# IOT BASED INTELLIGENT CARE SYSTEM

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**Abstract:** *The presented work Iot Based Intelligent Care (i-Care) System aims to improve the safety and well-being of Alzheimer's patients, children, and women with a wearable device and mobile app. The device has sensors to detect falls and a GPS for real-time location tracking. It stays connected through Wi-Fi and features an SOS button for emergencies. To enhance women's safety, the device operates independently by utilizing the user's mobile data, ensuring consistent connectivity and prompt alerting even when home Wi-Fi or coverage is unavailable. A long-lasting battery ensures continuous monitoring. The developed mobile application allows caregivers to monitor in real-time and manages alerts. Overall, this work combines fall detection, location tracking, and alerting to ensure user safety across various age groups.*
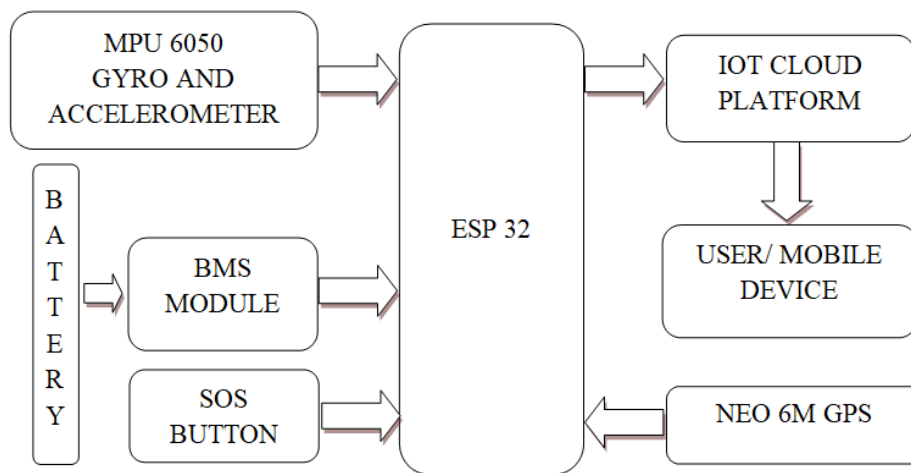
## I.    INTRODUCTION

This work is dedicated to enhancing the security and well-being of Alzheimer's patients, children, and women through the introduction of an advanced wearable device paired with a user-friendly mobile application. With built-in accelerometer and gyroscope sensors, the device actively monitors the wearer's movements, quickly identifying potential falls and promptly alerting caregivers during emergencies. Additionally, a GPS module enables precise real-time location tracking, empowering caregivers to monitor the wearer's whereabouts via the dedicated mobile app. Seamlessly connected, the device utilizes a microcontroller to manage connectivity to both home Wi-Fi networks and alternative networks outside the range, integrating an audible buzzer and SOS button for out-of-range detection and immediate alerts, addressing the unique safety needs of its users. To ensure women's safety, the device operates autonomously using the user's mobile data; ensuring consistent connectivity and immediate alerting even without home Wi-Fi or coverage. Furthermore, this proposed work aims to set up a robust battery, offering extended backup for continuous monitoring without frequent recharging. The developed mobile app complements the device's functionality, serving as a centralized platform for caregivers, providing a complete dashboard for real-time monitoring, alert management, and customization of device settings, thereby keeping caregivers effortlessly connected and informed. Finally, the proposed work aims to introduce a versatile wearable device and mobile app integrating accelerometer-based fall detection, real-time location tracking, and immediate alerting capabilities to safeguard the well-being of users across various scenarios and age groups [1-4].

Sindhu et al.,[5] introduced a smart home automation solution aimed at assisting family members providing care to Alzheimer's patients within their homes. This innovative system not only supports full-time care giving but also extends its benefits to nursing home environments. Their research findings demonstrated a significant enhancement in the patients' quality of life through the implementation of these solutions. Ashfaq et al.,[6] proposed a mobile-based system specifically designed for Alzheimer's patients, utilizing a Smartphone application to guide and support them in their daily routines. Their approach incorporates IoT technology to create an environment conducive to patient care at home while reducing healthcare costs. The Android application they developed includes brain-enhancing games, progress tracking, and practical reminders for

medication and daily tasks. Moreover, it harnesses GPS location capabilities to provide additional safety measures for Alzheimer's patients. Haruka et al.,[7] presented a cost-effective GPS tracking system tailored for real-time monitoring and location tracking of Alzheimer's patients. This study underscores the significance of health monitoring technology in aiding caregivers of Alzheimer's patients, especially considering the challenges in timely diagnosis and care initiation. Their research highlights the urgent need for accurate identification and proactive intervention for Alzheimer's patients, particularly in regions experiencing significant demographic shifts and increases in disease prevalence like India [8-10].

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## II. EXPERIMENTAL PROCEDURE

**Figure1. Block Diagram of Proposed System**



Block diagram of the proposed system is shown in Figure1.

