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Child Safety Device With GPS Tracking And Alert Messaging

Smita.k[1], Misbah Zainab[2], Sanjana[3], Apoorva[4], Swati[5]

[1]*Assistant Professor, Department Of Computer Science, Faculty of Engineering and Technology, Sharanbasva university, Kalaburagi, India.*

[2,3,4,5]*Students, Department Of Computer Science, Faculty of Engineering and Technology, Sharanbasva university, Kalaburagi, India.*

ABSTRACT

The project's goal is to create a wearable child safety tool that may be applied to put an end to bullying and violence. The gadget has numerous sensors and technologies, such as a GPS (Global Positioning System), GSM (Global System for Mobile) Module, and Alarm, in addition to real- time tracking, emergency alert messages, live streaming, and the capacity to stun assailants. The gadget tracks children's health using a mobile app. The device is perfect for daily use due to its small size, easy to conceal, and ease of use. The proposed method offers a reliable and practical means of enhancing child safety and reducing the probability of kidnapping and child trafficking situations involving children. It just requires one button to be pressed to turn it on in an emergency.

Keywords: IOT, Children Safety, ESP32 Cam, GPS, GSM, Sensors, Mobile Communications, Smart Phone.

I. INTRODUCTION

All of the devices and systems that are constantly linked to the internet and physical sensors are together referred to as the "internet of things" (IoT). Providing a technology-based solution that can support children in emergency situations and enable smart device monitoring is essential because children's safety is more vulnerable than ever. An Android app monitoring feature on the parent phone is enabled by the Wi-Fi module in the proposed system, which is utilised to implement IoT and communicate all the monitoring metrics to the cloud. To facilitate calls and SMS between the parental phone and safety device, the suggested system is additionally outfitted with GSM and GPS modules. If the parent's phone has the safety device's GPS coordinates, an Android app could be able to used to track its current location. while the majority of wearables today use Wi-Fi and Bluetooth to let parents know where the children are and what they are doing, these technologies have limitations when it comes to the amount of information that can be transferred. Because of this, SMS is thought to be a more dependable method of communication for parent-child wearables.

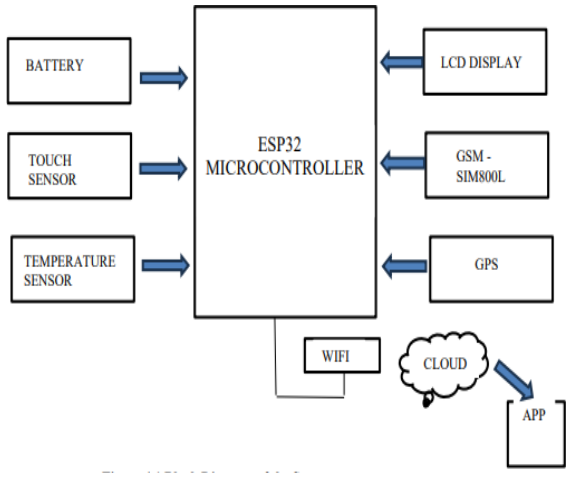
II. LITERATURE SURVEY

Authors: M Nandini Priyanka, S Murugan,
K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari. Title: Smart IoT Device for Child Safety and Tracking. Published in: 2019 IEEE. The system is developed using Link-It ONE board programmed in embedded C and interfaced with temperature, heartbeat, touch sensors and 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.
Merits: The parameters such as touch, temperature & heartbeat of the child are used for parametric analysis and results are plotted for the same.
Demerits: To implement the IoT device which ensures the complete solution for child safety problems.
Authors: Akash Moodbidri, Hamid Shahnasser Title: Child safety wearable device. Published in: 2020 IEEE. The purpose of this device is to help the parents to locate their children with ease. At the moment there are many wearable's in the market which helps to track the daily activity of children and also helps to find the child using Wi-Fi and Bluetooth services present on the device.
Merits: This wearable over other wearable is that it can be used in any phone and it is not necessary that an expensive smartphone is
required and doesn't want to be a very tech savvy individual to operate.
Demerits: As, this device's battery gives short life- time. High power efficient model will have to be used which can be capable of giving the battery life for a longer time.
Authors: Aditi Gupta, Vibhor Harit. Published in: 2021 IEEE. Title: Child Safety & Tracking Management System by using GPS. This paper proposed a model for child safety through smart phones that provides the option to track the location of their children as well as in case of emergency children is able to send a quick message and its

