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Child Monitoring System using IOT Device

Sundara Siva Kumar V[1], Pavithra M[2], Mounika L[3], Varshitha B.R.V[4]
[1]*Assistant Professor,* [2, 3, 4]*Student, Electronics and* Communication *Department, Maturi Venkata Subba Rao Engineering College, Osmania University, Hyderabad, India*

Abstract: ***With increasing crime rates such as child kidnapping, child trafficking, child abuse, and so on, the need for an advanced smart security system has become a necessity. With this motivation, a self-alerting "child monitoring system using IOT" is developed to aid parents to monitor and track their children in real time as an alternative to staying beside them. This system is intended as an everyday wearable device for the child, in the form of a wristband, hand glove, armband, or belt. The system is designed to continuously monitor the location and body vitals of children. This electronic system comprises a Nodemcu esp8266 controller and sensors to detect changes in parameters such as temperature, humidity, and pulse rate. The system also uses a GSM and GPS module. The location of the victim is traced using the GPS module and is sent to the registered contact numbers as a text message using a GSM module.***

Keywords: Child safety, GPS, GSM, DTH Sensors, Pulse sensor, cloud and Child Safety System using IOT

I. INTRODUCTION

Children are innocent and naive, so there high probability of children becoming victims to harm, injury, violence, and abuse due to their young age. Unfortunately, a child goes missing once every 10 minutes in India. Vital signs are often considered to be the baseline indicators of a child's health and mental status. Vital signs are never stagnant, as they are influenced by a variety of internal and external factors, which include disease, anxiety, pain, exercise, and even circadian and diurnal rhythms. An unusually high heartbeat, abnormal skin temperature, and emotional disturbance help to detect the abnormal movement of the child while he/she is victimized. WHDs (Wearable Health Devices) is an emerging technology that enables continuous ambulatory monitoring of human vital signs when children are away from home and their parents.

Incorporating location tracking with WHDs can prove to be an additional feature in the overall monitoring of the children's whereabouts to ensure their safety. Location and vitals monitoring gives parents the confidence to allow their children to explore the world outside, without the stress and fear of their child security. Real-time monitoring of vitals has been made possible with various applications in the domain of IoT. It has made this possible with the introduction of wearable sensors and various communication standards such as Wi-Fi, Bluetooth, GSM, etc.

Though Wi-Fi and Bluetooth are used widely, they appear to be an unreliable medium of communication as they are not available everywhere. Therefore, an SMS text-enabled communication medium is ideal as the environment for GSM is almost present everywhere. This paper discusses a smart wearable device that continuously monitors and tracks children and autonomously alerts the concerned using GSM technology.

A major advantage of this proposed system over other wearable devices is that it does not entirely depend on manual alerting by the victim, but can detect a distress situation automatically. This system also considers the child's emotional status which further aids in detecting alarming situations. These features stand out as the novelty of the proposed system. Further, it can be used in any cell phone and does not necessarily require a tech-proficient individual to operate.

II. METHODOLOGY

1) *Hardware Configuration:* The system combines GPS, GSM and Sensors with a ESP8266 microcontroller.
2) *Data Extraction:* Data is Collected from the DTH Sensors, Pulse sensors and location from GPS.
3) *Data Analysis:* The data is then analysed in ESP8266 microcontroller Whether to send alert SMS to Mobile number by executing an embedded C.
4) *Alert Notification:* In case of any abnormal vitals the alert notification is sent.
5) *Advantages:*

a) Good accuracy
b) Light weight
c) IOT application

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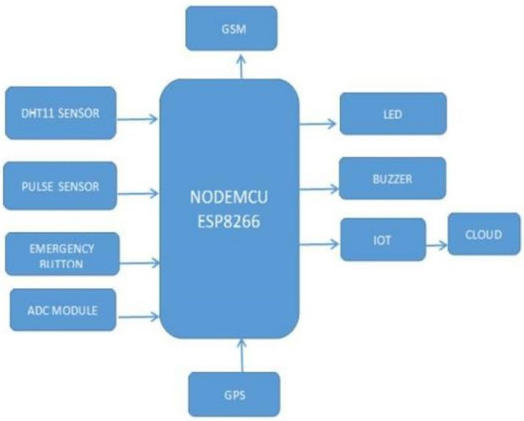
III. ARCHITECTURE



