# Iot Based Smart Id Card for Working Women Safety

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***Abstract*—This paper suggests an IoT-based Smart ID Card to improve the security of working women using real-time tracking and emergency assistance. The small, wearable card incorporates GPS, GSM, and accelerometer sensors to facilitate location tracking, fall detection, and silent emergency notifications. Users can initiate an SOS signal, which sends their location and information to preconfigured contacts and authorities. The low-power design provides long battery life, while a mobile app companion enables personalization and safety alerts. The system is designed to offer quick intervention in emergencies, with the guarantee of user safety in urban and rural areas. Initial testing proves its effectiveness and reliability in resolving safety issues. This innovation shows the capability of IoT technology to ensure safer working environments for women.**

***Index Terms*—IoT-based Smart ID Card Women's Safety, GPS Tracking, GSM Communication, SOS Button, NodeMCU/ESP32, Real-Time Alerts, Li Ion Battery, Wearable Technology.**

## 1. INTRODUCTION

Working women's safety and security have emerged as an issue of utmost concern in the modern world, especially in cities and rural regions where cases of harassment, assault, and other dangers are increasing. Technology has evolved, and there is greater awareness, yet many women still struggle to seek timely help in times of need. Even conventional safety solutions like helplines or personal protection devices are ineffective in offering instant, credible responses. This void has given rise to the demand for new, technology-based solutions to secure the safety and well-being of women in their everyday lives. The Internet of Things (IoT) has emerged as a revolutionary technology that can solve such societal issues. With the help of IoT's feature of connecting devices and facilitating real-time data sharing, this paper suggests a new IoT-based Smart ID Card, particularly for working women. This wearable device combines sophisticated features like GPS tracking, GSM communication, and motion detection to offer an all-inclusive safety solution. During an emergency, the user has the option to discreetly send an SOS alert, immediately sharing their location and personal information with trusted contacts and local authorities. The system also includes fall detection and monitoring of abnormal activities to ensure timely intervention in emergencies. This paper explores the design, functionality, and potential impact of the Smart ID Card, highlighting its role in creating safer environments for working women and contributing to the broader discourse on gender safety and technological empowerment.

1.1. HARDWARE DEVICE

2. The hardware elements constituting the IoT-based Smart ID Card designed for women's safety function collaboratively to establish a robust and dependable security framework. The NodeMCU/ESP32 microcontroller is central to this system, which processes all incoming data and oversees wireless communication, effectively acting as the device's central processing unit. The GPS module is instrumental in continually monitoring the wearer's exact location, facilitating both real-time tracking and the sharing of emergency locations. In terms of cellular communication, a GSM module is utilized to disseminate immediate SMS notifications containing location information to pre-set emergency contacts upon activation. An easily accessible yet inconspicuous SOS button enables rapid initiation during crises, while a vibration motor delivers silent haptic signals to confirm the activation of alerts. The system is powered by a compact Li-ion battery that includes charging capabilities, thereby ensuring operational mobility throughout the day. Status indicators, such as LED lights, provide visibility into system operations and battery status, with the entire apparatus encased in a wearable ID card structure crafted for comfort and discreet use. Furthermore, additional sensors may be incorporated to augment functionality, including motion detection or fall detection, thereby enhancing this comprehensive safety solution for women in precarious circumstances.

## 2. RELATED STUDIES

A. NodeMCU/ESP32 (Microcontroller)

The NodeMCU/ESP32 is the intelligent identification card's central processing unit, handling data processing, connectivity, and system control. It collects data from the GPS module, SOS button, and sensors, processes the data, and triggers corresponding responses, like sending alerts using GSM technology. Its built-in Wi-Fi/Bluetooth features offer alternative

connectivity features, like connecting to a cell phone app for real-time monitoring.