current location via Short Message services.
Merits: The advantages of smart phones which offers rich features like Google maps, GPS, SMS etc.
Demerits: This system is unable to sense human behavior of child.
Authors: Dheeraj Sunehera, Pottabhatini Laxmi Priya. Title: Children Location Monitoring on Google Maps Using GPS and GSM. Published in: 2018 IEEE. This paper provides an Android based solution for parents to track their children in real time. Different devices are connected with a single device through channels of internet. The concerned device is connected to server via internet. The device can be used by parents to track their children in real time or for women safety. The proposed solution takes the location services provided by GSM module. It allows the parents to get their child's current location via SMS.
Merits: A child tracking system using android terminal and hoc networks.
Demerits: This device cannot be used in rural areas

III. PROPOSED SYSTEM

The proposed methodology for the "Child safety device" project involves using a ESP32 Microcontroller, GPS module, GSM module, ESP32 cam module, a button, touch sensor and a power supply to create a wearable safety device. The device is designed to be compact and easy to use, allowing the user to quickly and discreetly alert emergency contacts in case of an emergency. The first step in the proposed methodology is to acquire the necessary components for the device. This includes a ESP32 microcontroller, GPS module, GSM module, button, touch sensor, Relay module, temperature sensor, nodeMCU and power supply. The components can be purchased online or from a local electronics store, and they are readily available and affordable. Next, the GPS module is connected to the ESP32 microcontroller using the appropriate pins. The GPS module provides the user's location coordinates, which are sent to the Esp32 microcontroller board. The board uses the data from the GPS module to calculate the user's current location, which is then stored in the board's memory. The GSM module is then connected to the ESP32 Microcontroller board using the appropriate pins. The module is used to establish a connection with the saved contacts and send location updates in case of an emergency. The module can be configured to send updates through SMS or a phone call, depending on the user's preference. The button is connected to the ESP32 Microcontroller Board using the appropriate pins.



The button is used to activate the device when the user needs assistance. When the button is pressed or touched by the sensor, the ESP32 microcontroller board triggers the GSM module to send the user's location coordinates to the saved contacts. The button is designed to be discreet, allowing the user to activate the device without drawing attention to themselves. 13 The power supply for the device can be provided using a battery or a USB cable. The battery should be compact and lightweight to ensure that the device is easy to wear and carry around. The USB cable can be used to charge the battery or power the device if a battery is not available. To ensure that the device is easy to hold. The device can also be attached to a keychain for easy access. The device's design should be discreet, allowing the user to wear it without drawing attention to themselves. The software for the device can be developed using Arduino IDE software. The software should be designed to control the device's functions, including GPS location tracking, GSM communication, button activation and live steaming video send to the parent's mobile. The software should be easy to use and accessible to users with limited programming experience. Once the device is assembled and programmed, it should be thoroughly tested to ensure that it is

working correctly. The device can be tested in a variety of scenarios, including indoor and outdoor environments. The device's range should be tested to ensure that it can establish a connection with the saved contacts in case of an emergency. Overall, the proposed methodology for the "Child safety device" project aims to provide child with a reliable and effective safety device that can be worn discreetly and easily accessed when needed. The device uses the power of GPS and GSM technologies to quickly alert emergency contacts in case of an emergency, reducing the risk of violence, kidnapping and harassment in public spaces. The methodology is designed to be accessible and easy to replicate, allowing for widespread adoption of the safety device.

Hardware Requirements:
ESP32 Microcontroller
GSM SIM 800C.
GPS Neo 6m.
16X4 LCD.
7805 Voltage Regulator.
DS18B20 Temperature Sensor.
Push Button
Buzzer
LED
Jumper Cables

