SMART CHILD SAFETY MONITORING SYSTEM

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Abstract - *With the rapid development of urbanization and industrialization in India, more and more children are studying and living in cities, which present some safety challenges. The purpose of this device is to help parents locate their children with ease. At the moment there are many devices in the market which help track the daily activity of children and also help find the child using Wi-Fi and Bluetooth services present on the device. But Wi-Fi and Bluetooth appear to be an unreliable medium of communication between the parent and child. Therefore, the focus of this paper is to have an SMS text enabled communication medium between the child's device and the parent as the environment for GSM mobile communication is almost present everywhere. In addition to this the realtime location and the heartbeat rate of the child are periodically updated in the android application in the parents mobile. On clicking the coordinates, parents could view the location in the realtime map and track the child. Children can be warned about potential risks, and their guardians can be informed of location or activity abnormities. This project is aimed to build a system which can notify the parent about their child's status by using GSM technology.*

Key Words: GSM, GPS, IoT
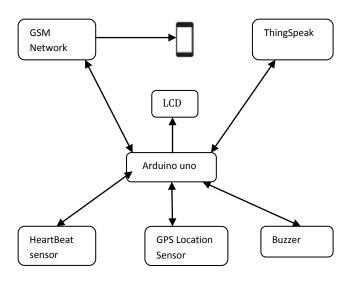
1. INTRODUCTION

The Internet of Things refers to the set of devices and systems that stay interconnected with real-world sensors and actuators to the Internet. The motivation for this wearable comes from the increasing need of safety for children. This project focuses on a key aspect any children in danger can be helped by the people around the child. Most of the wearables available today are focused on providing the location, activity, etc. of the child to the parents via Wi-Fi [8]and Bluetooth [9]. But Wi- Fi and Bluetooth seem a very unreliable source to transfer information. Therefore it is efficient to use SMS as the mode of communication between the parent and child's wearable device, as this has fewer chances of failing compared to Wi-Fi and Bluetooth. The platform on which this project will be running on is the Arduino Uno microcontroller board based on the ATmega328P, and the functions of sending and receiving SMS, calls and connecting to the internet which is provided by the Arduino GSM shield using the GSM network. **ThingSpeak** is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol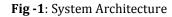 over the Internet or via a Local Area Network. It is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. With the ability to execute MATLAB code in ThingSpeak you can perform online analysis and processing of the data as it comes in. ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates". Also, additional modules employed which will provide the current location of the child to the parents via SMS.

2. SYSTEM ARCHITECTURE

This section discusses the architecture and the methodologies chosen for the development of this smart device. An ATmega328p microcontroller controls the system architecture of the wearable with an Arduino Uno. The Fig illustrates the architecture of the smart device, which depicts the various technologies and standards used. The Arduino Uno collects various types of data from the different modules interfaced to it, such as the GPS module upon being triggered by the Arduino GSM shield. The GSM is used as an interface to send the data received by the Arduino Uno via SMS to a smartphone over GSM. The GSM shield is used as an interface to send the data received by the Arduino via SMS to a smartphone over GSM/GPRS. If an SMS text with distinct characters is sent to request the current location or GPS coordinates is sent to the Arduino GSM shield via the user's Smartphone, then the GSM shield triggers the Arduino to request the current GPS coordinates and the heart rate of the child. Once the coordinates and the heart rate are received by arduino it will process this and transfer it over to the GSM shield, which then sends the data via SMS to the user's smartphone and also the data is periodically updated in the application using ThinkSpeak. The user can just tap on the coordinates which will open up the default GPS application installed on the phone and will show the user the distance between the child and the user. With the heartbeat sensor parent can identify if the child is in safe state or not by analyzing the heartbeat rate.

