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IoT Based Safety Gadgets for Child Safety Monitoring and Notification System

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ABSTRACT:

Borewell accidents are common due to uncovered openings of borewell. It is very difficult and risky to rescue the trapped children. A small delay in the rescue can cost the child his or her life. Due to that, parents whose families were located near boreholes are worried for their children and perhaps, a hard challenge for them to guarantee safety of their children when they are out. To overcome this issue, IOT is applied to propose a wearable smart band which helps parents to monitor and get known of their child's condition at anywhere and anytime even if they are not by their children side. It helps in tracking of child's location and capturing of data remotely such as temperature and pulse. It also sends notification if the child is out of location or when the device realizes abnormal conditions/situations. The heartbeat and temperature sensors are deployed to fetch the data and the values are send to microcontroller which in turn reflects in IOT webserver to monitor remotely. Then microcontroller sends the collected data to parents' smartphones by SMS using GSM module. When there are abnormal values detected that is when the child is out of the parent location, it will then automatically make calls to registered contact and to the nearest police station with help of GPS tracking.

Keyword: Child safety monitoring, GSM, GPS tracking.

1. INTRODUCTION:

Internet of Things (IOT) is a set of systems and devices interconnected with real-world sensors and actuators to the Internet, according to. It is able to make decisions via detecting the surrounding environment without human interaction. In this research, IOT is applied to propose a wearable smart band which helps parents to monitor and get known of their child's condition at anywhere and anytime even if they are not by their children side. Via the IOT smart band, children safety is guaranteed, and crime rate is reduced as immediate actions can be taken in case the child is in danger. Besides, unlike existing smart band, which is less focusing on child security aspect, the proposed system emphasizes in getting as much data as possible so that actual situation can be identified. The use of IOT in this device is motivated by the need of child security system in Malaysia due to child safety issues resulting from increasing cases on child related crime. In fact, IOT has been applied in domains such as smart home, smart city, smart factory, supply chain, retail, agriculture, lifestyle, transportation, emergency, health care, environment, energy, culture and tourism. However, it is seldom used to monitor child's safety in Malaysia. Actually, there is a need to use IOT-based child security system since the safety of children has become a major concern. In fact, crimes on children keep increasing despite actions have been taken by the government. Revealed by, the overall percentage of child abasements worldwide is about 80% nowadays, out of which 74% are girls and the remaining are boys. For every 40 seconds, a child is gone missing in the world. Due to that, parents are worried for their children and perhaps, a hard challenge for them to guarantee safety of their children when they are out. To cope with the issue, the system is proposed with these objectives:

- Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more.
- To show the child's actual data with reference values.
- Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations. Then, emergency notification along with real-time video will be sent to and display in the parents' mobile apps.
- Develop a prototype of IOT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace.

2. LITERATURE SURVEY

The global position system (GPS) based child care system using RSSI Technique. This paper proposed the GPS technology helps to determine the exact position of the child. A data from received signal strength indicator (RSSI) is extracted out from the Bluetooth connection Using which the distance between parent and child is found. An alert is triggered when the distance between the parent and child is far apart for a certain range.

The Remote Video Monitoring System Based on Embedded Linux and GPRS. This video monitoring system based on embedded Linux and GPRS (General Packet Radio Service) network. lo hardware takes ARM9 S3C2410 processor for centralization, in virtue of SDRAM, USB, GPRS module etc. the main function realized by C programming to achieve real- time camera data acquisition, image compression and network transmission through GPRS module. Monitoring center receives image data and displays after connects with the terminal. It is easier to be used in windows system. Image data can be transmitted to the monitoring center in 3-6 seconds after JPEG compression.

The Children Safety and School Bus Tracking Solution. School bus monitoring is an effective major to restrict the mishaps. This paper proposes an embedded system which focuses on children safety, tracking of school bus and exact we also provide with the help of longitude and altitude positioning of GPS and sending information through SMS. Each student possesses an RFID tag on his own smartcard which is useful for identifying the student. Two IR sensors are used to check whether a student is arriving or leaving bus. Hence, we have proposed “LPC 2148” based embedded system which provides a complete solution to children safety and school bus tracking.

IOT based School Bus Tracking System. This project recommends an android based solution which assists parents to track their children location in real time. To track the location Active RFID module is used and to identify the identity of the child a biometric identification is used which is in built in the system. Whenever a child boards a bus, the biometric identification is done in the bus, and the system will identify the child and update log on a server will send notification to the parents which consist of current location and time. Parents can see the location of bus, they will be notified when the children is getting into a bus or getting down from a bus.

Smart IOT Device for Child Safety and Tracking. Where the system is developed using Link It ONE board programmed in embedded C and interfaced with temperature, heartbeat, touch sensors and also GPS, GSM & digital camera modules. The novelty of the work is that the system automatically alerts the parent/caretaker by sending SMS, when immediate attention is required for the child during emergency.

