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SMART WOMEN SAFETY JAKET WITH AI DISTRESS DETECTION

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ABSTRACT

Women's safety is a major concern in modern society, especially in isolated and unsafe environments. Existing solutions like mobile apps and panic buttons rely on manual activation and internet connectivity, which may fail during emergencies. This paper proposes a Smart Women Safety Jacket using AI and IoT for automatic distress detection. The system uses voice and emotion recognition to identify danger situations and sends alerts even in offline mode via SMS or RF. It also provides smart safe route suggestions using GPS. Additional features like automatic camera capture and a non-lethal shock mechanism enhance safety, making the system a reliable real-world solution.

KEYWORDS: Women Safety, Smart Jacket, Voice and Emotion Detection, Offline Alert System, GPS-Based Safe Route Suggestion, Smart Camera Capture, Artificial Intelligence (AI), Internet of Things (IoT), Self-Defense Shock Mechanism.

INTRODUCTION

Women's safety is a major concern due to increasing crimes and unsafe situations in daily life. Existing solutions like mobile apps, GPS trackers, and panic buttons rely on manual activation and internet connectivity, making them unreliable in emergencies. To address this, this paper proposes a Smart Women Safety Jacket using AI and IoT for automatic distress detection without user intervention. The system use voice and emotion recognition to identify danger, provides an offline alert system for communication without internet, and suggests safe routes using GPS. It also includes smart camera capture for evidence and a non-lethal shock mechanism for self-defense, making it a reliable real-world safety solution.

OBJECTIVES

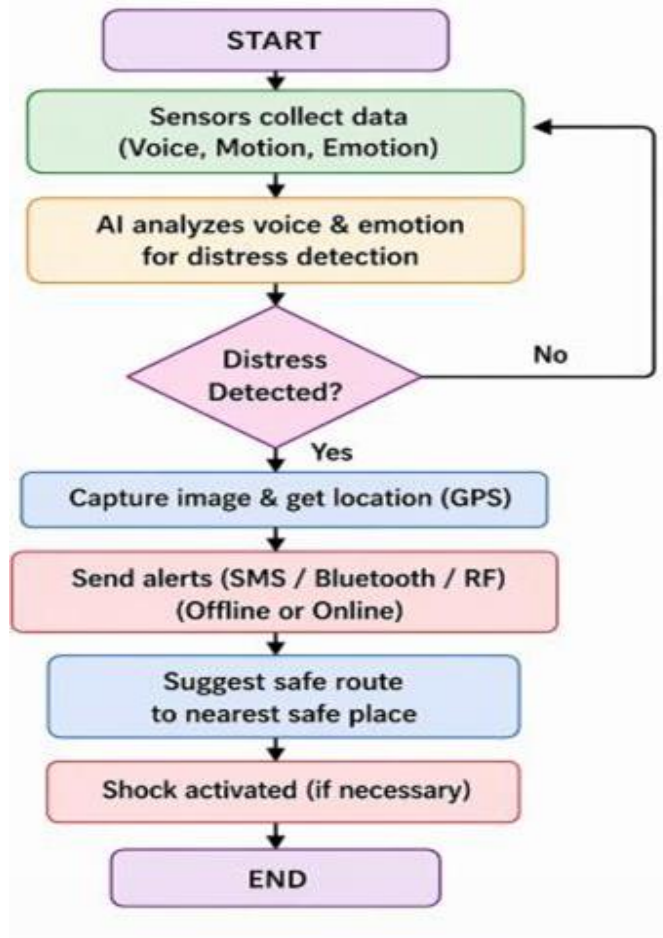
The main objectives of this project focus on developing an advanced and reliable safety solution for women using modern technologies. The system aims to overcome the limitations of existing methods by providing automatic, efficient, and real-time protection features.

1. To design a smart safety jacket that enhances women’s protection in real-time situations.
2. To develop an AI-based system for automatic distress detection using voice and emotion recognition.
3. To implement an offline alert mechanism that can send emergency messages without internet connectivity.
4. To provide GPS-based smart safe route suggestions to guide users to nearby safe locations.
5. To integrate a smart camera system for capturing real-time evidence during emergencies.
6. To include a non-lethal self-defense mechanism (shock feature) for additional safety.
7. To create a reliable, efficient, and user-friendly safety solution for real-world applications.

