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# Child Abuse Detection System

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***Abstract:*** Child abuse remains a serious problem that goes unnoticed despite the dire repercussions. This study offers an Internet of Things (IoT)-based system for detecting and responding to child abuse that uses real-time monitoring to improve kid safety. In order to identify possible indications of stress and abuse, the system incorporates a number of sensors using the ESP8266 NodeMCU microcontroller. This allows for position tracking and immediate alarms. It makes it possible for guardians to monitor remotely and receive timely notifications through cloud connectivity and mobile app integration. The suggested remedy supports proactive intervention in child abuse cases in a scalable and affordable manner.

***Index Terms* - Child Abuse, IoT, Real-time Monitoring, ESP8266 NodeMCU, Emergency Response, Sensor Integration, Location Tracking, Cloud Connectivity, Remote Monitoring, Child Safety**

## I. INTRODUCTION

Child abuse and marital violence are critical social issues that necessitate immediate technical solutions for early detection and response. Conventional methods usually have trouble identifying abuse in real time, especially when the child is unable to express what happened.Smart monitoring systems that can gather data in real time and send out alarms have been made easier by recent advancements in the Internet of Things (IoT). These technologies can be used successfully to monitor children's health and safety in potentially dangerous circumstances.The ESP8266 NodeMCU microcontroller is used in this study's Internet of Things-based child abuse detection and emergency response system. To detect physical impact, pressure, and irregular heartbeat rhythms, the system integrates a number of sensors, including an accelerometer (ADXL345), a force sensor, and a pulse sensor.A GPS module is used for instant location tracking to improve responsiveness, a push button enables the child to manually send emergency alerts. A camera module enables live video streaming, with all sensor data and alerts sent to the Blynk IoT cloud platform for remote access through a mobile application.

## II.LITERATURE REVIEW

| Sr. No | Author | Title | Published Year | Methodology |
| --- | --- | --- | --- | --- |
| 1. | Francesco Lupariello , Luca Sussetto, Sara Di Trani and Giancarlo Di Vella | AI in child abuse and neglect: A systematic review | 2023 | Review of AI tools applied to child abuse cases |
| 2. | M. Khan, R. Zehra, A. Ashraf, S. Syed, A. Iqbal and S. A. Afghan, | Design and Development of Child Abuse Detecting System (CADS). | 2022 | System designed to detect child abuse using sensors and real-time data analytics |
| 3. | Thakur, Zanwar, Khan | Child abuse detection system using ML and Open CV | 2022 | Emotion detection with ML and unsafe distance alerts |
| 4. | R. Kamalraj and M. Sakthivel | A Hybrid Model on Child Security and Activities Monitoring System Using IoT | 2020 | Survey of 184 school staff in Spain, comparison of detectors vs. non-detectors |

## II.PROPOSED WORK

This project focuses on developing an IoT-based Child Safety System that monitors signs of physical abuse and distress in realtime. It uses a combination of sensors—accelerometer, force sensor, pulse sensor, and GPS—integrated with the ESP8266 NodeMCU microcontroller to continuously track the child's movements, physical pressure, and heart rate.

The system is designed to provide immediate alerts to caregivers through the Blynk IoT cloud platform, enabling remote monitoring and quick response. A manual SOS button allows the child to trigger emergency alerts, while optional video streaming offers visual confirmation of the child's environment.

Emphasizing affordability and ease of use, the device is compact and wearable, making it practical for everyday protection. The solution aims to enable early detection and intervention in child abuse cases, enhancing safety and peace of mind for guardians

### 2.1 System Overview

- Central microcontroller: ESP8266 NodeMCU for data processing and Wi-Fi communication.
- Sensors integrated: ADXL345 accelerometer, force sensor, pulse sensor, GPS module, push button, and optional camera.
- Alerts triggered by abnormal sensor readings or manual SOS activation.
- Real-time data and alerts accessible remotely through the Blynk mobile app.
- Emergency mechanisms include buzzer activation and relay-controlled heating coil

### 2.2 Workflow

- Sensors continuously monitor the child's movement, applied force, and heartbeat.
- On detecting abnormal parameters beyond set thresholds, the ESP8266 triggers alerts.
- Manual SOS button press immediately activates alert systems.
- GPS module provides live location data during alerts.
- Sensor data and alert notifications are sent to the Blynk cloud platform.
- Guardians receive instant notifications and can monitor live data and video feed.