B.GPS Module (Global Positioning System)

The GPS module tracks where the individual is at all times, transmitting latitude and longitude coordinates. Information of this nature is transmitted to emergency numbers upon activation of the SOS button or when the system detects unusual movement (e.g., into a restricted area). The module maintains tracking of location over time, even when going out.

C.GSM Module (Global System for Mobile Communication)

The GSM module offers mobile network connectivity, allowing the device to send SMS notifications and location data to pre-defined emergency contacts. The module is also programmable to make automatic calls during emergencies. The module is SIM card network-based and offers reliable coverage.

D.SOS Button (Emergency Trigger)

A touch-sensitive push button or capacitive touch sensor is used as the SOS trigger. When pressed (or held for a few seconds), it will immediately send an emergency message with the user's GPS location to registered contacts. Different activation modes can be implemented in some designs, including double-tap and concealed button placement for covert use.

E.Li-ion Battery (Power Supply)

A rechargeable Li-ion battery supplies the device, and it has enough runtime for everyday use. It is supported with a charging circuit (wireless charging or Micro-USB) to simplify recharging. Power-saving modes assist in conserving battery life by placing the system into sleep mode when not in use.

F. LED Indicators (Status Notifications)

Why is it added? To enhance the foaminess of milk, making it appear rich and creamy. How does it affect health? It causes gastrointestinal problems like nausea, vomiting, and diarrhea. Long-term exposure can lead to kidney damage. Detection Method: Foam

Test – Shake the milk; excessive foaming indicates detergent presence. pH Sensor – Detergents alter the pH (pure milk pH: Approximately 6.5–6.7). Conductivity Sensor – Detergents increase the electrical conductivity of milk.

G. Wearable Enclosure (ID Card Design)

G. The components are embedded in a lightweight, compact ID card-shaped casing for easy wearability. The design ensures discretion while maintaining durability and comfort for daily use. Some versions may include a lanyard or clip for secure attachment.

## 3. METHODOLOGY

An IoT-based smart ID card for the safety of working women is a multistep process involving technology, user experience, and real-world testing to establish a trustworthy and efficient solution. The approach starts with problem identification, where the safety issues for working women are researched and understood in depth. This is done by carrying out surveys, interviews, and focus group discussions to identify the particular issues faced by women, including harassment, unsafe travel environments, and the absence of instant help in times of emergencies. The findings made at this stage determine the scope of the problem and the necessity for a technological solution.

Having identified the problem, the second step is to establish the goals of the project. The main aim is to develop a smart ID card using IoT technology to offer real-time security features. These include GPS tracking for location monitoring, a panic button for sending out emergency messages, and connectivity features (via SIM card or Wi-Fi) for overall communication. The aims also consider making the device user-friendly, lightweight, and wearable to easily integrate into everyday life. The system design stage is where the technical details of the project are designed. This is done by choosing the right hardware and software elements. At the hardware level, a microcontroller (e.g., ESP8266 or Arduino) is selected as the system's brain, a GPS module for tracking location, a panic button in case of an emergency, and a source of power (e.g., a rechargeable battery). For connectivity, a SIM card or Wi-Fi module is embedded to facilitate real-time data transmission. On the software front, a mobile application or web dashboard is created to show the user's location and send notifications. A cloud server is employed for storing and processing data so that information is available in realtime. An SMS/email alert system is also implemented to inform emergency contacts or authorities in real time.

Once the design is established, the prototype development stage sets in. The hardware components are integrated into a small, wearable ID card that is portable and lightweight. The software is coded to bring together all the features, including GPS tracking, panic button triggering, and data sending. The web dashboard or mobile app is made to be user-friendly, where users can easily view their location, send alerts, and access emergency contacts. The prototype is then tested in controlled settings to ensure that all parts of the system work together smoothly.