3. PROPOSED SYSTEM

An IOT based prototype is proposed in this research for child security purposes. This prototype is developed using temperature sensor, heartbeat sensor, pulse sensor, GPS and GSM. The prototype we used is lightweight and the controller we used is a low power consumption. This prototype is the combination of three security purposes. The first one is to find the missing child from the school, the second one is rescue the child from child abuse and the third one is monitor the child who trap into borewells.

By using GPS(Global Positioning System) will help the parents to find the location of the children. With the help of GPS it will automatically make calls to registered contact and to the nearest police station. The heart beat and temperature sensor are deployed to fetch the data and the values are send to microcontroller it will monitor remotely.

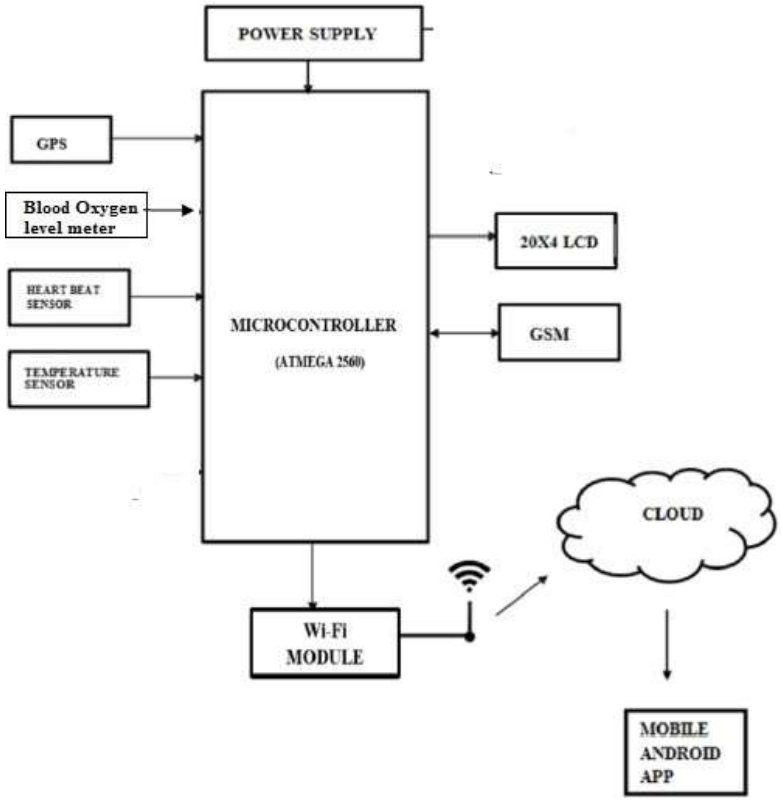

Fig 1 BLOCK DIAGRAM

HARDWARE REQUIREMENTS

Micro Controller –ATMEGA 2560

- GPS
- GSM
- Sensors
- 20x4 LCD
- Power Supply

SOFTWARE REQUIREMENTS

- Embedded C
- Keil IDE

1. Wearable IOT Device:

Keil Software provides two kits that let The wearable IOT device tasked with acquiring various data from the all the different modules connected. It comprises of Arduino Uno based on the ATmega328P microcontroller. It receives the data from its various physically connected modules, anatomizes this data and refines the data in a more user understandable format to the different available user interfaces. The user, therefore, can conveniently view the information on their cellphone. The physical characteristics of the wearable device are proposed to be as a wrist watch which remains placed around the wrist of the child during times when the child is not being accompanied by an adult/parent. For the moment the design is not made compact, since the main focus now has been to show that this concept of smart wearables would be highly impactful for the safety of children.

2. GPS Location Sensor

For determining the real time location of the child Parallax PMB-648 GPS module has been used which communicates with the Arduino Uno through a 4800 bps TTL-level interface. The connections between the Arduino Uno and the GPS module established with three wired connections which enable the Arduino to read the GPS data. The GPS module receives location information from the various satellites present in the NAVSTAR (American Satellites Timing and Ranging Global Positioning System) GPS system. It has a low power consumption and size of the only 32x32mm, which is very compact. 20 parallel satellite- tracking channels for fast acquisition and reacquisition. on the Arduino Uno via jumper cables. Similarly, the GND (black wire) pin on the GPS module is connected to the module is in the following format: GND pin on the Arduino Uno via jumper cables. The TXD (yellow wire) is connected to pin 6 of the Arduino Uno via jumper cables on the breadboard. The pin six on the Arduino Uno is a digital pin which can also be used for PWM (Pulse Width Modulation) applications. 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. The location output received from the GPS module is in the following format: The latitude and longitude coordinates received are stored invariables called "flat" and "flonase," which are then called upon when the SMS text received on the GSM module matches with the keyword "LOCATION." If an SMS text is received which contains none of the pre programmed keywords, then the Arduino GSM shield automatically deletes the text message and does not reply back the user the with any location details. Once the SMS trigger text "LOCATION" is sent from the smartphone 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.

