

CHILD SAFETY WEARABLE DEVICE USING WIRELESS TECHNOLOGY

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Abstract:- Technologies are evolving continuously that connects the real world with the virtual world.

Wireless technology is one among them that provides the ability to connect different devices over wider area without using any cables or wires. The storing and computation of large data can be performed easily on a cloud platform. The system is integrated with the wireless technology and the cloud technology which includes advantages of both the technologies within the child safety device. The system designed is a prototype that monitors the health condition of the children with the help of heartbeat and temperature sensor. It detects if there is too much change in the position of the child and also senses if any obstacle found using accelerometer and ultrasonic sensor respectively.

Keywords- Child, Health, Temperature, Heartbeat, Accelerometer, Ultrasonic, Buzzer, GSM, Camera.

I. INTRODUCTION

Internet of Things (IoT) is a system that allows the set of devices and systems to be connected to different sensors using internet. It includes systems like smart automation, smart city, and smartphones. The motivation to this system is due to the increasing rate in the need for child safety. The system's key aspect is to help the lost child reunited with the parents with the help of the people around the child. The system designed is a prototype which can alert during abnormal conditions. The device is made available in the form of a glove for the children. All the components are incorporated within the glove as a wearable device. The ultrasonic sensor helps in detecting the obstacle within certain range. The accelerometer is used to detect if there is any change in the position of the child. Temperature sensor and heartbeat sensor helps in monitoring the health condition of the child. The alert messages are sent to store emergency contacts when the parameters are sensed abnormal.

II. RELATED WORK A. Existing System

Some of the existing systems use bluetooth as the technology for communication. There is a system which was built like a band that can be worn. Few other systems use different sensors based on their requirements such as barometer used to measure the altitude etc. Similar wearable devices are the Mimo, Sproutling, and iSwingband.

B. Literature Survey

1. Vehicle Tracking System for Children Safety Using RFID, GPS and GSM

This system helps in tracking the vehicles providing the details of entry and exit of the student from the bus using RFID and GSM technologies. The proposed system provides a facility to track the exact location of the bus in a cost-effective way. So, this can be implemented in small schools. These systems helps in order to reduce the number of abductions taking place. Some of the difficulties faced are: the school buses can't be tracked if it gets late to drop the children at the respective places, whole system is integrated in a small chip. It may harm the child since it is attached to the child's body, the child and the parent might not have an android phone. And the use of phones in school are strictly prohibited [6], the child will not be aware when to press the panic button [7]. This system helps to track the children while entering and leaving the bus using RFID and GSM Technology [8]. If the child gets missed in the bus the information will be sent to the school.

2. Design and Development of an IOT based wearable device for the Safety and Security of women and girl children

The wearable device is developed with the motive to protect and safeguard the girls and women. The analysis of physiological signals in conjunction with body position is one of the ways of achieving the objective. The signals that are analysed are galvanic skin resistance and body temperature which are physiological. Triple axis accelerometer is used to determine the body position by acquiring raw accelerometer data. Acquisition of raw data is then followed by activity recognition which is a process of employing a specialized machine learning algorithm. An open source Cloud Platform is used for real-time monitoring of data which is achieved by sending sensor data through wireless technology. This device is programmed to continuously monitor the subject's parameters and take action when any dangerous situation presents itself. This process of monitoring is performed by detecting the change in the monitored signals, which is followed by appropriate action performed by means of sending notifications/alerts to designated individuals. In this work

the relationship between stress and skin resistance, stress and body temperature have been studied. With reference to implementing activity recognition, there are four ways of differentiating body position as sitting, standing, sleeping and struggling. While the device uses both skin resistance and body temperature is used to analyse and react to the existence of a dangerous situation [9].

3. Smart Wearable Device Using Arduino GSM Shield

Most of the wearable devices available in the market today are embedded with Bluetooth and Wi-Fi [10] to track the location of people and their moments. But these Bluetooth and Wi-Fi are an unreliable medium for far communications; therefore, we used GPS enabled communication for a reliable medium between people. The total project will run on an Arduino [11] Uno microcontroller based on ATmega328p and the text message process i.e. to send and receive messages and connecting to the internet will work with the help of an Arduino GSM shield [12]. By sending the text as "LOCATION" we can track the location including exact coordinates where the other person presents. Many of existing projects done with this same concept but works with Bluetooth [5] or Wi-Fi technology hence the working efficiency will have confined to a fixed length of 100 meters maximum. This GPS used a smart wearable device is mostly useful for children and senior people and youngsters also.

