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Project Synopsis Template (2024-25) - Sem V

SurakshaSaKey - Ensuring Safety for All Ages...

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Abstract

In today's world, ensuring personal safety is a significant concern, particularly in urban areas. SurakshaSaKey is a Smart Personal Safety Keychain designed to enhance security for women, elderly individuals, young children, and in vehicle accidents. This AI-powered device continuously monitors for distress signals such as rapid movement or loud noises. It automatically sends alerts, including the user's location, to emergency contacts. The companion app, connected to the device, offers features like Emergency Contact, History of Alerts, and Location Behavior warnings to provide comprehensive safety coverage.The SurakshaSaKey aims to offer a sense of security and peace of mind.

Introduction

Personal safety in urban environments is a growing concern due to rising crime rates. Traditional safety devices and mobile apps often fall short in emergency situations, requiring manual

activation or access to a phone. The SurakshaSaKey is designed to address these shortcomings by providing a reliable, automated, and discreet personal safety device. This AI-driven keychain can detect distress signals, such as rapid movement or loud noises, and automatically send alerts with the user's location to emergency contacts. It aims to cater to a wide range of users, including women, the elderly, young children, and individuals involved in vehicle accidents.

Problem Statement

Current safety devices and mobile apps frequently fall short in critical emergency scenarios due to their dependence on manual activation or the necessity of phone access. This reliance poses significant challenges, as traditional personal alarms require users to manually activate them, a task that can be nearly impossible under high-stress conditions where immediate action is crucial. Similarly, mobile apps, which are designed to alert emergency contacts, rely on the user's ability to access and interact with their phone during a crisis. This dependency can be impractical when the user is incapacitated or unable to use their device effectively. Consequently, there is a clear need for a compact, reliable, and fully automated personal safety device capable of swiftly detecting distress signals—such as unusual motion or loud noises—and providing precise location information to emergency contacts without requiring any manual intervention or phone access.

Proposed Solution

The SurakshaSaKey effectively addresses the limitations of traditional safety devices and mobile apps by offering a discreet, always-on solution that utilizes advanced AI technology to monitor and detect distress signals. This innovative device is designed to continuously analyze data from its sensors, which include accelerometers and microphones, to identify indicators of distress such as rapid, erratic movement or loud, distressing sounds. Upon detecting such signals, the keychain automatically sends alerts to pre-defined emergency contacts, including precise location information, without requiring any manual intervention from the user. This automated response system is intended to enhance personal security by ensuring that help can be summoned swiftly and accurately, even in high-stress situations where manual activation or phone access may not be feasible.

Furthermore, the project expands its scope to cater to a diverse range of users, including children, women, the elderly, and vehicle drivers. For children and elderly individuals, the keychain provides an added layer of safety by detecting falls or unusual movements, while for women, it offers enhanced protection against potential threats. Vehicle drivers benefit from the keychain’s ability to detect accidents or sudden impacts, ensuring timely alerts in case of vehicular incidents. To complement the keychain, a companion app developed in Flutter will facilitate seamless connection and interaction with the device. This app will enable users to customize their alert settings, manage emergency contacts, and monitor the device’s status, thereby

providing a comprehensive and user-friendly solution for personal safety and emergency response.

Methodology / Block Diagram

System Architecture

- Sensors
  - Accelerometer: Monitors motion patterns to detect rapid movements.
  - Microphone: Captures and analyzes loud noises or vocal distress signals.
- Microcontroller
  - Data Processing: Receives input from sensors, processes data, and runs machine learning models for distress detection.
  - Decision Making: Determines if distress conditions are met and triggers alerts.
- Machine Learning Model
  - Distress Detection: Analyzes sensor data to identify distress signals based on pre-trained algorithms.
- GPS Module
  - Location Tracking: Provides real-time location data to be included in emergency alerts.
- Communication Module
  - Alert Transmission: Uses Bluetooth (or Wi-Fi) to send distress alerts and location information to emergency contacts or a mobile app.
- Power Management
  - Battery Management: Ensures efficient power usage and manages battery life through charging circuits and regulators.
- Enclosure
  - Protection: Houses and protects all internal components in a compact, portable design.

Block Diagram

The block diagram of the SurakshaSaKey includes the following components:

1. Sensors (Accelerometer, Microphone)
2. Microcontroller (ESP32)
3. Machine Learning Model
4. GPS Module
5. Communication Module (Bluetooth/Wi-Fi)
6. Power Management Circuit
7. User Interface (Optional)