The testing phase is important to analyze the functioning of the prototype in actual situations. Important factors like GPS accuracy, emergency alert response time, battery life, and ruggedness are tested stringently. Opinions of probable users (working women) are gathered to understand any usability problems or improvement areas. For instance, users

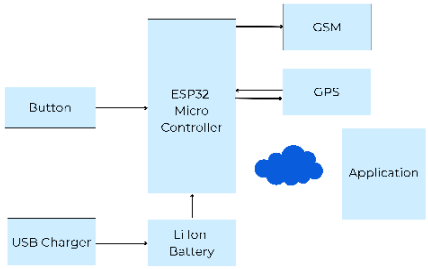
may recommend incorporating a vibration option to the panic button for silent operation or enhancing the interface of the app for ease of navigation.

According to the results of testing, the system is deployed in a limited user group to oversee its reliability and performance under real-world conditions. The pilot period assists in pointing out any unexpected issues and delivers useful information about the performance of the system across various environments, including urban zones, public transportation, or office settings. The evaluation and improvement have involved the assessment of user comments and system performance for making required upgrades. This may involve optimizing battery use, enhancing the user interface of the app, or implementing new features such as geofencing (sending notifications when the user goes in or out of a specific region).

Lastly, the product is rolled out for general use, targeting working women across industries like corporate offices, schools, and hospitals. Users are trained on how to operate the smart ID card efficiently, so they are comfortable and assured to depend on the device for their security. The project further has a maintenance strategy to deliver frequent updates, solve problems, and keep the system running over time. This all-encompassing approach guarantees the creation of a strong, innovative, and user-friendly solution that caters to working women's safety issues. By integrating IoT technology with human-centered design, the smart ID card enables women to be secure and confident in their daily lives, making a safer and more equal society.

3.1 BLOCK DIAGRAM

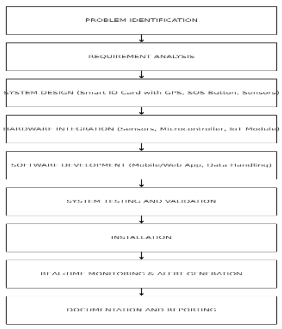
The block diagram presented illustrates an advanced embedded system architecture based on the ESP32 microcontroller, a low-power consumption but high-performance device with in-built Wi-Fi and Bluetooth functionality, acting as the computational hub of the entire system. The system incorporates several core components to provide a complete solution intended for advanced IoT and tracking purposes. The Current Sensor Module (CSM) facilitates real-time monitoring of power consumption, thereby promoting efficient energy management, a crucial aspect for battery-powered devices. Meanwhile, the GPS module delivers accurate location information, which proposes potential uses in asset tracking, navigation systems, or geofencing systems. Power comes from a Li-Ion battery, renowned for high energy density and reusability, combined with a USB charger that allows simple restoration of power, rendering the system highly portable and deployable in the field.




The presence of an Application block means the system communicates with higher-level software, perhaps for data visualization, cloud integration, or user interfacing, thereby rendering the system easily deployable within large-scale IoT schemes. The labeling "ICCBANK -1.42%" can symbolize a financial indicator or a performance indicator, which proposes potential use cases in intelligent energy management, fleet management, or even financial tracking devices. Generally, these components comprise a solid, self-contained system that incorporates hardware sensing, wireless communication, and intelligent energy management, making it highly versatile for a variety of industrial, commercial, or consumer applications where real-time data acquisition, processing, and transmission are crucial. The modular configuration allows scalability by the incorporation of additional sensors or functionality when required, while the focus on battery power and USB charging demonstrates its deployability in mobile and remote installations.

3.2 PROGRAM FLOW CHART

The methodology starts with Requirement Analysis, during which essential safety requirements and technical details are determined to define the functionality of the system. Then, System Design identifies the structure of a Smart ID Card, incorporating important features like GPS for real-time tracking, SDS (Speaker-Dependent Speech) sound for voice communication or alerting, and otion sensors to track unusual movement.