4. SMS Based Kids Tracking and Safety System by Using RFID and GSM

The parent and the child communicate using Short Message Service (SMS). The SMS module will help the system to work without the need of an internet connection. The system sends the child's location to the parent's smart phone when they wish to check on the child. The benefit of this system is that it works automatically and the child need not do anything, and it is simply kept in his bag.

System Details:

- ☒ RF Receiver and transmitter module: It guides the RFID
- ☒ Sensing Unit: The sensing element will connect to the speedometer of the school bus for the security against the threshold limit of the bus.
- ☒ RFID: used to turn on and off the module via HT12E.
- ☒ GPS Unit: contains cohesively made GPS module for receiving the longitude and latitude of the kid's location.
- ☒ GSM\GPRS Unit: Contains module for transferring data.

III. SYSTEM DESIGN

A. Problem Statement

To design and implement a child safety wearable device using wireless technology which is a smart IoT device. It provides parents with information such as temperature, heartbeat of the child along with the alarm buzzer to alert bystanders. The device detects if there is any obstacle found and also senses if there is too much change in the position of the child.

B. Proposed System

The proposed system is to develop a device for the safety and security of the child. The wearable device is in the form of the hand glove which can be worn. The device monitors the health condition of the child with the help of temperature and heartbeat sensor. The device detects the obstacle using ultrasonic sensor. It also senses if there is too much change in position of the child using accelerometer. When both obstacle is detected and accelerometer senses change in position, the camera starts capturing the video. The video is sent as mail to stored mail account.

C. Block Diagram

The microcontroller board used here is Raspberry Pi 3B that has both digital and analog input pins. The temperature sensor and the pulse sensor are connected to the input pins. Hence, these two sensors act as the inputs for the microcontroller board. The power to the board is supplied using a battery/terminal or USB cable connected to a computer or by using an adaptor connected to a plug point. The power to the sensors and monitor is supplied by Raspberry Pi. The monitor displays the output to the users. The accelerometer senses if there is too much change in position of the child and ultrasonic is used to detect the obstacles if found. If any of these both sensors are activated then

the camera module starts capturing the video. The WIFI module connects the board to internet and hence transmits the data collected from the sensor to cloud storage. ThingSpeak is used as the cloud platform to store and manage large collection of data. ThingSpeak can be accessed with user id and password after authentication.

ThingSpeak stores all the information and the data from the sensors in the form of graphs and charts. The parents can then access the data directly from the cloud.

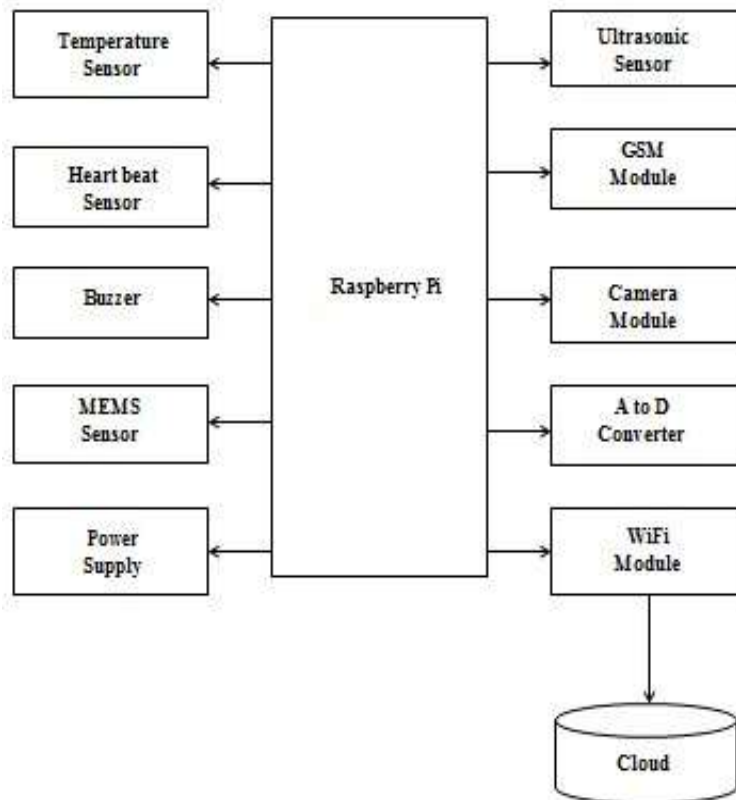


Fig.1 Block Diagram

The GSM module is connected to the Arduino Raspberry Pi which sends alert messages to the stored contact number when the sensed values is not in range of threshold values.

