NIRBHAYA: IOT Based Women Security Vehicle

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Abstract: The project "NIRBHAYA: IoT-Based Women Security Vehicle" is designed to enhance the safety of women through an integrated system featuring a speech recognition module, buzzer, panic button, GPS, GSM, and camera. Upon pressing the panic button, the system is activated, triggering the buzzer and the camera to capture 3-4 photos. These photos are sent to the user's emergency contacts and the nearest police station via Telegram. Concurrently, a text message containing the vehicle ID, location, and a danger alert is sent through the GSM module. If the user is unable to press the button, predefined keywords can be spoken to activate the system and initiate the emergency protocol. This comprehensive approach ensures immediate assistance and accurate location tracking, significantly improving response times during emergencies.

Index Terms: Women Safety Vehicle, IoT Security System, Emergency Buzzer, GPS Tracking, GSM Communication, Real-Time Camera Activation, Emergency Contact Alerts, etc.

I. INTRODUCTION

In today's world, ensuring the safety and security of women is paramount. Our project, z, is an innovative IoT-based women security vehicle designed to provide immediate assistance in times of distress. This system integrates multiple cutting-edge technologies, including a speech recognition module, buzzer, panic button, GPS, GSM, and a camera, to create a robust and reliable safety solution.

Upon pressing the panic button, the system is activated, triggering a series of automated responses. The buzzer sounds an alarm, drawing attention to the vehicle. Simultaneously, the camera captures three to four photographs, which are sent to the user's emergency contacts and the nearest police station via Telegram. Additionally, a text message is dispatched through the GSM module, containing the vehicle's ID, location, and a distress message, ensuring that help is on the way even if the user cannot verbally communicate their situation.

Moreover, if the user is unable to press the panic button, the system can be activated through predefined voice commands. These commands are integrated into the system's code, allowing the user to initiate the safety protocols using specific phrases. This dual activation method ensures that the system is accessible and functional in various emergency scenarios, providing a reliable safety net for women on the move.

NIRBHAYA exemplifies the integration of modern technology to address a critical social issue, combining real-time data transmission, immediate alert mechanisms, and user-friendly activation methods to enhance personal security and peace of mind.

II. EXISTING HARDWARE

The NIRBHAYA project focuses on enhancing women's safety through an integrated IoT-based vehicle security system. This system is designed to provide immediate assistance and alert authorities in emergency situations. The following hardware components are utilized:

1. **Speech Recognition Module**: Allows the user to activate the system using predefined voice commands if they are unable to press the panic button.

2. **Buzzer**: Emits a loud sound to attract attention and deter potential threats when the system is activated.

3. **Panic Button**: A manual activation switch that initiates the security protocol, triggering all subsequent safety measures.

4. **GPS Module**: Tracks the real-time location of the vehicle and provides accurate coordinates for emergency response.

5. **GSM Module**: Sends text messages containing the vehicle's ID, location, and a predefined danger message to emergency contacts and nearby police stations.

6. **Camera**: Captures 3-4 photos when the system is activated, sending these images to designated contacts via Telegram for visual confirmation and additional context.

7. **User-friendly interface -** The display and user interface are essential for women drivers, providing them with the sending of information in dangerous case to any emergency contact number (which can also be customised) and nearest police station.

"NIRBHAYA: IoT Based Women Security Vehicle." Despite integrating modules like Speech Recognition, Buzzer, Panic Button, GPS, GSM, and Camera, user activation remains a challenge. However, predefined code-triggered commands facilitate system activation for seamless functionality.

III. WORKING METHODOLOGY

Sure, here's a breakdown of the working methodology of the NIRBHAYA project, divided into two parts: manual activation and speech activation.