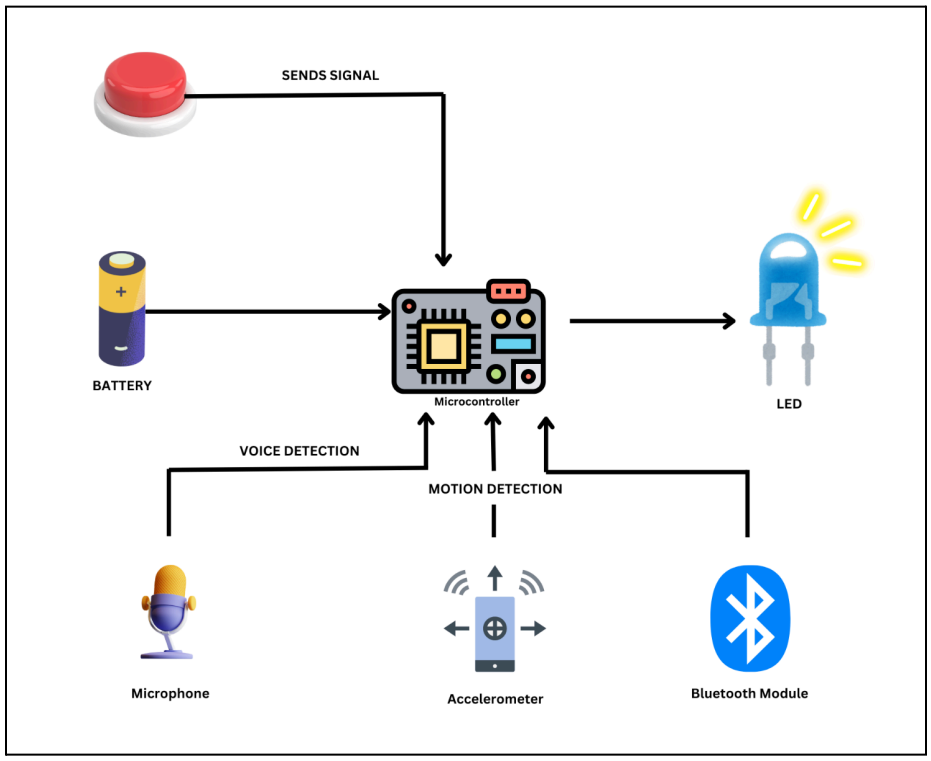

Fig. 1 Block Diagram of Circuit

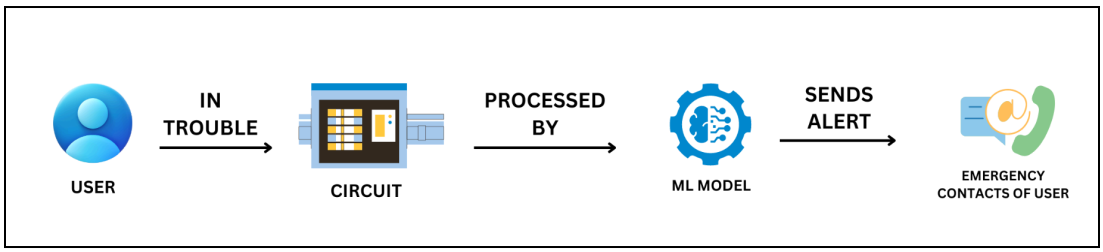

Fig. 2 Flow of Entire Model

Hardware , Software and tools Requirements

Hardware

Accelerometer: Detects rapid movement or unusual motion.
Microphone: Captures loud noises or vocal distress signals.
Microcontroller: Manages sensor data processing and communication.
Battery: Powers the keychain and its components (e.g., Rechargeable Li-ion, Li-Po Battery).

Bluetooth Module: Enables wireless communication.
GPS Module: Provides location data.
Power Management Circuit: Manages battery usage and charging.
Enclosure: Protects internal components, compact design (Custom-designed Plastic/Metal Casing).

Software
Distress Detection Model: Machine learning model to identify distress signals.
Communication Module: Handles sending alerts and location information (Bluetooth or Wi-Fi based communication).
Power Management Software: Manages battery usage and extends battery life (Software integrated with the microcontroller).
User Interface: Provides status updates and control options using an application designed for customizing the device.

Tools
Development Tools: Integrated Development Environment (IDE) for microcontroller programming (e.g., Arduino IDE, PlatformIO).
Machine Learning Tools: Frameworks for training and deploying ML models (e.g., TensorFlow, PyTorch).
Mobile App Development: Frameworks for developing the companion app (Flutter).

Proposed Evaluation Measures

- Enhanced Personal Safety: The device should provide real-time monitoring and immediate emergency alerts, significantly improving personal safety in various situations, including accidents, assaults, and other emergencies.
- Rapid Emergency Response: By sending instant notifications with the user's live location to emergency contacts, the device should enable quicker response times from family, friends, and emergency services.
- Increased Peace of Mind: Users and their loved ones should feel peace of mind knowing they have a reliable tool for emergency situations, beneficial for vulnerable groups such as children, the elderly, and those with medical conditions.
- User-Friendly Customization: The accompanying Flutter app should allow users to easily set up and customize their emergency contacts and preferences, making the technology accessible and adaptable to individual needs and circumstances.

Conclusion

The SurakshaSaKey revolutionizes personal security by integrating AI-driven distress detection with real-time alert capabilities. Its sleek, compact design houses advanced sensors like accelerometers and microphones that continuously monitor for signs of distress, such as sudden movements or loud noises. The AI algorithms analyze this data to swiftly identify emergencies and automatically send alerts, including the user's exact location, to emergency contacts. This ensures timely and accurate assistance without the need for manual activation. Designed to enhance user safety in high-stress situations, the SurakshaSaKey provides peace of mind knowing help is always within reach. Future enhancements will include longer battery life, additional environmental sensors, and integration with community safety networks, expanding its impact. With its blend of innovative technology and user-friendly design, the SurakshaSaKey promises significant advancements in personal safety and emergency response.

References

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