedback, or some games. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Here, alarm buzzer is used to alert the bystanders whenever the sensor value exceeds the threshold to indicate that the child is in a trouble. tone(buzzer, 1000) sends a 1KHz sound signal to pin 9, delay(1000) pause the program for one second and noTone(buzzer) stops the signal sound. The loop() routine will make this run again and again making a short beeping sound as an output.
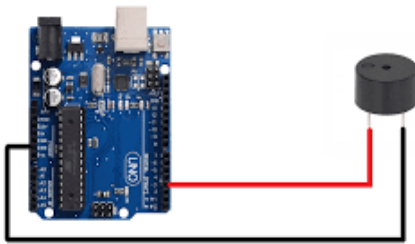
SOS Light:-

LED is used as a SOS light. When the sensor values crosses the threshold then the light will blink to indicate that the child is in trouble. An LED is a small light (it stands for "light emitting diode") that works with relatively little power. First, The setup function runs after pressing the reset or power button. Then Initialize digital pin LED_BUILTIN as an output. The loop function runs over and over again forever. Then Turn the LED on and Wait for a Second. After that Turn the LED off by making the voltage LOW and Wait for a Second. As a result The LED will blink for a specific sensor value.

FUTURE SCOPE

- The system includes a compact, lightweight wearable device equipped with GPS module, accelerometer, heart rate sensor, and GSM/Wi-Fi communication capabilities. The device is designed to be comfortable for children to wear, ensuring they are willing to keep it on.

- The GPS module in the wearable device accurately tracks the child's location in real- time. Parents can monitor the child's movements on a map through a dedicated mobile application or a web interface.

- Parents can define safe zones and danger zones using defencing technology within the application. Whenever the child enters or exits these predefined areas, the system sends instant alerts to the parent's smartphone, ensuring parents are informed of the child's location status.

CONCLUSION

The child safety wearable device can act as a smart device. It provides parents with surrounding temperature, Distress alarm buzzer for their child's surroundings and the ability to locate their child or alert bystanders in acting to rescue or comfort the child. This paper surveys various papers related to an IOT based safety wearable device that helps the parents or guardians to monitor the safety of their ward or children. The main aim is to provide an effective and convenient solution to the parents or guardians to keep track of their child's safety and in turn to reduce the increased occurrence of crime against missing children.

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