

# SHAKTISENSE – Smart Women Safety Pendant

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**Abstract:** Nowadays, cases of harassment, kidnapping, and unsafe situations for women are increasing day by day. Many times, women are not able to call for help during emergencies, and there is no proper system to quickly inform family members or police. (1)

To solve this problem, this project presents a Smart Women Safety Pendant, a small wearable device that helps in danger situations. The pendant includes a camera, microphone, and GPS, which work together to provide quick help. (3)

When the user presses the emergency button, the device immediately captures photos or videos, records surrounding sound, and finds the current location using GPS. (1) This information is sent instantly to family members and nearby police stations through a mobile network. (2)

The main aim of this project is to provide fast help and also collect proof (image, video, audio) during emergencies. It is easy to use, portable, and can be worn like a normal pendant. This system can improve women's safety and give them more confidence in daily life.

**Keywords:** Women Safety, Smart Pendant, GPS Location, Emergency Alert, Camera,

Microphone, Wearable Device, Security System.

## 1. Introduction

In today's world, women's safety has become a major concern due to the increasing number of crimes such as harassment, kidnapping, and assault. Many times, women are unable to call for help during emergency situations, especially when they are alone. This delay in communication can lead to serious consequences. (3)

To address this issue, ShaktiSense – Smart Women Safety Pendant is developed as a compact and wearable safety device (2). It is designed to provide quick help and ensure the user's safety in critical situations. The pendant can be easily worn like a normal accessory, making it convenient for daily use.

ShaktiSense is equipped with advanced features such as a camera, microphone, and GPS tracking system. When the user presses the emergency button, the device instantly captures images or videos, records surrounding audio, and sends the live location to family members and nearby police stations through a mobile network.

The main aim of this project is to provide a fast and reliable safety solution that not only alerts others but also collects important evidence. This system helps in improving women's safety and gives them confidence to move freely in society.

### 1.1. Problem Statement

In many emergency situations, women do not get enough time or opportunity to contact someone for help. Mobile phones may not always be accessible, or the situation may be too risky to make a call. This creates a serious safety issue. (1)

There is also a lack of systems that can instantly share location and collect proof like audio, images, or videos. Without proper evidence, it becomes difficult to take quick action. Additionally, delays in communication reduce the chances of timely rescue. (7)

Therefore, there is a need for a smart, fast, and reliable safety device that can send emergency alerts, track live location, and capture evidence automatically.

### 1.2. Existing System

Currently, women mainly depend on mobile phones and basic safety apps for protection. Many applications provide features like emergency calling, location sharing, and SOS alerts. Some wearable devices like smart bands and smartwatches also offer limited safety features.(5)

However, these existing systems have several limitations:

- **Dependence on smartphones:** Most apps require the phone to be in hand, which is not always possible in danger situations

- **Manual operation:** The user must unlock the phone and open the app, which takes time
- **No evidence collection:** Most systems do not capture **photos, videos, or audio** during emergencies
- **Limited alert system:** Alerts are usually sent only to saved contacts, not directly to nearby police stations
- **Delay in response:** Due to manual steps, there can be a delay in sending alerts and location
- **Network dependency:** Some apps do not work properly in low network areas

Because of these drawbacks, existing systems are not always reliable in critical situations. This creates a need for a more advanced, fast, and automatic safety solution like ShaktiSense – Smart Women Safety Pendant.

### 1.3. Proposed System

To overcome the limitations of existing systems, ShaktiSense – Smart Women Safety Pendant is proposed as an advanced and reliable safety solution. It is a compact, wearable device that provides instant help during emergency situations without requiring complex operations.

The proposed system includes key components such as a camera, microphone, GPS module, and GSM/IOT communication system. The device is designed to work quickly and efficiently with a single press of a panic button.

When the user feels unsafe and presses the emergency button:

- The device captures real-time images or video using the camera
- It records surrounding audio through the microphone
- It detects the current location using GPS

- All this information is instantly sent to family members and nearby police stations via mobile network.

The system may also support automatic triggers, such as sudden movement or abnormal activity, to activate alerts without manual input.

Additionally, the collected data (image, video, audio, location) can be stored on a cloud server or mobile app, which can be used later as evidence.

The proposed system is:

- Fast and automatic
- Easy to use (single button operation)
- Portable and wearable
- More reliable than existing solutions

Thus, ShaktiSense provides a complete safety solution by combining real-time alerting, tracking, and evidence collection, making it more effective in protecting women during emergencies.