- Buzzer and heating coil activate as immediate deterrents and alerts.

### 2.3 Hardware Components

- **ESP8266 NodeMCU:** Main microcontroller unit with Wi-Fi capabilities.
- **ADXL345 Accelerometer:** Detects sudden or abnormal child movements.
- **Force Sensor:** Measures pressure applied to detect physical abuse.
- **Pulse Sensor:** Monitors real-time heart rate for stress detection.
- **Push Button:** Manual SOS trigger for emergency alerts.
- **GPS Module:** Tracks and shares real-time geographical location.
- **Camera Module (Optional):** Enables live video streaming for visual surveillance.
- **Buzzer:** Provides audible alert on detecting emergency.
- **Relay-Controlled Heating Coil:** Optional deterrent activated during alerts.

### 2.4 Software Tools

- **Arduino IDE:** Used for embedded programming of the ESP8266.
- **Blynk Library:** Facilitates Wi-Fi communication and cloud integration.
- **Blynk IoT Mobile App:** Provides real-time monitoring, alert notifications, and GPS tracking.
- **Sensor Calibration Tools:** Used during development for threshold setting

### 2.5 System Architecture

- **Initialization:** Power-on and setup of ESP8266, sensors, GPS, buzzer, and relay.
- **Continuous Sensing:** Accelerometer, force sensor, and pulse sensor monitor child’s status.
- **Data Processing:** ESP8266 compares sensor readings with calibrated thresholds.
- **Alert Triggering:** On abnormal detection, buzzer and heating coil activate.
- **Manual Alert:** Push button enables immediate manual SOS signal.
- **Location Tracking:** GPS module sends real-time coordinates during alerts.
- **Data Transmission:** Sensor data, alerts, and GPS info sent via Wi-Fi to Blynk cloud.
- **Remote Monitoring:** Guardians access live data, alerts, and optional video stream via Blynk app