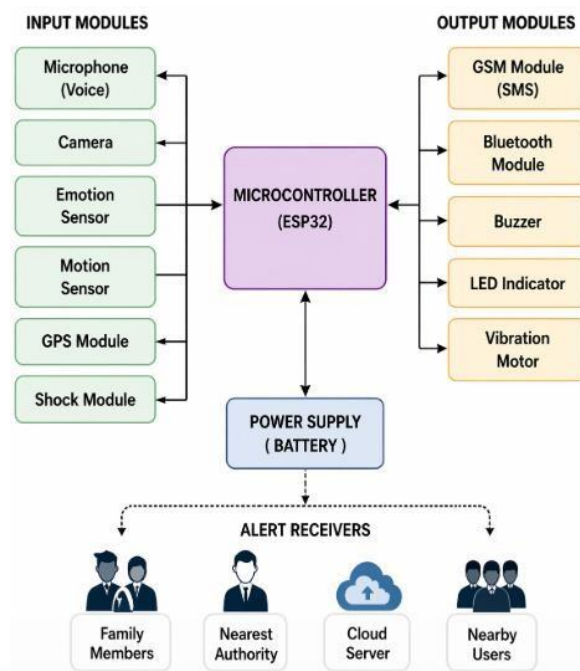
LITERATURE SURVEY

Existing women safety systems use mobile apps, GPS, and IoT devices, but they rely on manual activation and internet connectivity, highlighting the need for an advanced system with automatic detection and offline alert features.

Research/ System	Features	Limitations
Smart Safety Jacket (2021)	GPS, panic button, SMS alert	Manual activation, No Ai detection
Ai Based Safety Device (2022)	AI for fall detection	No voice/emotions detection
IOT Safety Band (2022)	SOS button, Location tracking	Internet department, No smart routing
Women Safety App (2023)	Location sharing, Emergency call	Needs smartphone, manual operation



SYSTEM ARCHITECTURE



VII. WORKING FLOW

The smart safety jacket uses sensors and AI to detect distress, capture location and images, alert contacts, suggest safe routes, and activate self-defense if needed. It continuously monitors the user's condition and automatically triggers emergency support and protection features when danger is detected. Ensures user safety, enhances protection and ensures user safety in emergencies.

The **Smart Women Safety Jacket** is designed to protect women by keeping track of their well-being in real time. As soon as someone wears the jacket, built-in sensors—like a microphone, motion detector, and emotion sensor—start monitoring the user's voice, movements, and emotional state.

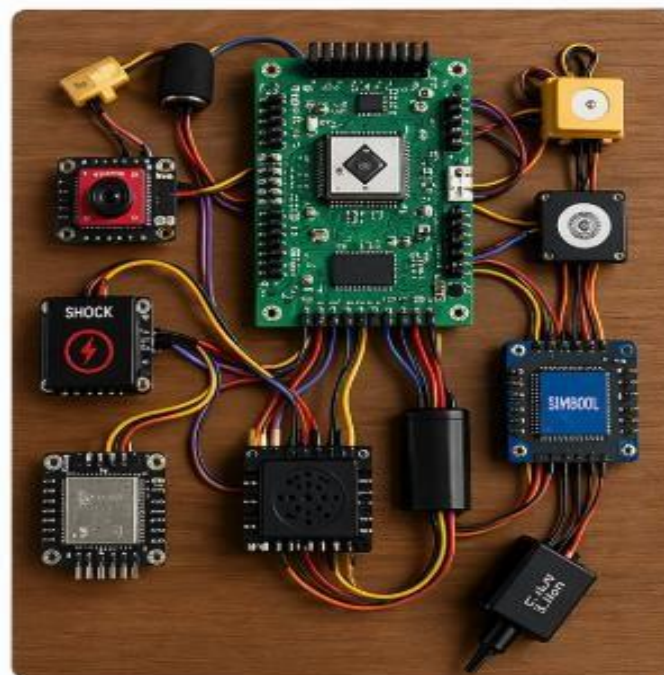
The smart system constantly analyses this information. If everything looks normal, it simply continues to watch quietly. But if it detects signs of distress—such as fear, panic, or unusual behavior—it immediately takes action. A smart camera captures images, the GPS module pinpoints the user's location, and emergency alerts are sent to family members, nearby users, and authorities through SMS, Bluetooth, or RF signals (whether online or offline). The system also suggests the safest route to nearby secure places like police stations or hospitals. In extreme cases, a non-lethal shock mechanism can be activated for self-defense.

In short, the jacket provides continuous monitoring, instant detection, quick alerts, and immediate support, making it a reliable companion for women's safety.

The **Smart Women Safety Jacket** is a wearable device designed to provide continuous protection by monitoring the user's voice, movements, and emotions through built-in sensors. The system uses AI to analyse the data in real time and quickly spot any signs of distress such as fear or panic, and if danger is sensed, it automatically activates safety measures including capturing images with a smart camera, sending emergency alerts with live GPS location to family, nearby users, and authorities, and guiding the wearer to the nearest safe place like a police station or hospital. In extreme cases, a non-lethal shock mechanism can be triggered for self-defense, ensuring quick response and reliable support for women's safety.

HARDWARE COMPONENTS

The hardware components form the core of the smart safety jacket by collecting data, processing it, and generating alerts. The ESP32 microcontroller acts as the main controller, while sensors like microphone, motion sensor, and emotion sensor collect real-time inputs. The GPS module provides location tracking, and GSM/Bluetooth modules are used for communication. The camera captures images during emergencies, and the shock module is used for self- defense. Additional components like buzzer, LED, vibration motor, and battery support alerting and power supply.