## 2. Design and Development

The design and development of ShaktiSense – Smart Women Safety Pendant focus on creating a compact, efficient, and easy-to-use safety device. (9)The system is developed using both hardware components and software integration to ensure fast response during emergency situations

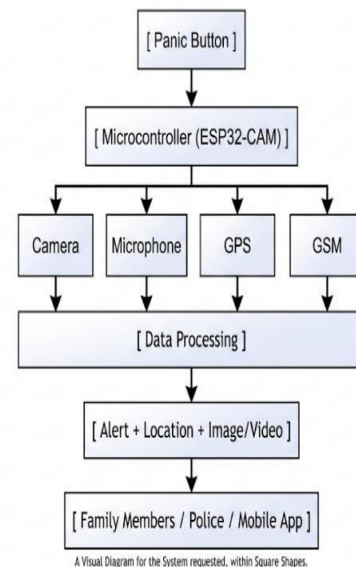
### 2.1. System Design

The system design of ShaktiSense – Smart Women Safety Pendant represents how all components are connected and work together to provide safety during emergency situations. The design is simple, compact, and efficient, making it suitable for a wearable device.

The system is centered around the ESP32-CAM micro-controller, which controls all operations.

It is connected to input devices like the panic button and output/communication modules such as camera, microphone, GPS, and GSM.

When the panic button is pressed, the controller activates all modules to capture data and send alerts.



## 2.3 Hardware Development

The hardware development of Shakti-Sense – Smart Women Safety Pendant involves selecting, connecting, and assembling all electronic components required for the system. The main goal is to build a compact, reliable, and efficient wearable device.(21)

All components are integrated using proper wiring and later designed on a PCB (Printed Circuit Board) to make the system small and portable.

### Main Hardware Components

#### 1. ESP32-CAM (Micro-controller)

The ESP32-CAM acts as the brain of the system. It controls all connected modules and processes the data. It also supports Wi-Fi connectivity and an inbuilt camera interface, making it ideal for IoT-based applications.(21)

## 2. Camera Module

The camera module is used to capture images and videos during emergency situations. It provides visual evidence, which can help in identifying the surroundings and suspects.

## 3. Microphone

The microphone records audio from the surroundings. It helps in capturing voice and background sounds, which can be used as audio evidence.(21)

## 4. GPS Module (Neo-6M)

The GPS module is responsible for tracking the real-time location of the user. It provides accurate latitude and longitude coordinates, which are sent during emergencies.

## 5. GSM Module (SIM800L)

The GSM module is used to send SMS alerts and data. It connects the device to the mobile network, allowing communication with family members and nearby police stations.

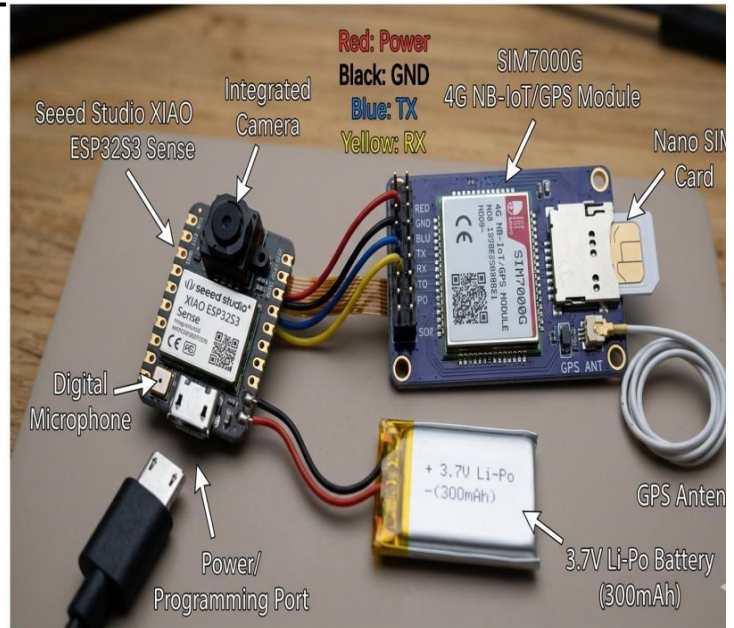
## 6. Panic Button

The panic button is used to activate the system instantly. It is designed to be easily accessible so that the user can press it quickly in an emergency situation.