Manual Activation:

1. Button Press: The user initiates the integrated system by pressing a designated button.
2. Buzzer Activation: Upon button press, a buzzer is activated to attract attention.
3. Photo Capture: Simultaneously, the camera captures 3-4 photos.
4. Emergency Message Dispatch: The system sends the captured photos, along with the user's emergency contacts and the nearest police station's information, via Telegram.
5. Text Message Notification: Additionally, a text message is sent via GSM, containing the vehicle's ID, its current location, and a predefined danger message.

Speech Activation:

1. Voice Command Recognition: Users can activate the system by uttering predefined words recognized by the speech recognition module.
2. Integration Activation: Upon recognizing the command, the system integrates all its functionalities.
3. Buzzer Activation: Similar to manual activation, the system activates the buzzer for attention.
4. Photo Capture: The camera captures 3-4 photos as evidence.
5. Emergency Communication: Using Telegram, the system dispatches the captured photos, user contacts, and nearby police station details.
6. Text Notification: A GSM text message is sent out, including the vehicle's ID, current location, and a predefined danger message.

In summary, NIRBHAYA's manual activation involves physical button pressing, while speech activation relies on voice commands recognized by the system. Both methods trigger a series of actions aimed at ensuring women's safety, including alerting emergency contacts and authorities with necessary information.

IV. BLOCK DIAGRAM

[Part-1] MANUAL ACTIVATION (Figure-1)

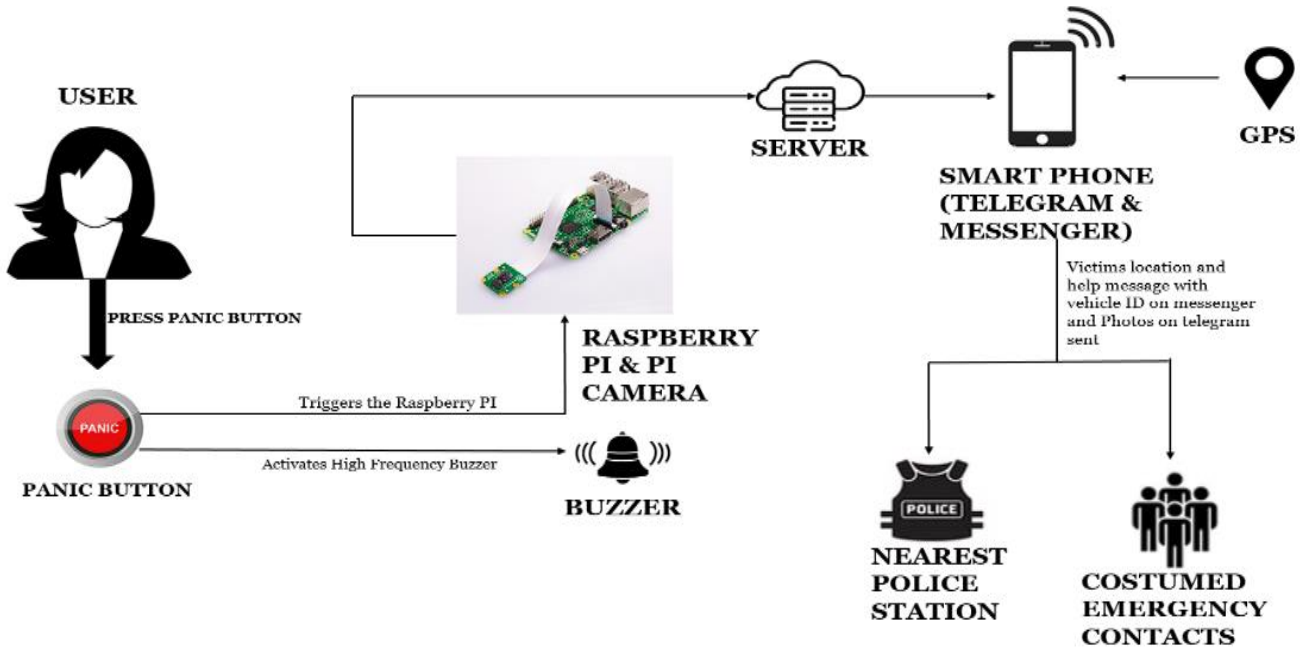


Figure 1. MANUAL ACTIVATION of the System

[Part-2] VOICE ACTIVATION (Figure-2)