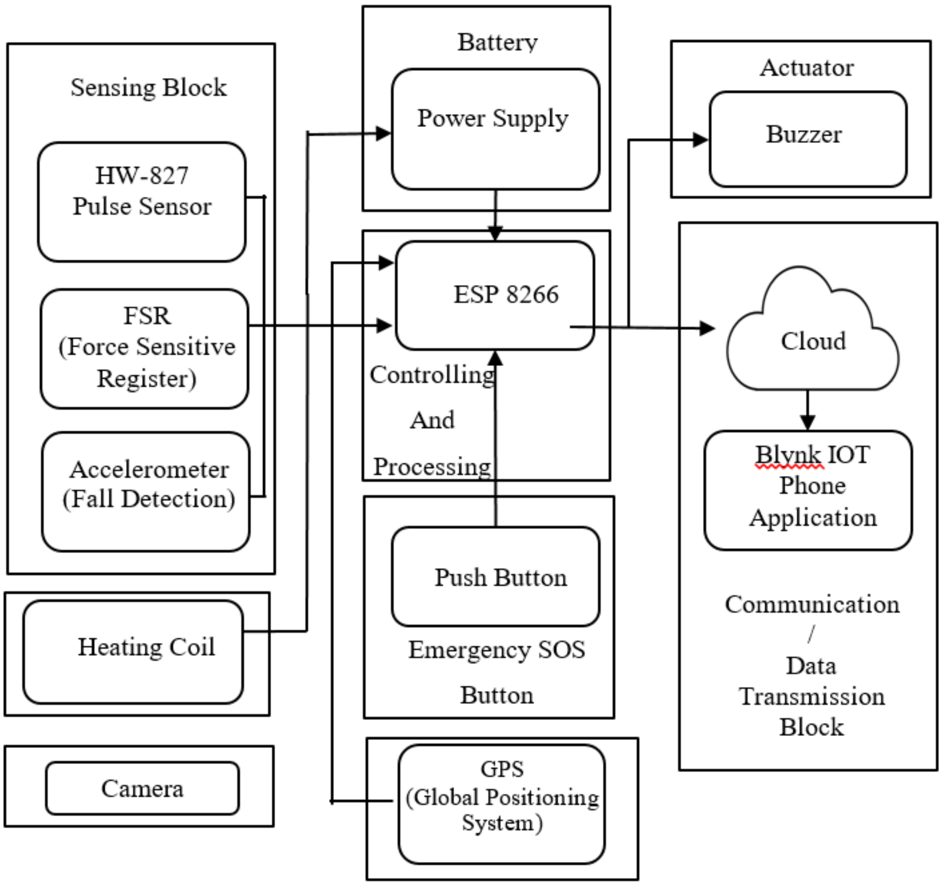


**Figure .1: System Architecture**

### III. SYSTEM IMPLEMENTATION

The system diagram shown in the figure represents a wearable health and safety monitoring prototype. At the core of the systeis  the ESP8266 microcontroller, which connects and controls all the components. A GPS module is integrated to track the real-time location of the user. The fall detection sensor identifies accidental falls, triggering alerts. A force sensor monitors pressure or weight changes, while a heating pad (labeled as "Heating cheap") is used for therapeutic purposes. The relay acts as a switch to control the heating element. An emergency push button allows the user to send a distress signal when needed. The system is powered by a battery and includes a buzzer for audible alerts during emergencies.