The Smart Women Safety Jacket is powered by an **ESP32 microcontroller**, which acts as the brain of the system. It includes a **microphone** to capture voice signals, a **camera module** for image recording, and both **emotion** and **motion sensors** to track the wearer's state and movements. A **GPS module** provides live location data, while a **GSM module** ensures communication through mobile networks. For connectivity, a **Bluetooth module** is built in. In extreme situations, a **shock module** can be activated for self-defense, supported by alert features like a **buzzer, LED lights, and a vibration motor**. The entire system runs on a **battery**, making it portable and reliable for continuous safety monitoring.

TECHNOLOGIES USED

The proposed **Smart Safety Jacket** combines modern technologies to deliver real-time protection and intelligent response. It uses **Artificial Intelligence (AI) and Machine Learning** to analyze voice and emotion, automatically detecting signs of distress. Through the **Internet of Things (IoT)**, sensors, the microcontroller, and the mobile application communicate seamlessly.

- **AI & Machine Learning** – analyze voice and emotions to detect distress
- **IoT Integration** – connects sensors, microcontroller, and mobile app
- **Embedded Systems (ESP32)** – handle data processing and control
- **Sensors (Microphone, Motion, Emotion)** – collect real-time data
- **GPS Technology** – track live location and suggest safe routes
- **GSM, Bluetooth, RF Communication**– send alerts online and offline
- **Camera Module** – capture real-time images during emergencies
- **Mobile Application** – display alerts, location, and route information

Together, these technologies ensure continuous monitoring, quick alerts, and immediate support, making the jacket a reliable solution for women's safety.

MOBILE APP INTERFACE

- Displays real-time safety status of the user (Safe/Unsafe).
- Sends and shows emergency alerts when distress is detected. Provides GPS-based safe route to nearby safe locations.
- Allows tracking of user's live location. Stores alert history with date and time details.
- User-friendly interface for quick access and response.



VI. JACKET DESIGN



The above image represents the design and working components of the Smart Women Safety Jacket, showing both the front view and back view along with integrated safety features. In the front view, important user-interaction components are placed. A microphone is used to capture voice signals, which helps in detecting distress through AI-based voice and emotion analysis.

The status LED indicates the current condition of the system such as normal or alert mode. A heart rate sensor monitors the user’s pulse and stress level, which helps in identifying abnormal conditions. The power button is provided to turn the system ON or OFF easily. In the back view, components related to tracking and emergency response are integrated. The GPS antenna/module continuously tracks the user’s live location.

A camera module is placed to capture real-time images during emergency situations, which can be used as evidence. The motion sensor detects unusual or sudden movements, such as running or falling, indicating possible danger. The vibration motor provides instant alerts to the user through vibration.

At the bottom of the design, the key features of the **Smart Safety Jacket** are highlighted. The jacket uses **AI processing** to analyze voice, motion, and emotion, allowing it to detect distress automatically. It supports **alert communication** through SMS, Bluetooth, RF, or GSM modules, while the **camera module** captures images during emergencies. A **GPS system** provides live location tracking and suggests safe routes to nearby secure places. In extreme situations, a **self-defense shock module** can be activated. The jacket is built with **wireless connectivity, embedded sensors, and a long-lasting battery**, ensuring continuous operation. Overall, this design shows how multiple technologies are integrated into a single wearable system to deliver real-time monitoring, quick alerts, and enhanced safety for women.

FUTURE SCOPE

The **Smart Safety Jacket** can be improved further by integrating advanced technologies. Instead of only capturing images, it could support **real-time video streaming**, allowing continuous monitoring during emergencies. Direct **connection to police control rooms** would enable faster response and action. In the future, more advanced **AI models** could predict dangerous situations before they occur by analyzing behavior patterns and surroundings. Linking the system with **smart city infrastructure and CCTV networks** would strengthen tracking and safety. Additional features like **biometric authentication** and **health monitoring** (blood pressure, oxygen levels, etc.) could also be added, making the jacket not just a safety device but a comprehensive personal protection and wellness tool.

The **Smart Safety Jacket** can be made even more effective with future enhancements. Improvements in **battery technology** would allow longer usage time, while the use of **lightweight smart fabrics** could make the jacket more comfortable and efficient. These upgrades would make the system more intelligent, reliable, and practical for everyday use.

- Real-time video streaming instead of image capture
- Direct connection with police control rooms for faster response
- Advanced AI to predict danger before it happens

- Integration with smart city infrastructure and CCTV systems
- Improved battery life and lightweight smart fabrics

CONCLUSION

The **Smart Women Safety Jacket with AI Distress Detection** is designed as a practical solution to enhance women's safety in everyday situations. By combining **Artificial Intelligence, IoT, sensors, and communication systems**, the jacket can automatically detect distress without requiring manual input. Key features include **voice and emotion detection, an offline alert system, live location tracking, safe route suggestions, camera-based evidence capture, and a self-defense shock mechanism**. With these integrated technologies, the jacket ensures **real-time monitoring, quick response, and reliable protection**, ultimately boosting personal security and confidence while offering an innovative approach to women's safety.

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