Software Requirements:
Arduino IDE
Android Studio
Languages Used:
Embedded C

IV. METHODOLOGY

Live Location Tracking: The safety device has a GPS module that retrieves the current location and sends it to the microcontroller for processing. The safety device also has a GSM module installed so that it can respond to location requests
sent via SMS from the parent's phone. When a parent wants to keep track of the location of a safety device, they can use the parental app, which retrieves all the information from the updated cloud and also displays the current/live location of the safety device. The system is connected to the cloud via Wi-Fi technology, so the GPS location is updated to the cloud at regular intervals or on request.
Panic Alert System: The device has a panic alert system feature that mainly consists of a button that is only activated during specific abnormal/panic situations; this button is programmed so that, once it is activated, then multiple alerts in various forms occur within few seconds of time, SMS and also phone call is triggered to the parental phone from the safety device GSM module to the parental phone, which contains current local WiFi on the safety device triggers an alert notification on the parental app, which then receives the information from the cloud. It is mainly focused on schools.
GPS Module: Using the correct pins, the GPS module is connected to the ESP32 microcontroller. The ESP32 microcontroller board receives the user's location coordinates from the GPS module. The board calculates the user's current location and stores it in the board's memory using information from the GPS module.
Stay Connected Feature: The Stay Connected feature allows the safety device (a GSM module) and parental phone to stay in touch regardless of the circumstances. The safety device can call the parental phone at any time and vice versa. The screen of the device will display a safety device.
Health Monitoring System: The device measures temperature and is used to keep track of the child's overall health. The safety device immediately sends a notification via Wi-Fi to the parental app if it discovers any anomalies in the health monitoring parameters. Moreover, parental app displays

4.1 SOFTWARE REQUIREMENTS

The Arduino Software (IDE) is an open-source tool that makes writing code and uploading it to the board easy. It works with Linux, Mac, Windows, and iOS. Processing and other open- source technologies are used to construct Java applications. Arduino-Uno interfaces are now much more reliable thanks to this software. Because it was meant to be user-friendly for everyone with a smartphone, the GS shield was selected as the main means of connection instead of Wi-Fi and Bluetooth. in an effort to maximize system usability.
Applications for the Android operating system are made using the Java programming language (which is also compatible with C) and the SDK Android software development kit.

4.2 ADVANTAGES

Real-time Location Tracking: Parents can monitor the child's exact location in real-time, reducing the risk of abduction or a child getting lost.

Emergency Alerts: Children can send SOS or panic alerts to parents or guardians instantly in dangerous situations.

Geo-fencing Capabilities: The device can alert parents if a child leaves a designated safe zone (like school or home area).

Two-way Communication: Many devices allow voice or text communication, enabling quick contact in case of emergencies.

Peace of Mind: Knowing where a child is at all times provides significant emotional reassurance to parents.

Activity Monitoring: Some devices track movement patterns or steps, giving insight into the child's daily routine and safety.

Data Logging: Past location data can be reviewed to understand routines or investigate incidents.

4.3 DISADVANTAGES

Privacy Concerns: Continuous tracking may raise concerns about a child's right to privacy as they grow older.

Device Dependency: Parents may become overly reliant on the device, reducing direct supervision or communication.

Battery Limitations: GPS devices require regular charging, and a dead battery can render the device useless during emergencies.

Signal Issues: GPS and communication features may not work well in certain areas, such as indoors, underground, or remote locations.

Cost: High-quality devices and subscription services for GPS and messaging can be expensive.

False Alarms: Devices may send incorrect alerts due to glitches or accidental button presses, causing unnecessary panic.

Vulnerability to Hacking: If not properly secured, the device's data could be accessed by unauthorized users, posing security risks.

4.4 APPLICATIONS

School Commutes: Ensures children reach school and return home safely; parents can track the route in real time.

Outdoor Activities: Useful during trips to parks, malls, or public events where kids can easily get separated from guardians.

Travel and Vacations: Keeps children safe in unfamiliar places, allowing parents to monitor their location abroad or in large crowds.

Emergency Situations: Allows children to instantly alert parents or authorities during potential threats or medical emergencies.

Special Needs Monitoring: Helps in tracking and ensuring the safety of children with autism or other conditions requiring close supervision.

School Field Trips: Facilitates group safety and monitoring during excursions or camps.

Custody Arrangements: Offers reassurance and transparency for parents sharing custody by confirming a child's location.

V. RESULTS

The Output of the proposed System is as follows: Figure 5.1 Shows the Child Safety Device with GPS & Alert Messaging is designed by using the following components such as ESP32 Microcontroller GPS Module, GSM SIM800L Module, LCD Display switch which are connected as shown below.