1) An automatic alerting child safety system is presented here. A Nodemcu esp8266 is used as a microcontroller that receives the values of the pulse or BVP (Blood Volume Pulse), humidity, and temperature from different wearable sensors. Along with the parameter values, the location in terms of latitude and longitude is sent to the Nodemcu esp8266 using a GPS(global positioning system) module. An Embedded C program is dumped into the Nodemcu esp 8266. The decision of whether an alert is to be sent or not is done by including the known vital values in the Embedded C program.
2) The SIM card-mounted GSM modem upon receiving a digit command by SMS from any cell phone sends that data to the MC through serial communication. While the program is executed, the GSM modem receives the command 'STOP' to develop an output at the MC, the contact point of which is used to disable the ignition switch. The command so sent by the user is based on an intimation received by him through the GSM modem 'ALERT' a programmed message only if the input is driven low. The complete operation is displayed over a 16×2 LCD display. A buzzer is used to alert the people in the proximity. The whole system is powered using a portable power bank which is compact.

IV. COMPONENTS NODEMCU ESP8266

NodeMCU (Node MicroController Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. ESP8266 comes up with 2 switches one is reset and other one is flash button. flash button is used to download and is used while upgrading the firmware and Reset button is used to reset NodeMCU. It has 17 GPIO pins which can be assigned to various functions.
operating voltage:2.5 to 3.3
operating current:600Ma

Fig 1: NODEMCU ESP8266

A. *Pulse Sensor*

Pulse sensor is a hear beat detecting and biometric pulse rate sensor. It is also known as Heartbeat sensor or Heart rate sensor. The working of this sensor can be done by connecting it from the fingertip or human ear to Nodemcu esp 8266 board. So that heart rate can be easily calculated. The pulse sensor includes a 24 inches color code cable, ear clip, Velcro Dots-2, transparent stickers-3,etc.

Fig 2: PULSE SENSOR

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B. GSM

GSM is a mobile communication modem; it stands for global system for mobile communication (GSM).is a standard to describe the protocols for digital cellular networks used by mobile devices such as mobile phones. It requires a SIM card to be inserted to transmit and receive information. This project uses the A6 GSM module shown to send an alert along with the location obtained from the GPS module in the form of text messages to registered mobile numbers. GSM is reliable and almost present around the world, unlike wifi and Bluetooth.

Fig 3: GSM

C. DHT 11 Sensor

DHT11(digital humidity and temperature) is a low-cost sensor. It is used to check the temperature and humidity of a body. This sensor can be easily interfaced with any micro-controllersuch as Arduino, Raspberry pi,Nodemcu esp8266.It has four pins-VCC, GND,Data pin and not connected pin.

The temperature range of DTH11 is from 0 to 50 degree Celsius with a 2-degree accuracy.Humidity range of this sensor is from 20 to 80% with 5% accuracy.

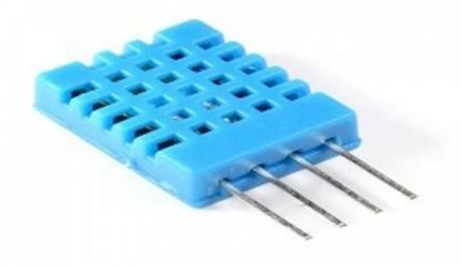

Fig 4: DHT 11 SENSOR

D. GPS Mosule

GPS(Global Positioning System) is a satellite-based navigation system. It used to calc**ul**ate the exact location of the child with lattitude and longitude.

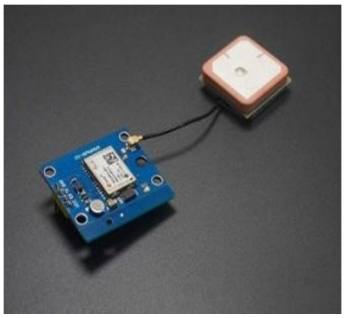

Fig 5: GPS MODULE

E. Cloud

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. Cloud computing poses privacy concerns because the service provider can access the data that is in the cloud at any time.