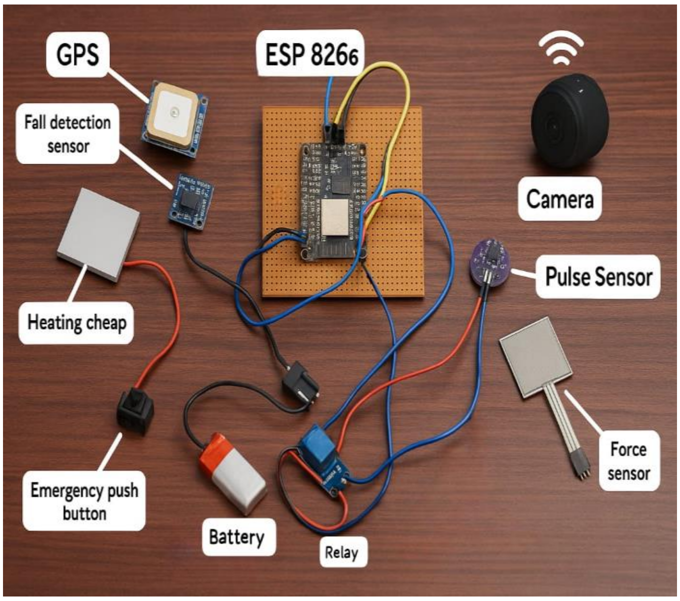


Figure 3.1: System Implementation

IV.RESULTS

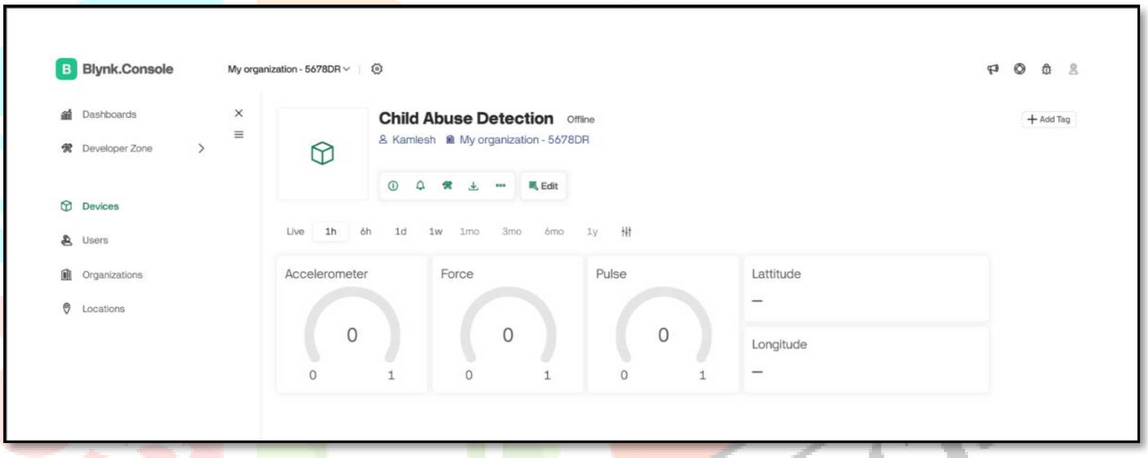


Figure 3.1: Blynk App Configuration for Sensor Monitoring

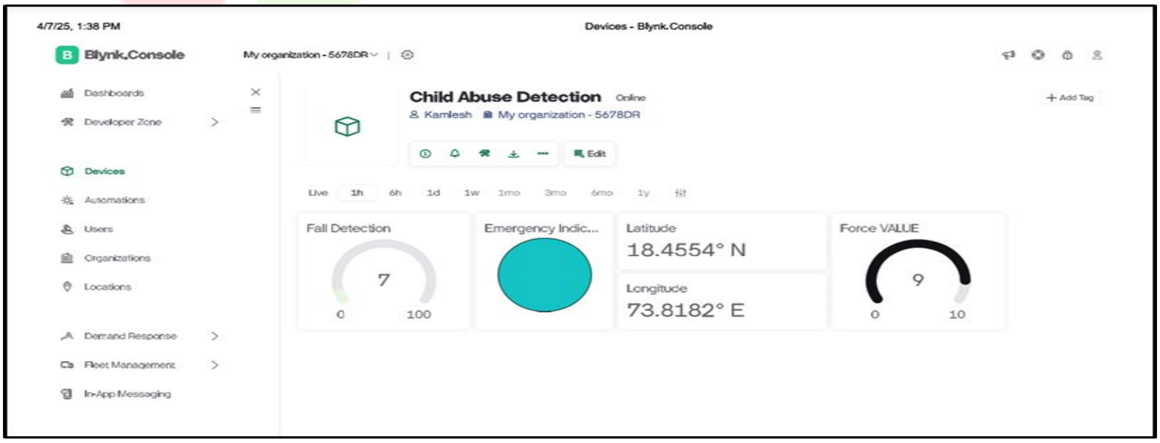


Figure 3.2: Force Sensor Readings Indicating Pressure Levels

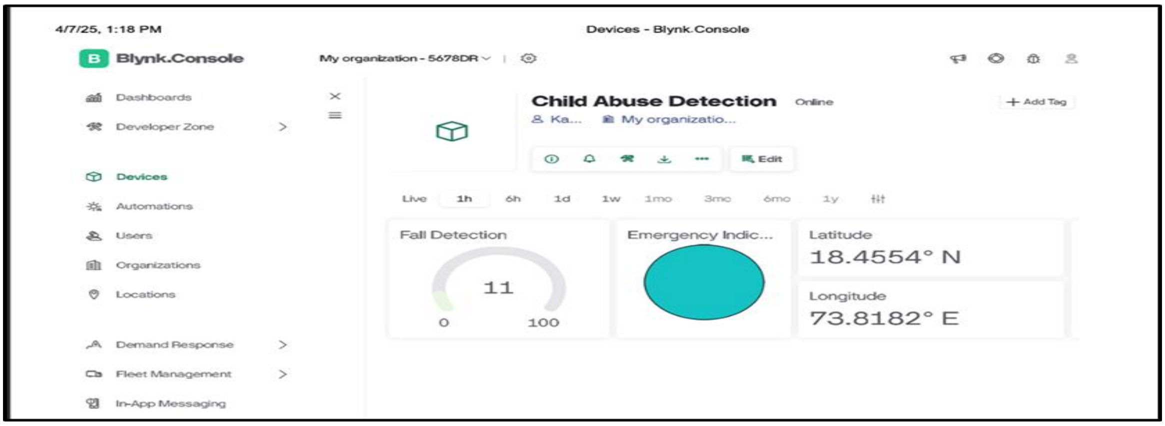


**Figure 3.3: Accelerometer Output Showing Movement Values**

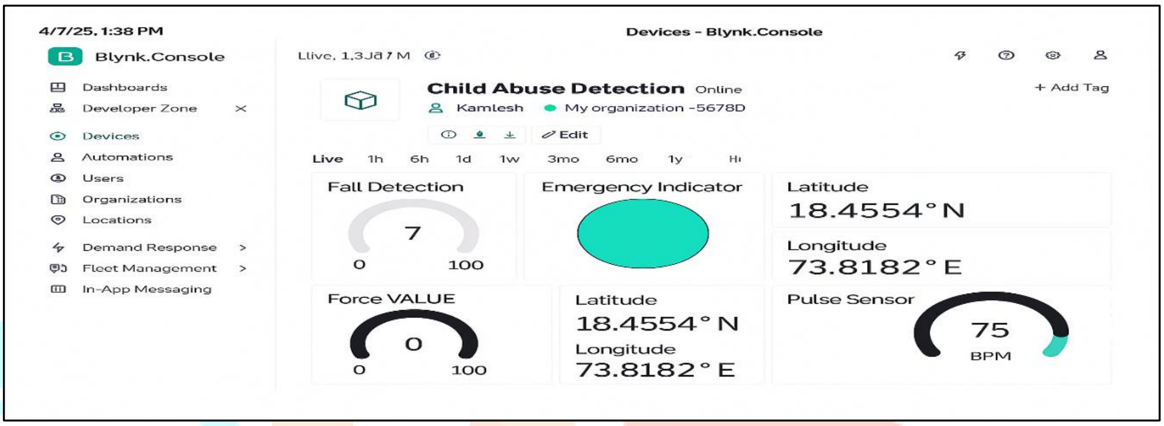


**Figure 3.4: Pulse Sensor Readings on Blynk Dashboard**

## V. FUTURE SCOPE

- **Machine Learning Integration:**
  Machine learning algorithms can be incorporated to analyze sensor data patterns over time. This will allow the system to distinguish between regular physical activities and suspicious or harmful behavior, thereby reducing false positives and increasing detection accuracy.
- **Voice and Cry Detection:**
  A microphone module can be added to detect audio cues such as crying, screaming, or distress sounds. Audio-based analysis will strengthen the system's ability to identify abuse even when physical movement is limited, enabling more comprehensive monitoring.
- **AI-Based Camera Surveillance:**
  Enhancing the optional camera module with AI-based video processing can enable real-time detection of facial expressions or abnormal postures. This visual analysis will assist in identifying potentially abusive scenarios and provide additional evidence for authorities or guardians.
- **Emergency Calling via GSM Module:**
  Integrating a GSM module will enable the system to make automated emergency calls or send SMS alerts when critical thresholds are breached. This ensures immediate notification even in the absence of Wi-Fi, thereby improving reliability in emergency situations.

## VI. CONCLUSION

This paper presents an IoT-based Child Abuse Detection and Emergency Response System designed to monitor real-time signs of distress using sensors integrated with the ESP8266 NodeMCU. By combining accelerometer, force, pulse sensors, GPS, and alert mechanisms, the system enables timely detection and immediate notification to guardians through the Blynk IoT platform.

The proposed solution is low-cost, scalable, and offers remote monitoring, making it suitable for real-world implementation. With future enhancements like machine learning and GSM integration, the system can evolve into a more intelligent and reliable safety tool for protecting children against abuse.

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