5.1 Prototype

In the system, an ESP32 microcontroller is used. The ESP32 module, which receives longitude and latitude data continually, is coupled to the GPS module. When the button is hit, the authorized device's mobile number will receive the current position information, or latitude and longitude data.

GSM Module (SIM800L) is used in the prototype which contains a physical sim which supports 3G Network. When the push button is pressed, the GSM Module takes the current Longitude and latitude values from GPS Modules and sends to the pre-saved mobile numbers. LCD Display which is used to show the present status of the prototype and when the push button is pressed, it shows the alert message along with details of latitude and longitude data.

ESP32 cam module is used to share the live stream video to parents mobile when the push button is pressed, it shows the alert message along with details of latitude and longitude data.

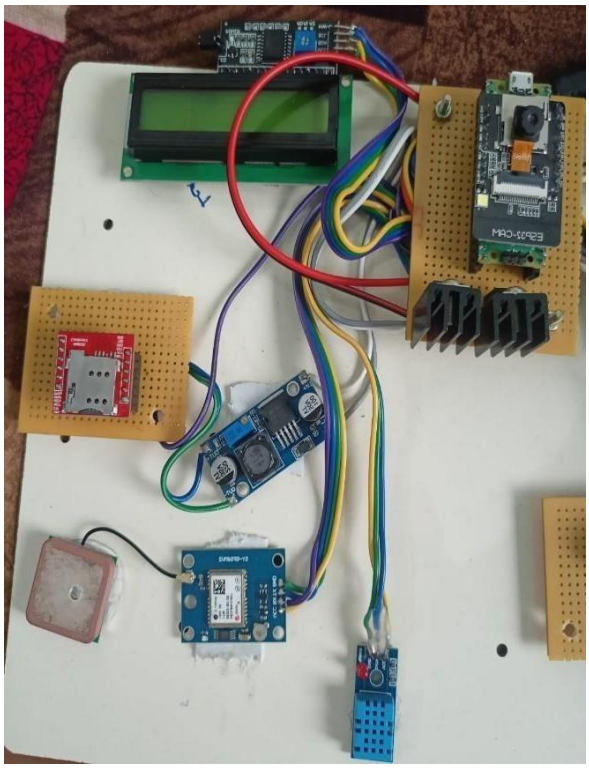


Fig: 1

Fig: 2

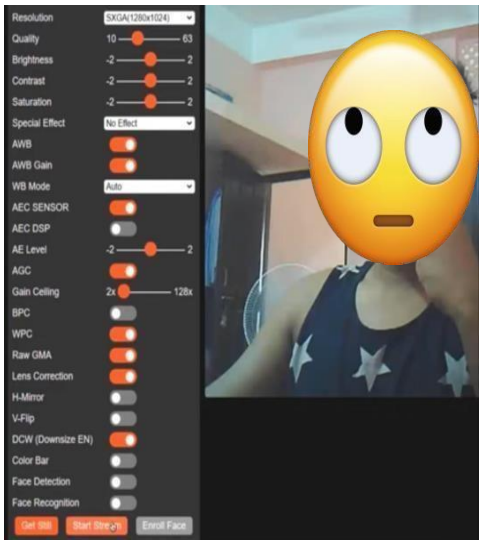


Fig-3

VII. CONCLUSION

This paper presents a new idea for the security and protection of children while also discussing the applications for kid security that are currently on the market. The advent of smart technology, in which objects and people interact to form a network, makes further research possible. This will enable their technological resolution with concepts and portable tools. It's crucial to utilize loud alarms and text the location to the emergency contacts in order to keep children safe. It sends the parents' smartphone live streaming footage. when kids push the button when their health is seriously compromised. when students are in class. This device uploads live video to the cloud and transmits it to the parents' mobile device while connected to the school's Wi-Fi.

7.1 FUTURE SCOPE

This paper presents a new idea for the security and protection of children while also discussing the applications for kid security that are currently on the market. The advent of smart technology, in which objects and people interact to form a network, makes further research possible. This will enable their technological resolution with concepts and portable tools. It's crucial to utilize loud alarms and text the location to the emergency contacts in order to keep children safe. It sends the parents' smartphone live streaming footage. when kids push the button when their health is seriously compromised. when students are in class. This device uploads live video to the cloud and transmits it to the parents' mobile device while connected to the school's Wi-Fi.

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