### 1.1 MPU 6050 Fall Detection Sensor

Integrated with the MPU6050 sensor, well-known for its precision in detecting falls, this device differentiates between normal movements and fall incidents. It triggers immediate alerts to caregivers, ensuring prompt attention during emergencies. This feature is especially essential for Alzheimer's patients and children who may not effectively communicate in such situations [11-13].

### 1.2 Real-time Location Tracking with NEO 6M GPS Module

NEO 6M GPS module offers precise and continuous location tracking. Caregivers can monitor the wearer's movements in real-time and access a detailed location history through the developed mobile app. This feature is helpful for quickly locating Alzheimer's patients, children, or individuals in potentially dangerous situations.

### 1.3 ESP32 Microcontroller

The powerful ESP32 microcontroller efficiently manages all device operations, ensuring smooth connectivity, data processing, and power management. Its robust performance contributes to the device's reliability and durability.

### 1.4 Dedicated Mobile App

The user-friendly mobile app "i-CARE" is designed with caregivers. It provides a comprehensive dashboard displaying real-time location, and alerts. Users can customize settings, manage multiple devices, and receive push notifications, ensuring they remain connected and informed.

## 1.5 Wi-Fi Connectivity for Alzheimer's Patients and Children

When within the home's Wi-Fi range, the device seamlessly connects to the network, enabling advanced IoT features and continuous monitoring. If the wearer moves beyond the Wi-Fi range, the device proactively searches for available Wi-Fi networks, including public ones, to maintain connectivity and keep caregivers informed.

While within the home's Wi-Fi range, the device effortlessly links to the network, facilitating advanced IoT capabilities and continuous monitoring. Should the wearer moves beyond this range, the device actively scans for accessible Wi-Fi networks, including public ones, ensuring sustained connectivity and keeping caregivers updated.

## 1.6 Buzzer Alert for Out-of-Range Detection

Featuring an integrated buzzer, this device emits audible alerts when the wearer moves out of the predefined safe zone, such as leaving home or school premises. This serves as an immediate notification for caregivers to take necessary actions, ensuring the wearer's safety.

## 1.7 SOS Button

Significantly placed SOS button serves as a lifeline during emergencies. When pressed, it triggers instant alerts to caregivers through the i-CARE app and sends SMS notifications, ensuring rapid response and assistance during critical situations.

## 1.8 SMS Alerts

In addition to app notifications, the device sends SMS alerts to selected contacts. These messages include vital information such as "fall or seeking help ", timestamp, and real-time location, enabling caregivers to act without delay.

## 1.9 Safety Features for Women

For women's safety, the device operates independently, connecting to the internet via the user's mobile data. It offers enhanced features like tactful SOS alerts, fall detection, and text message alerts, which ensuring women feel secure and empowered, even when alone or in unfamiliar surroundings.
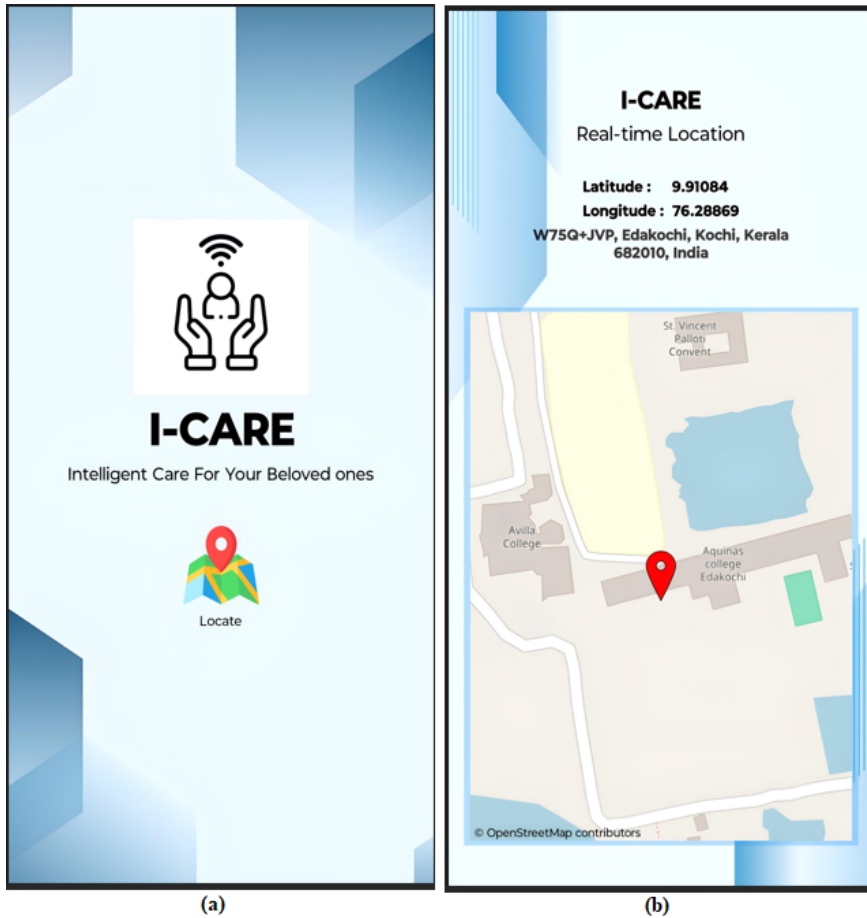
## 1.10 IoT Connectivity

Enabled by a real-time database, the device's IoT help smooth communication between hardware and developed mobile app. This innovation supports remote monitoring, firmware updates, and ensures the device's functionality adjusts to changing needs and demands effortlessly.