IV. SYSTEM IMPLEMENTATION A. Methodology

This system discusses the concept of a wearable device for children or any disabled children. The system focuses on sending an SMS text enabling communication medium between the child's device and the parent. For monitoring the child, we use temperature sensor and heartbeat sensor. For temperature measurement of the child lm35 sensor is used, and heartbeat sensor to track the heartbeat of the child. MEMS sensor or accelerometer is used to detect if there is 90 to 180 degree change in the position of the child's body. Ultrasonic sensor is used to detect the obstacles if found. If any obstacle is found or accelerometer senses the change in the position then camera will start recording the video. The video recorded will be sent as a mail to stored mail account. All the sensors use 5v power supply and connected to the Raspberry Pi 3B. This IC microcontroller controls the system with a Raspberry Pi boot-loader. In case of emergency, buzzer will be activated in the device. The child's parameters that are recorded by the sensors incorporated within the device is uploaded to the cloud. This sensitive information can be accessed from the cloud by certain users who are authorized via username and password. It also enables the data analysis of the child using cloud based on requirement.

B. Flowchart for sensor analysis

The sensors are connected to the Raspberry Pi board which controls the functioning of the system. The wireless network is given to the device, it will start working when it gets connected. If connection established, then data is read from the sensors. The read data is stored in the ThinkSpeak via wireless network. The sensed data is also displayed on the output screen that is monitor. Only authenticated users who have created a channel can login to view the data in the

ThinkSpeak. If the data sensed exceeds the threshold values then an alert message is sent to stored contact number. Otherwise it just checks for next iteration.

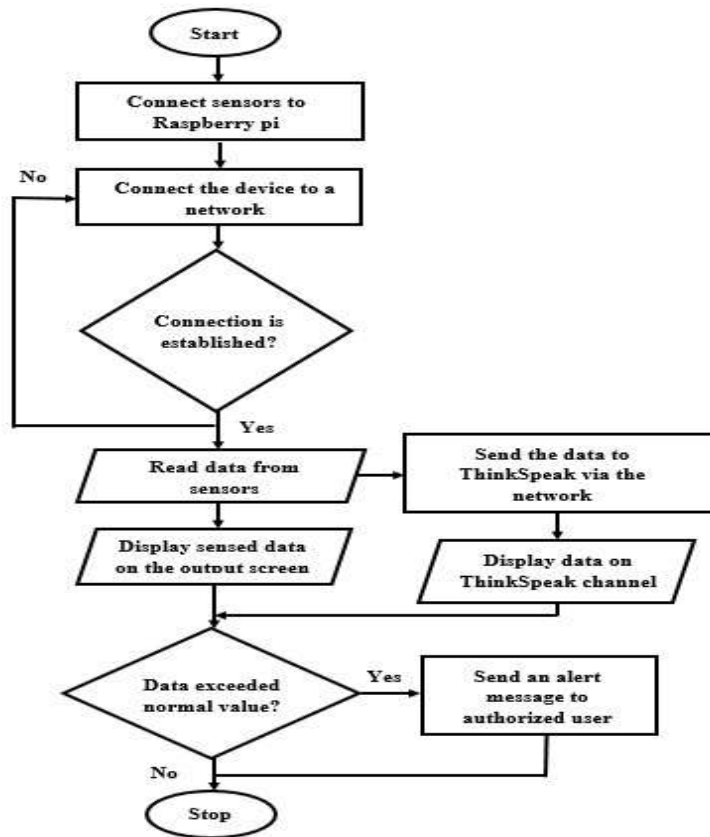


Fig.2 Flowchart for sensor data analysis

V. EXPERIMENTAL RESULT

The child safety wearable device that is implemented is tested to meet the objectives of the system. The interactions between all the modules are tested after integration. The results obtained are tested and verified. Hence the system is complete along with the user interface.