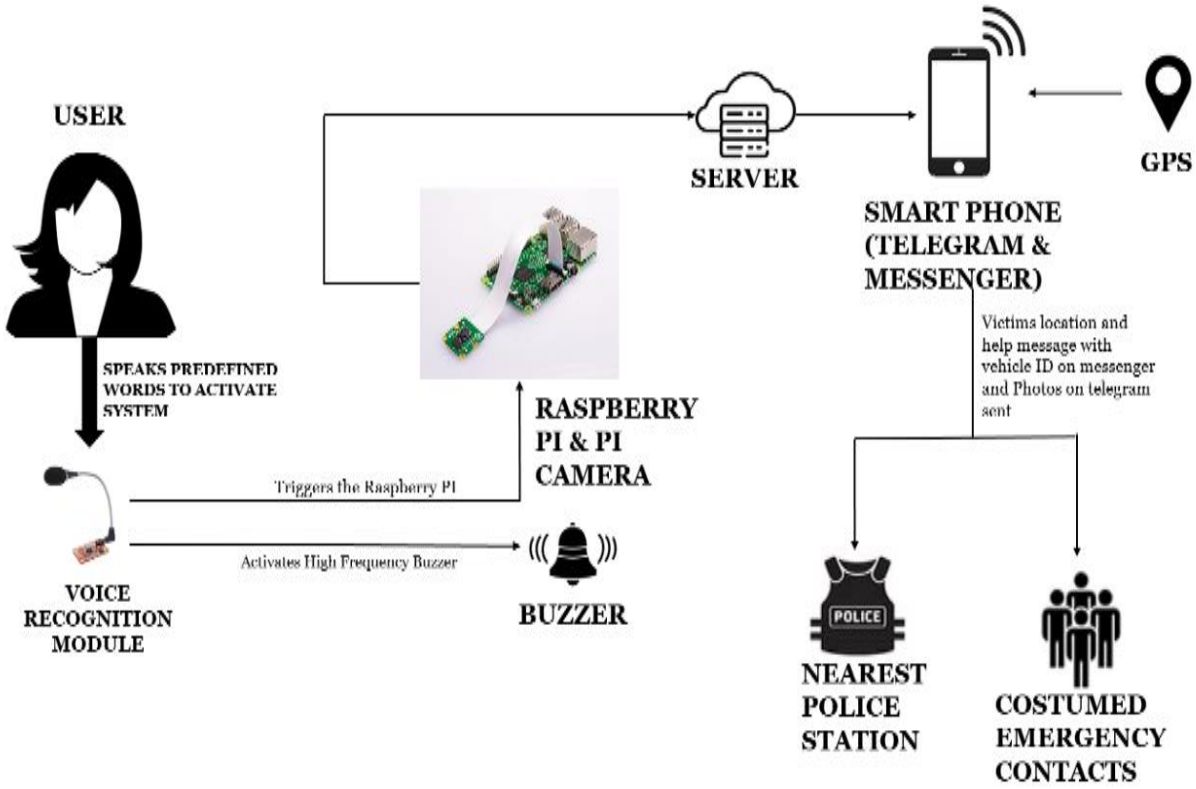


Figure 2. SPEECH ACTIVATION of the system

V. HARDWARE DETAILS

1. Raspberry PI 4 Model B

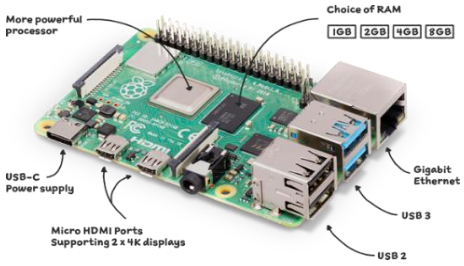


Figure 3. Raspberry PI 4 Model B

The Raspberry Pi 4 Model B, a compact yet powerful single-board computer, serves as the heart of IoT women security vehicles. Its hardware includes a quad-core ARM Cortex-A72 processor, up to 8GB of RAM, and various connectivity options like Wi-Fi and Bluetooth. Paired with sensors, cameras, and GPS modules, it enables real-time monitoring of vehicle location, surroundings, and occupant safety. The Raspberry Pi facilitates data processing, communication with cloud servers for alerts and remote management, and integration with vehicle systems for immediate responses to emergencies. Its versatility, low cost, and community support make it ideal for enhancing women's safety in IoT-enabled vehicles.

2. Panic Button and Buzzer

Figure 4. Panic Button and Buzzer

The PANIC BUTTON in IoT women security vehicles typically consists of a durable, easily accessible physical switch integrated with microcontroller-based hardware. When activated, it triggers a rapid alert system, transmitting distress signals to designated contacts or emergency services. The BUZZER, also part of the setup, emits a loud, attention-grabbing sound to alert nearby individuals of the emergency. Both components are crucial for ensuring quick response in potentially dangerous situations, providing an immediate means of communication and summoning assistance. These hardware elements are pivotal in enhancing the safety and security features of IoT-enabled women's security vehicles.

3. GPRS SIM800L GSM Module with Antenna

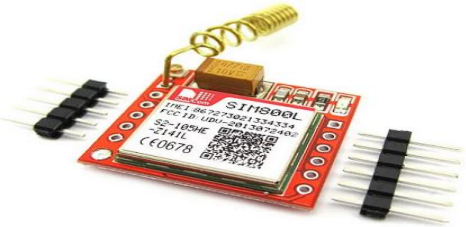


Figure 5. GPRS SIM800L GSM Module with antenna