## III. RESULTS AND DISCUSSION

The proposed device is addressing the safety concerns of Alzheimer's patients, children, and women through the integration of cutting-edge technology. At its core, the MPU6050 sensor, accepted for its precise detection of falls. Continuously monitoring the wearer's movements, this sensor proficiently distinguishes between routine activities and potential falls, rapidly alerting caregivers in emergencies. The NEO 6M GPS module complements the fall detection feature by enabling real-time location tracking. This module provides caregivers with precise and timely location data, facilitating prompt retrieval if the wearer wanders or encounters unfamiliar environments. Managed by an ESP32 microcontroller, the device efficiently manages connectivity, primarily utilizing home Wi-Fi for Alzheimer's patients and children. This Wi-Fi connection serves not only as an IoT hub but also as a safety measure. Should the wearer moves beyond Wi-Fi range, the device emits audible alerts and actively seeks alternative Wi-Fi networks, including public ones, to ensure uninterrupted connectivity.
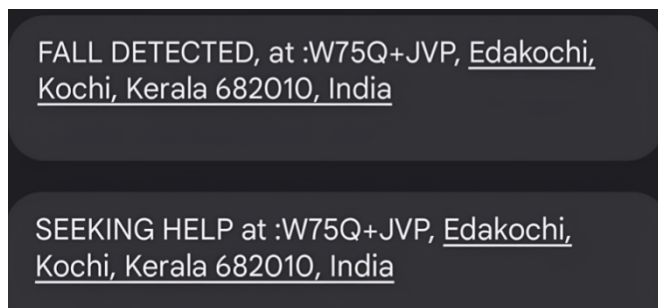
Figure 2(a) shows the designed mobile application ' i-CARE'. Figure 2(b) shows the updating of App with real time location.

**Figure 2 (a) Designed Mobile Application. (b) App updated with Real Time Location**



For women's safety, featuring a prominently positioned SOS button, easily accessible during emergencies, the device triggers immediate alerts when activated. These alerts are relayed to designated contacts via the designed app and SMS, further bolstering safety with location map displaying the wearer's precise location. The presented mobile app serves as a centralized platform for caregivers. With its user-friendly interface, the app enables caregivers to monitor the wearer's real-time location, manage alert settings, and customize device preferences seamlessly. Figure 3 shows the format of text message received during the emergency situation. Figure 4 depicts the application updates when emergency situations like seeking help or fall detected. Figure 5 shows the generated mobile app for seeking help. It can be installed in individuals mobile for a safty.
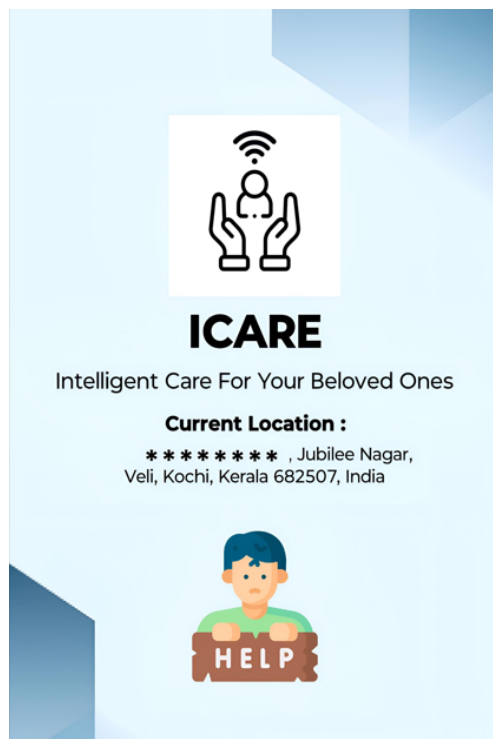
**Figure 3. Text Message Received Format**

**Figure 4. (a) App Updated with Seeking Help Message (b) App updated with Fall Detected**


(a)    (b)

**Figure 5. Created App Model for Seeking 'HELP'**



## IV.  CONCLUSION

In conclusion, the proposed device represents a significant advancement in addressing the safety concerns of Alzheimer's patients, children, and women through the integration of cutting-edge technology. With its diverse features, reliable connectivity, long-lasting battery, and mobile app integration, the proposed system emerges as an essential aid for caregivers committed to ensuring the safety and well-being of their loved ones across different scenarios and age groups.

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