Fig.3 System Setup

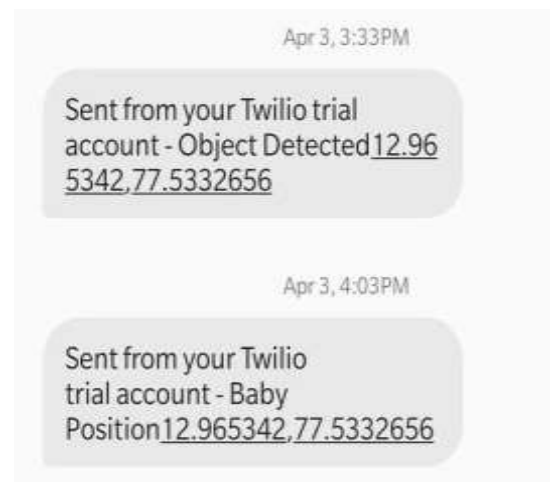


Fig.4 SMS alert

VI. CONCLUSION

The proposed system includes hardware that consists of sensors, such as temperature, heartbeat, MEMS, ultrasonic, buzzer and camera sensors along with modules like WIFI, GPS and GSM. Raspberry Pi is the microcontroller that communicates with the sensors and modules. The temperature and pulse of the child is monitored continuously and is transferred to the cloud for storage using WIFI technology. The GSM module sends an alert SMS to the authorized users in case of an emergency. The data stored on cloud can be accessed via web application by the user. The limitations of the system are consumption of power is high, slow pulse detection, device is not compact, and slow processing speed. The future enhancement of this system would be providing a more compact device for the child, along with other features, such as voice enabled command and detection, advanced camera specification, also the system can be provided with user interface by developing a website.

VII. REFERENCES

- [1] A. NasneenFathima, P. S. Nivedha, T. Sangavi, S. Selvalakshmi, R. Chitra, "Vehicle Tracking System for Children Safety Using RFID, GPS and GSM", International Journal for Trends in Engineering & Technology, Volume 13, Issue 1, May 2016
- [2] AnandJatti, MadhviKannan, Alisha RM, Vijayalakshmi P, ShresthaSinha, "Design and Development of an IOT based wearable device for the Safety and Security of women and girl children", IEEE International Conference On Recent Trends In Electronics Information Communication Technology, May 2016
- [3] Kota Srinivasa Rao, Karri Yatheshvamsi Naidu, Mudadla Asha, Gullipalli Sailaja, "Smart Wearable Device Using Arduino GSM Shield", IJIRCCE, Volume 6, Issue 2, February 2018
- [4] Nitin Shyam, Narendra Kumar, Maya Shashi, Devesh Kumar, "SMS Based Kids Tracking and Safety System by Using RFID and GSM", IJSET, Volume 2, Issue 5, May 2015
- [5] Pravin Bhagwat, "Bluetooth: Technology for Short-Range Wireless Apps", IEEE Internet Computing, June 2001
- [6] P. Santharaj, V. Anuradha in "Design and Implementation of Children Tracking System using ARM7 on Android Mobile Terminals "International Journal of Scientific Engineering and Technology Research ISSN 2319-8885, Vol.03, Issue.21, September-2014
- [7] PoojaMankar, HitaliNasare, PrachiPatle, MeenalMahadole, PranaliBorkar, Swati Gupta in" Implementation of children tracking system using mobile terminals"International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 4 Issue 1, January 2015.
- [8] Maryam Said Al-Ismaili, Ali Al-Mahruqi, JayavrindaVrindavanamin" Bus Safety System for School Children Using RFID and SIM 900 Modem" International Journal of Latest Trends in Engineering and Technology (IJLTET) Vol. 5 Issue 1 January 2015 ISSN: 2278-621X
- [9] Azian Azamimi Abdullah, and Umida Hafsah Hassan, "Design and Development of an Emotional Stress Indicator (ESI) Kit", IEEE conference on Sustainable utilization and development in emerging and technology, University Tunku Abdul Rahman, Kuala Lumpur, Malaysia, 6-9 October 2012
- [10] R.V. Datar, "Wi-Fi and WiMAX - break through in wireless access technologies," Wireless, Mobile and Multimedia Networks, 2008. IET, International Conference on, Beijing, 2008, pp. 141- 145.
- [11] Y. A. Badamasi, "The working principle of an Arduino," Electronics, Computer and Computation (ICECCO), 2014 11th International Conference on, Abuja, 2014, pp. 1-4
- [12] Nwankwo Nonso Prince "Design and implementation of microcontroller based short message service control system," Internet Technology and Secured Transactions (ICITST), 2013 8th International Conference for, London, 2013, pp. 494-499