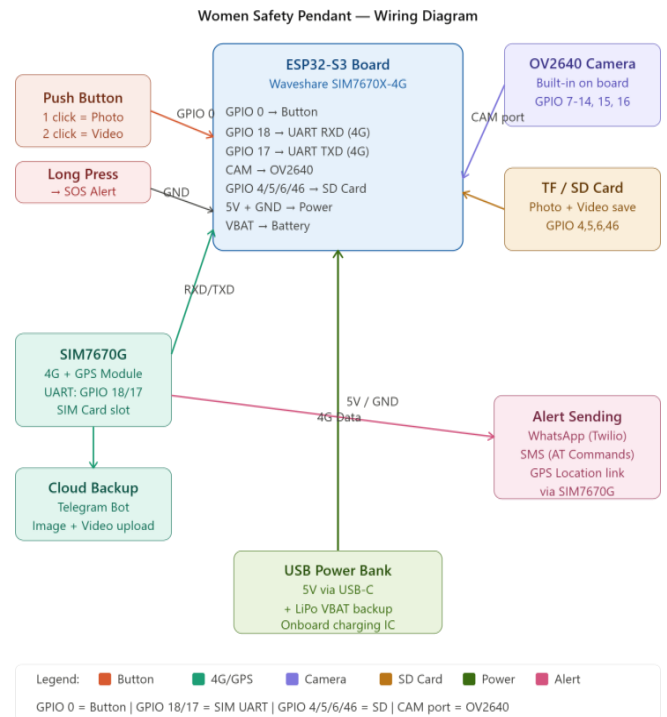
## 7. Battery (Rechargeable)

The rechargeable battery supplies power to the entire system. It ensures the device is portable and can work continuously without external power.

**Diagram:-**



**Figure 2.3.1 HARDWARE**



**Figure 2.3.2 Hardware Wiring Diagram**

## 2.4 Software Specifications

The software architecture of ShaktiSense – Smart Women Safety Pendant is designed to enable real-time emergency response through efficient integration of embedded systems and communication technologies. The system follows an event-driven approach, where the activation of the panic button initiates multiple

parallel operations such as data acquisition, processing, and alert transmission.

To ensure modularity and flexibility, the software is divided into two main parts: Arduino (Embedded System) and Python (Server/Application Side).

### (A) Arduino-Based Embedded Software

The embedded software is developed using Embedded C/C++ in Arduino IDE and is deployed on the ESP32-CAM micro-controller. This part is responsible for direct interaction with hardware components and real-time execution(21)

#### Libraries Used:

- **WiFi.h** → For internet connectivity
- **esp\_camera.h** → Camera control
- **TinyGPS++** → GPS data processing
- **SoftwareSerial.h** → GSM communication
- **HTTPClient.h** → Sending data to server

The Arduino-based system ensures real-time response, low latency, and efficient hardware control.

### Python-Based Software (Server / Application Side)

The Python component is used for data handling, storage, and monitoring. It runs on a server or system connected to a cloud platform and enhances the functionality of the embedded device.

#### Functions:

- Receiving data from ESP32 via HTTP/MQTT protocols
- Processing and storing image, audio, and location data

- Displaying real-time location on maps (Google Maps API)
- Sending notifications (SMS/Email/App alerts) to users

### 3. Working

The working of ShaktiSense – Smart Women Safety Pendant is based on an event-driven approach that ensures quick response during emergency situations.(8) The system remains in a standby mode under normal conditions, continuously monitoring the panic button.

When the user feels unsafe and presses the panic button, the system is immediately activated. The ESP32-CAM microcontroller controls the entire process and triggers all connected modules. First, the camera module captures images or short video clips of the surroundings. (11) Simultaneously, the GPS module retrieves the real-time location of the user in terms of latitude and longitude. This location data is essential for tracking and rescue purposes. All the collected data is then processed by the micro-controller.

After processing, the GSM module sends an emergency alert message along with the user's location to predefined contacts such as family members and nearby authorities.(8) If internet connectivity is available, the system can also upload images, audio, and location data to a cloud platform or mobile application for real-time monitoring.