The GPRS SIM800L GSM Module with antenna serves as a crucial component in IoT women security vehicles. This hardware enables real-time communication via GPRS (General Packet Radio Service) and GSM (Global System for Mobile Communications) networks. Its compact design facilitates seamless integration into vehicle systems, ensuring constant connectivity for tracking and emergency alerts. The module's robust antenna enhances signal reception, vital for remote monitoring and distress signalling in critical situations. With low power consumption and reliable performance, it safeguards women by enabling swift communication with authorities or designated contacts, reinforcing safety measures in vehicles tailored for their protection.

4. SIM28ML GPS Receiver Module with GPS Antenna

Figure 5. SIM28ML GPS Receiver Module with GPS Antenna

The SIM28ML GPS Receiver Module, coupled with a GPS antenna, is integral to IoT-based women's security vehicles. This compact module features high sensitivity, low power consumption, and fast signal acquisition, making it ideal for real-time location tracking. It operates with a supply voltage of 3.0-4.3V and supports UART interfaces for easy integration with microcontrollers. The included GPS antenna enhances signal reception, ensuring accurate and reliable positioning. This setup provides continuous monitoring and geofencing capabilities, enabling rapid response in emergencies and enhancing the overall safety of women in transit.

5. Raspberry PI 5MP Camera Board Module

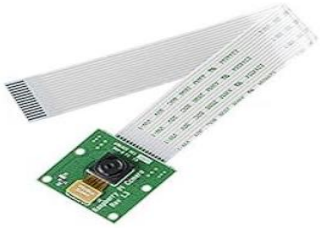


Figure 6. Raspberry PI 5MP Camera Board Module

The Raspberry Pi 5MP Camera Board Module is a compact, high-quality camera designed for integration with Raspberry Pi devices. It features a 5-megapixel OV5647 sensor capable of capturing 2592 x 1944-pixel static images and 1080p video at 30fps. This module is ideal for IoT applications due to its small size and compatibility with the Raspberry Pi, making it perfect for a women's security vehicle. It can be used for real-time monitoring and recording, enhancing safety through surveillance and immediate data transmission to a connected network for prompt response and action.