3. Temperature Sensor

In order to measure the temperature of the surroundings of the child, a seed studio grove temperature sensor was used. The sensor module is equipped with a thermistor for measuring the ambient temperature and the fluctuations with high accuracy. The observable temperature detectability for this sensor ranges from -40Â°C to -125Â°C and the precise accuracy for this device range from + 1.5Â°C to -1.5Â°C. The temperature is connected to the Arduino Uno and GSM shield using a Grove base shield which contains eight digital ports ranging from D 1 to D8, four analog ports ranging from AO to A3 and 4 I2C ports. Therefore, the temperature sensor is connected to the A2 analog port of the base shield. The temperature value is stored in a string get Temp(a), where "a" is the integer type. Hence the get Temp(a) is called by the GSM module upon receiving the proper SMS keyword "TEMPERATURE" by the user's smartphone.

4. Heart beat sensor

The basic heartbeat sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. When a tissue is illuminated with the light source, i.e. light emitted by the led, it either reflects (a finger tissue) or transmits the light (earlobe). Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate. To achieve the task of getting the AC signal, the output from the detector is first filtered using a 2 stage HP-LP circuit and is then converted to digital pulses using a comparator circuit or using simple ADC. The digital pulses are given to a microcontroller for calculating the heat beat rate.

Finger Pulse Oximetry: The pulse oximetry is to check how well your heart is pumping oxygen through your body. It may be used to monitor the health of individuals with any type of condition that can affect blood oxygen levels. During a pulse oximetry reading, the device is clipped on a finger. Small beams of light pass through the blood in the finger, measuring the amount of oxygen. It does this by measuring changes of light absorption in oxygenated or deoxygenated blood.

5. Gateway: Arduino GSM Shield

It transfers the information over to the user via SMS by using General Packet Radio Service (GPRS) which can provide data rates around 56-114 Kbit/sec. Arduino provides various libraries such as Ethernet, Wi-Fi for the different Arduino shields. Similarly, Arduino provides GSM libraries for their official GSM shield as well which allows the GSM shield to make/receive a call, send/receive SMS and act as a client/server. The Arduino GSM shield receives 5V power supply directly from the 5V pin connection at the Arduino Uno 5V. The serial communication between the Arduino Uno and Arduino GSM shield is performed between the software serial digital pins 2,3 and also reset pins 7. The GSM shield has been programmed to receive SMS text messages from the parent's cellphone. The GSM shield will constantly be scanning the received text messages for the specific keywords such as "LOCATION" "TEMPERATURE" shield is an Arduino produced device, it has the necessary GSM libraries installed into the Arduino IDE which makes the interfacing with Arduino Uno much more reliable.

5. RESULT:

In this section, the experimental tests were performed to determine the various components of the proposed wearable device.

(i). GPS Location Sensor

Upon testing the wearable device multiple times with repeated SMS texts. The GPS location sensor was able to respond back with precise latitude and longitude coordinates of the wearable device to the user's cellphone, which then the user would click on the received Google maps URL which would, in tum, open the Google maps app and display the pinpoint location. The GPS turned out to be so precise with the location that it performed even better than the GPS on an expensive smartphone. As shown in the image below, the GPS module (red bubble) was able to show the current location of the wearable with pinpoint accuracy and also show exactly at which side of the building it is present

(ii). Temperature

Similar to the GPS location sensor, and the Temperature were tested multiple times under different temperatures and higher intensities of sunlight. Both the sensors performed exceptionally well to the test performed. The response time to receive a response back to the keywords "TEMPERATURE" was under a minute.

6. CONCLUSION

This research demonstrates Smart IOT device for child safety and tracking, to help the parents to locate and monitor their children. If any abnormal readings are detected by the sensor, then an SMS and phone call is triggered to the parents mobile. Also, updated to the parental app through the cloud. The system is equipped with GSM and GPS modules for sending and receiving call, SMS between safety gadget and parental phone. The system also consists of Wi-Fi module used to implement IOT and send all the monitored parameters to the cloud for android app monitoring on parental phone. Panic alert system is used during panic situations alerts are sent to the parental phone, seeking for help also the alert parameters are updated to the cloud. This system can be further enhanced by installation of mini camera inside smart gadget for better security so that live footage can be seen on parental phone during panic situations. The system can be modified by installation of small solar panels for charging the battery of smart gadget to gain maximum battery backup.

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