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Fig 6: CLOUD

F. THINGSPEAK

ThingSpeak is an Open-Source IoT application and API to store and retrieve data from Hardware devices and Sensors. ThingSpeak is an IoT platform, that allows you to connect and save sensor data in the cloud and develop IoT applications. We can create channels for every sensor data. These channels can be set as private channels or you can share the data publically through Public channels. In this project, we create 3 fields for temperature, humidity, and pulse.

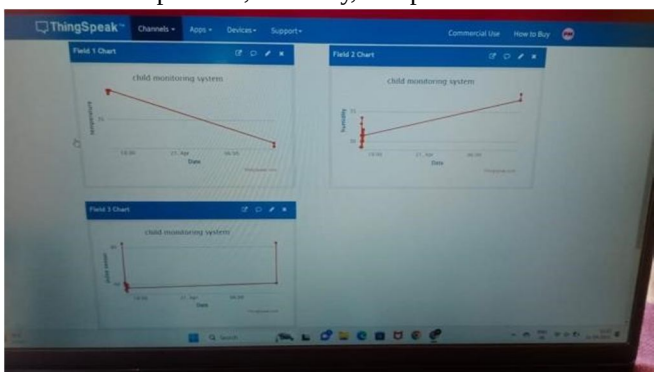

Fig 7: THINGSPEAK

V. CONCLUSION

This paper has focused mainly on the autonomous operation of the child safety system. Combined usage of three different vitals has increased the accuracy of detecting the abnormal situation. Usage of IOT using wireless sensors has improved the accuracy and made the system intelligent for a general case compared to a threshold detector when tested on different sets of subjects.

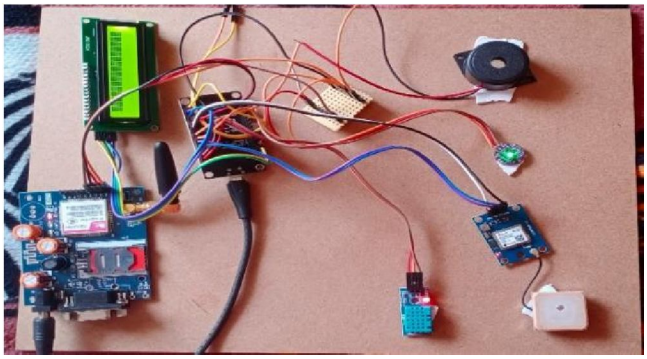

Fig 8: HARDWARE KIT

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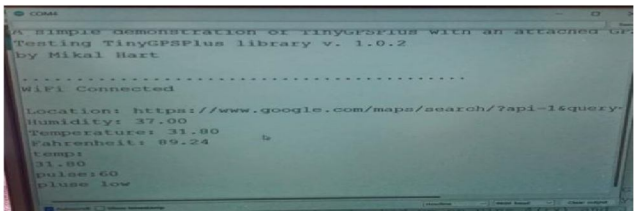

Fig 9:RESULT

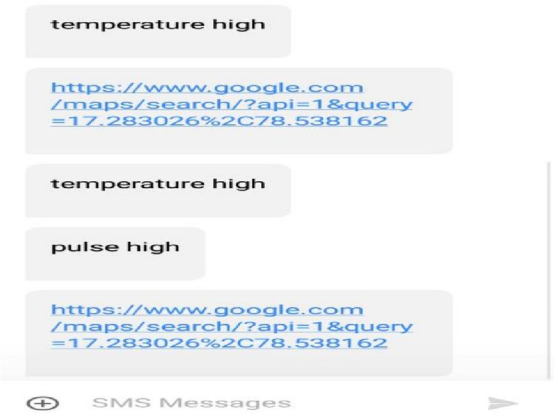

Fig 10: ALERT NOTIFICATION TO MOBILE NUMBER

VI. FUTURE SCOPE

The system can be miniaturized to make it more concealing. The efficiency of the system can be increased when it uses a dataset which has been developed by monitoring pulse, humidity and temperature of children. By tuning the parameters of the machine learning model, this work can also be extended as a potential device for ensuring child safety