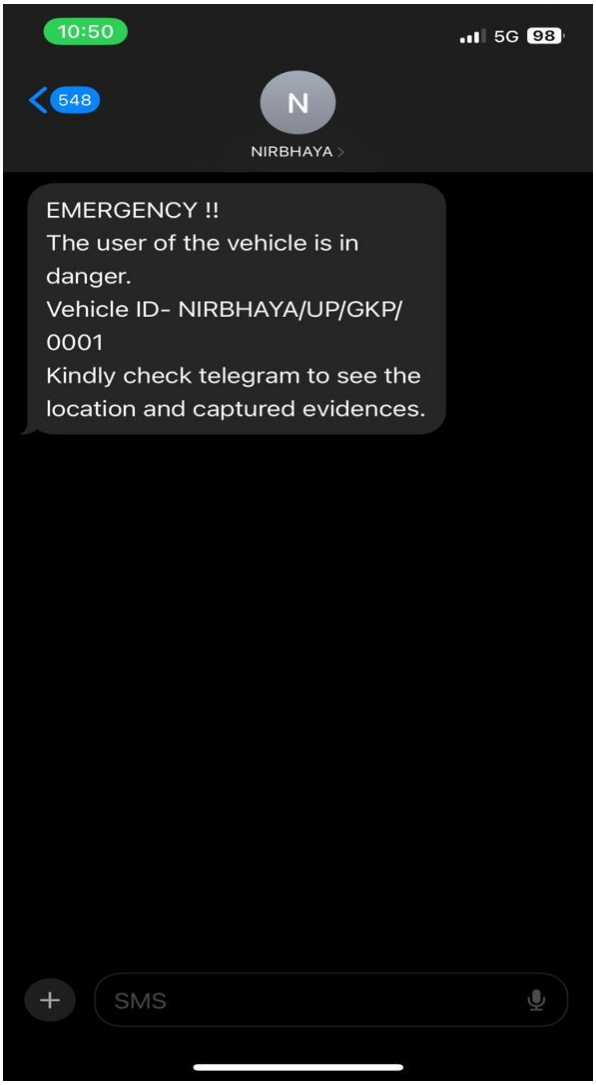
6. Speech Recognition V3 Module

Figure 7. Speech Recognition V3 Module

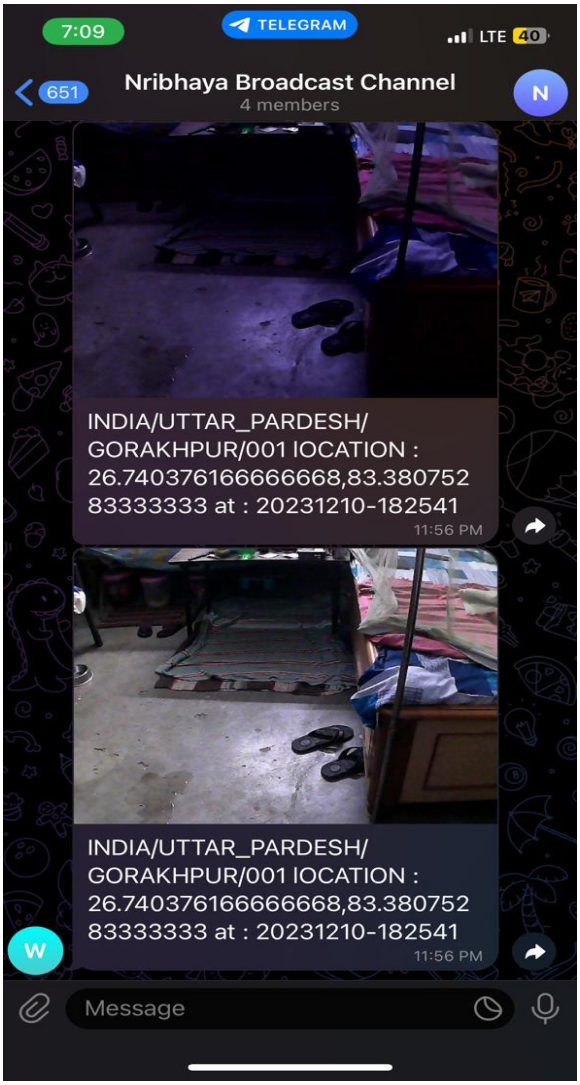
The Speech Recognition V3 Module is a compact, user-friendly device designed for integrating voice control into IoT applications, such as a women's security vehicle. It features a highly efficient speech recognition IC and a built-in microphone, capable of recognizing up to 80 voice commands. This module supports both serial and GPIO interfaces, making it versatile for various microcontroller platforms. In a women's security vehicle, it enables hands-free operation, allowing users to activate alarms, send distress signals, or control other vehicle functions through voice commands, enhancing safety and convenience.