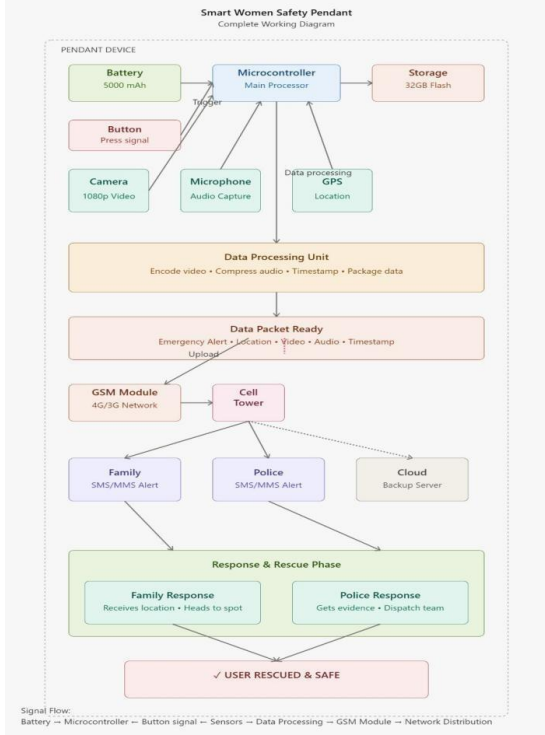


Figure 3.1: Working Architecture

```

ARDUINO CODE
// Include libraries
#include <LiquidCrystal.h>
LiquidCrystal lcd(7, 6, 5, 4, 3, 2);

#include <SoftwareSerial.h>
#include <TinyGPS.h>
SoftwareSerial gps(10,11); // RX, TX
TinyGPS gps_object; // create object

char test[] = "$GPGGA";
String latitude = "no Range";
String longitude = "no Range";

boolean gps_status = 0;
long lat, lon;

void setup() {
  // code logic
}

SERIAL OUTPUT (COM11)
$GPGGA,000110.262,,,0.0,M,0.0,0.000000000,A,1,0.0,M,0.0,0.000000000,E
$GPRMC,000110.262,V,,0.00,0.00,060180,,N*44
$GPVTG,0.00,T,M,0.00,N,0.00,X,N*32
$GPGGA,000111.262,,,0.0,M,0.0,0.000000000,A,1,0.0,M,0.0,0.000000000,E
$GPRMC,000111.262,V,,0.00,0.00,060180,,N*45
$GPVTG,0.00,T,M,0.00,N,0.00,X,N*32
    
```

Figure 3.3: GPS receiver data.

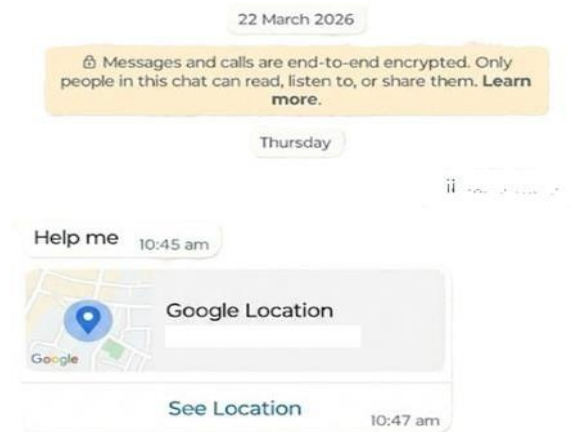
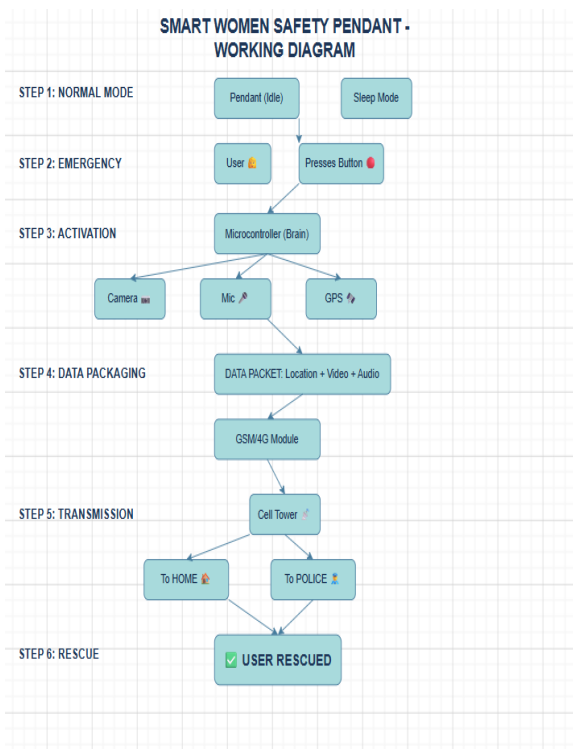


Figure 3.4: Message received showing location

4. Conclusion

ShaktiSense is a cost-effective, portable, and technologically sound safety solution that empowers women with greater confidence and security in their daily lives. Future enhancements may include AI-based threat detection, longer battery life, and integration with city-wide emergency response networks, making the system even more intelligent and impactful. This project demonstrates the meaningful application of IoT and embedded systems toward social good, contributing to a safer environment for women across diverse settings.

Figure 3.2: Working Flow



## 5. Acknowledgement

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