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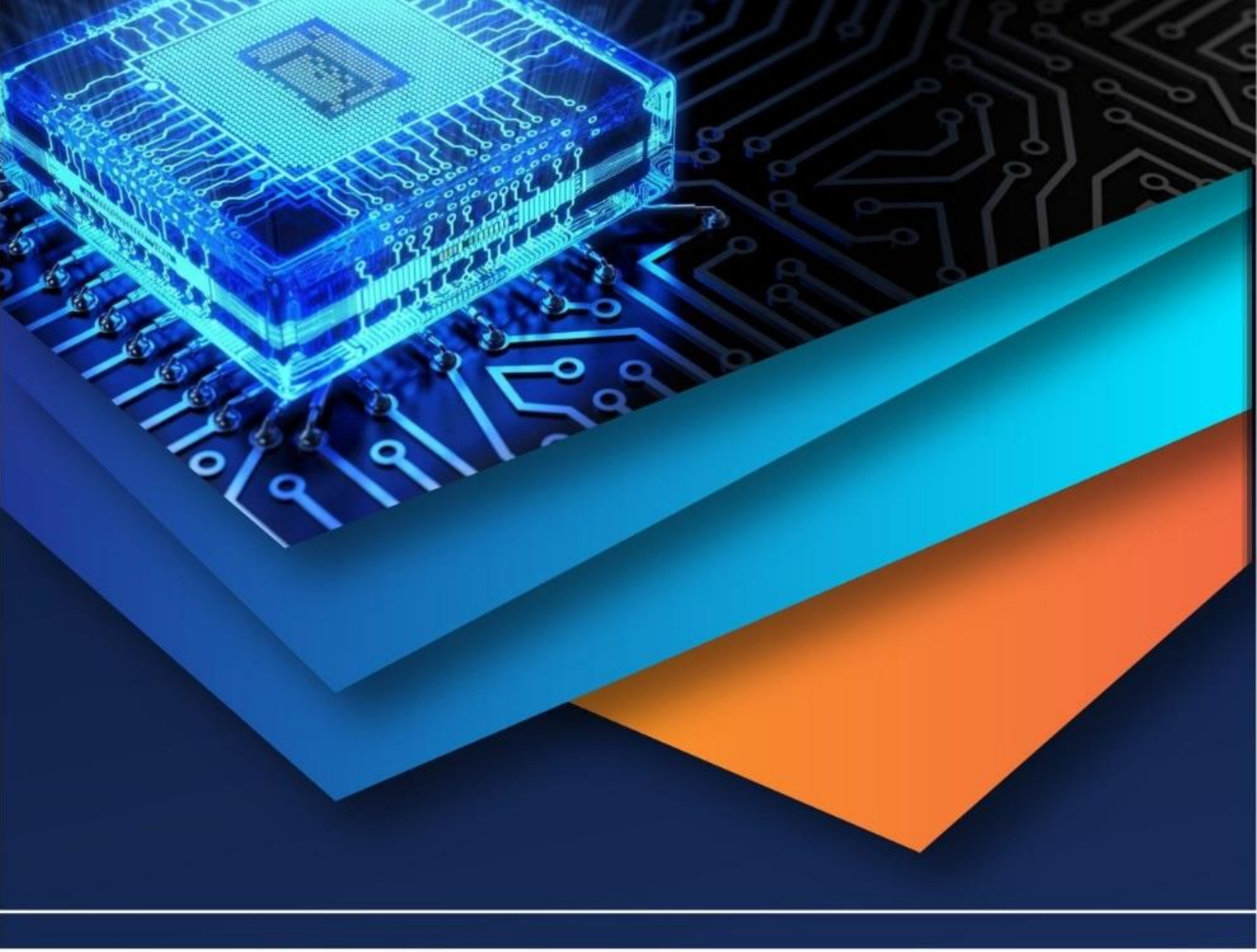
About the Author:

Mr. V Sundara Siva Kumar, is working as an Assistant Professor in ECE department, MVSR Engineering College, Hyderabad, since November 2022 He completed his M.Tech in VLSI & ES. He has an overall teaching experience of 12 years. He is interested in Instrumentation Engineering and VLSI.
ORCID ID: 0000-0003-3533-0125.
Researcher ID: AAC-1211-2019.



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