VI. HARDWARE RESULT

1. After pressing the panic button or saying the predefined words the system will get activated.
2. An emergency message will be sent on the emergency contact given by user (which can also be customised) and to the nearest police station.
3. Photos captured by the camera will be sent on telegram of that respective emergency contact number with the location of victim's vehicle.



Emergency Message on Messenger



Photos as evidence and location of the user's vehicle

VII. ADVANTAGES

Here are five advantages of the project titled "NIRBHAYA: IoT-Based Women Security Vehicle":

1. **Enhanced Safety through Multiple Alerts**: By pressing the panic button, the system triggers a multi-layered alert mechanism. It activates a buzzer to draw immediate attention, captures photos, and sends them along with a location-based emergency message to both emergency contacts and the nearest police station via Telegram and GSM, ensuring swift assistance.
2. **Speech Recognition for Hands-Free Activation:** The inclusion of a speech recognition module allows users to activate the safety system using predefined words. This feature is crucial if the user is unable to physically press the button, providing an additional layer of accessibility and security.
3. **Real-Time Location Tracking**: The integration of GPS ensures that the exact location of the vehicle is sent in the emergency message. This real-time tracking is vital for quick response and rescue operations, significantly reducing the response time in emergencies.
4. **Comprehensive Evidence Collection**: The camera module captures 3-4 photos immediately after the panic button is pressed. These photos are crucial for providing visual evidence, which can aid in identifying suspects and understanding the situation, thereby assisting law enforcement agencies effectively.
5. **Automated Communication System:** The GSM module sends an automated text message containing the vehicle ID, location, and a danger message. This automation ensures that the alert is sent without any delay, allowing for a prompt response from emergency services and designated contacts, enhancing the overall effectiveness of the security system.

VIII. CONCLUSION

The NIRBHAYA: IoT-Based Women Security Vehicle project represents a significant advancement in personal safety for women through the integration of modern technologies. This system is equipped with a speech recognition module, a buzzer, a panic button, GPS, GSM, and a camera. By pressing the panic button, the user activates the entire security system. The buzzer immediately sounds an alert, while the camera captures 3-4 photos, which are sent to the user's emergency contacts and the nearest police station via Telegram. Simultaneously, a text message containing the vehicle's ID, its current location, and a danger alert is sent through GSM.

In scenarios where the user is unable to press the panic button, they can activate the system using predefined voice commands integrated into the system's code. This feature ensures that the user can still trigger the alert mechanism and summon help using speech alone. This multi-faceted approach leverages IoT technology to provide a robust and reliable safety net, enhancing the security and peace of mind for women on the move. The NIRBHAYA project exemplifies the potential of integrating various technological components to create a comprehensive safety solution, setting a new standard in the realm of personal security.

IX. REFERENCES

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