Fig -1: System Architecture

3. SYSTEM OVERVIEW

The proposed System consist of 3 modules
- Location tracking module
- Heartbeat detecting module
- Communication module

3.1 Location Tracking Module

For determining the realtime location of the child, PS module is used. The connection between the arduino uno and GPS module enables the system to read the GPS data.SIM800l GSM module is connected to arduino that helps in sending the data via SMS. The GPS module receives location information from the various satellites. Once the SMS trigger text "LOCATION" is sent from the cell phone of the user, this text is received by the Arduino GSM Shield which in turn triggers the Arduino Uno to execute the GPS code to fetch the current, accurate location of the GPS module. Upon testing the wearable device multiple times with repeated SMS texts, the GPS location sensor was able torespond backwith precise latitude and longitude coordinates of the device to the user's cellphone, which then the user would clickon the received Google maps URL which would, in turn, open the google maps app and display the pinpoint location. In all the scenarios the GPS module was tested, it would respond back to the user'scellphone with in a minute. The latitude and Longitude coordinates are periodically fetched and updated in the application.

3.2 Heartbeat Detecting Module

The more easy way to monitor the heart rate is to use a Heartbeat Sensor. It comes in different shapes and sizes and allows an instant way to measure the heartbeat. The heartbeat is measured in beats per minute or bpm,

which indicates the number of times the heart is contracting or expanding in a minute. The principle behind the working of the Heartbeat Sensor is Photoplethysmograph. According to this principle, the changes in the volume of blood in an organ are measured by the changes in the intensity of the light passing through that organ. These data are fetched and sent to Think Speak. The data from the Think Speak is periodically updated in the android application. It let the parents know about their child's status when they are out of home.
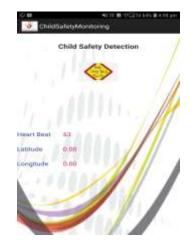
3.3 Communication Module

This module describes the communication between parent and child. Parent can know the location of the child by sending a text with predefined keywords to the device in the child end. The device with the help of GPS location tracking sensor identifies the current location and sends this data to cloud. The information is sent as an SMS with the help of GSM to the users who does not have a smart phone. The real time accurate location and heartbeat rate is periodically updated in the android application, so the parents with smartphone can constantly monitor their Child.

4. RESULTS

4.1 Data Acquisition

Data from the sensors are captured and sent to Think Speak. GPS is a Location Tracing sensor which tracks the current location of the child. The more easy way to monitor the heart rate is to use a Heartbeat Sensor. It comes in different shapes and sizes and allows an instant way to measure the heartbeat. The heartbeat is measured in beats per minute or bpm, which indicates the number of times the heart is contracting or expanding in a minute. On keeping the finger over the sensor, the heart beat rate is displayed in LCD and also it is updated periodically in the application.

4.2 User Interface

The acquired data is sent to ThingSpeak and the fieldchart is generated based on the data. From ThingSpeak the data is fetched and sent as an SMS to the parent's mobile. These data is also updated in the android application constantly.

4. CONCLUSION

The system has presented a Smart safety device for child monitoring using Internet of Things . It provides efficient monitoring of child with the help of GPS and GSM based Technology.The proposed system provides communication between parent and child.It provides parents with the real-timeLocation,Heart beat along with Distress alarm buzzer for their child'ssurroundings and the ability to locate their child or alertbystanders in acting to rescue or comfort the child. The application keeps track of the child periodically and updates the status of child to the user . Thus the parents are always kept aware of their Child constantly.

5. FUTURE ENHANCEMENT

For surveillance of the child's surroundings, to get a clearer picture of the location, this wearable can also contain a camera module incorporated in it. The camera will be collecting information in the same manner as the GPS module. It will be on stand by conserving power waiting for the particular keyword "SNAPSHOT" to be sent from the user's smart phone to the GSM shield will activate the camera to start clicking a snapshot of the surrounding and save the file temporarily on the external microSD card. After which Arduino Uno will access the saved image from the microSD storage and transfer it to the GSM module which send it to the user via SMS/MMS text.

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