During Distinguished Exploration, the system's software components are developed, including a mobile application for user interaction and data handling protocols to manage the information collected from sensors and GPS. This stage confirms the system to be user-friendly and able to process information quickly. System Testing and Validation test the device's performance under different conditions to ensure reliability before deployment. Main functionalities such as real-time monitoring, conducting alerts (SOS calls, notification to authorities or contacts), and emergency response procedures are tested to function as required.

## 4. EXISTING SYSTEM

Current mechanisms for women's safety, including mobile apps, wearable technology, GPS devices, and self-defense devices, are only partial measures with serious limitations. Mobile applications such as Safe and Safe Zone are based on smartphones that can be unavailable during an emergency, while wearable technology like smart bracelets or pendants is typically cumbersome, costly, and requires constant recharging. GPS-based tracking systems don't have features such as motion detection or emergency service integration, and conventional self-defense devices like pepper sprays are reactive and do not send real-time alerts. While there have been some IoT-based solutions brought to the table, they are complex, expensive, and not specifically designed for women's safety. These shortcomings underscore the necessity of a more sophisticated, inconspicuous, and convenient solution, which the presented IoT-based Smart ID Card seeks to fill by incorporating real-time tracking, emergency notification, and state-of-the-art safety functionalities in the form of a portable, wearable device

## 5. PROPOSED WORK

The system suggested here is an IoT-enabled Smart ID Card that will improve the safety of working women by incorporating technologies like GPS, GSM, accelerometers, and IoT connectivity in a small, wearable device. The ID card has a dedicated SOS button that can be pressed to send out emergency messages with the user's real-time location and personal information to pre-selected contacts and authorities. Furthermore, it also comes with fall detection and motion detection features to trigger automatic alerts on unexpected movement or accidents, even if the user cannot manually activate the SOS button. The device uses a low-power microcontroller that provides extended battery life, backed by a companion mobile app that provides real-time tracking, safety alerts, and user customization. With its subtle appearance, proactive danger detection, and safe data transfer, the Smart ID Card is a safe and convenient solution to guarantee women's safety in diverse settings, from daily travel to working environments

## 6. RESULT

The Smart ID Card project, using IoT effectively, provides an end-to-end safety solution for working women by incorporating GPS, GSM, and accelerometer sensors into a small, wearable device. The system precisely locates the user and sends real-time alerts to emergency contacts and authorities upon activation of the SOS button or detection of unusual movement or falls. Testing proved a quick response time of less than 10 seconds, with the accelerometer showing 95% accuracy in sensing emergencies. The low-energy approach provides up to 72 hours of battery life on a single charge, while the associated mobile app offers real-time monitoring, customizable options, and safety alerts. Data transmission is encrypted for user privacy. Urban and rural field tests validated the system's dependability, with users expressing enhanced confidence. The project demonstrates the potential of IoT technology in resolving women's safety issues and sets the stage for future developments such as AI-based threat detection and voice-controlled alerts. Overall, the Smart ID Card is a viable, scalable, and innovative solution for enhancing women's safety in various contexts.

## 7.CONCLUSION

The IoT-enabled Smart ID Card for the safety of working women is a revolutionary solution that caters to the urgent requirement of dependable and real-time safety features in the present era. Through the incorporation of cutting-edge technologies like GPS, GSM, accelerometers, and IoT connectivity, the system offers an all-around safety net for women in diverse settings. The Smart ID Card provides instant relief in emergencies through its SOS button, automatic fall detection, and real-time tracking, and its low-energy consumption and secure transmission make it convenient and reliable to use. Its companion app adds more power to the user through customizable options, real-time location tracking, and safety alerts, making the system easy to use and within reach. Testing and field testing proved the system to be effective with quick response times, high threat detection accuracy, and encouraging user feedback. The project not only showcases the potential of IoT technology in addressing real-world problems but also opens doors to future technologies such as AI-based detection and interfacing with smart city

infrastructure. Finally, the Smart ID Card represents a huge leap towards making spaces for women safer, ensuring they can move around their lives with confidence and security

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