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Emergency Alert System for Physically Disabled and Senior Citizen

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Abstract

This paper focuses on the need for enhanced personal safety, which is particularly critical for senior citizens and individuals with physical disabilities. Many current devices require internet access or manual operation, which can be impractical in certain situations. While emergency phone apps and personal safety devices offer some functionality, they often lack integration of real-time location tracking and immediate alert systems, making them less effective for those with limited mobility. The user-friendly design of our Emergency Alert System ensures easy activation, making it ideal for seniors and those with physical limitations. The system specifically addresses these challenges by combining a loud alarm with GPS technology, enabling effortless distress signaling without the need for an internet connection. This project empowers users to alert caregivers and authorities quickly, significantly enhancing their safety and peace of mind.

Key words — Emergency Response System, Panic Button, GPS Module, Real-Time Location, GSM Module, Personal Safety

I. INTRODUCTION

Personal safety is a concern in the modern world, particularly for vulnerable populations like the elderly and people with disabilities. These groups could encounter difficulties in calling for help when they are in an emergency because they have mobility issues, cognitive impairments, or limited accessibility to communication equipment. Consequently, there is a compelling need for systems that are accessible and dependable to provide help in such situations of urgency. This project seeks to fill this gap by creating a user-friendly emergency alert system for seniors and persons with disabilities that guarantees assistance can be easily and quickly called upon when needed.

The system proposed functions through the integration of a panic button that may be pressed during an emergency. When activated, the system retrieves the user's location in real time using a GPS module. This location information is then forwarded to caregivers or authorities through SMS, sent over a GSM module. Aside from notifying through the alarm, a buzzer is audible to send sound signals to notify people within vicinity that rescue services are being called, boosting attention towards the signal of distress. The fact that the system, being simple one-button to activate, does not require specialized use means anyone regardless of experience level can apply the system well while in emergency.

This system is cost-effective, simple to use, and practical, and it offers an instant, life-saving solution for the person who might be in peril but cannot call or communicate in the conventional way. Using GPS and GSM technologies, the system offers real-time tracking and instant communication, which are important in emergency cases. The overarching purpose of this project is to increase the security, autonomy, and peace of mind for vulnerable citizens so that they can feel more confident in their lives while having assistance always at their fingertips

II. LITERATURE REVIEW

The primary range of the "Emergency Alert" application is to dial and also message (SMS) the current location where we happen to be, to some specific contacts either through shaking the phone or by pressing the "Help" button in the application. In this system the user is required to enter two or more contact numbers, in case of emergency after triggering the emergency alert system, the system transmits the user's current location using SMS to all chosen contacts and dials one of the numbers entered into the system [1].

In this thesis the hand gesture recognition of the unit is tested on Arduino mega microcontroller board by using GSM module and Arduino ide software with a precise result of 98%. The output of the proposed system greatly depends upon the result of the

hand gesture. Sign language is the medium of disabled people to express their feelings or thoughts to others. But their communication is limited to other disabled individuals as normal who are unable to comprehend what they intend to communicate. The vision-based solutions can surmount some of their challenges and disadvantages, they seem to be the optimal option for raw data collection. This system translates the sign language into voice and on LCD which is easily comprehensible by disabled and normal individuals. Also, it is a low-cost, portable and effective solution [2].

Here, they critically assess the potential of smartphones and handheld devices which can respond effectively and effectively in emergency cases and the emergency management systems/teams may be informed in a timely manner. In addition, various user's behavior and thoughts are discussed in this research paper based on smartphone emergency management apps and the intelligence employed by various mobile phones to react to emergency and crises situations is also included in this research paper [3].

This article has discussed the varied role of wearable technology in medicine, specifically its influence on patient monitoring, healthcare outcomes, challenges, future direction, and ethics. In the understanding of patient monitoring, we explored how wearables enable ongoing health monitoring, remote patient monitoring, and chronic disease management. Real-time vital sign monitoring, early warning of health anomalies, and the capacity to lower hospital readmissions demonstrate the promise of wearables to transform patient care. The healthcare outcomes discussion emphasized how wearables help improve patient engagement, personalized medicine, and positive changes in preventive care strategies [4].

III. System Overview

The Arduino Uno board, one of the most popular and widely used models in the Arduino family, is built around the ATmega328 microcontroller. The development of the Emergency Alert System involves selecting and integrating various hardware components, each playing a crucial role in ensuring the system works efficiently. The Arduino Uno operates at a clock speed of 16 MHz and offers 32 KB of flash memory for program storage, 2 KB of SRAM for temporary data, and 1 KB of EEPROM for non-volatile data.

a. Arduino Microcontroller:

Digital I/O Pins (D0 – D13): Fourteen digital input/output pins that can be configured for digital reading or writing. Analog Input Pins (A0 – A5): Six analog input pins used to read varying voltage levels from sensors.

Reset Pin: The reset pin allows for manually restarting the microcontroller and reloading the program. This can be useful for troubleshooting or restarting the system without disconnecting the power supply.

b. Panic Button

A Panic Button is a simple push-button device designed to allow users to signal an emergency with a single press. The Panic Button plays a critical role in emergency alert systems, providing an immediate means of communication and helping ensure a quick response in emergencies.

c. Neo-6M GPS Module

The Neo-6M GPS Module is a compact and reliable GPS receiver based on the u-blox NEO-6M chipset, designed to provide accurate location data for a variety of applications, including Emergency Alert Systems.

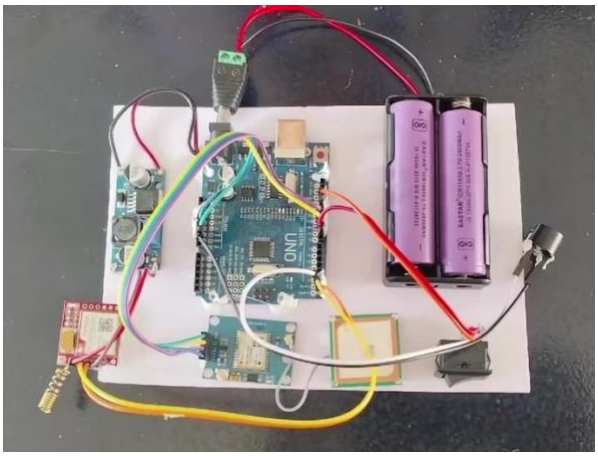

Fig.1: Working Mode

IV. Methodology

The Emergency Alert System is designed to provide immediate assistance to seniors and individuals with disabilities during emergencies. At its core, the system includes a panic button that users can easily activate.

When pressed, this button triggers the SIM800L module to send an instant distress signal to designated caregivers and emergency services, ensuring rapid notification of the situation. Simultaneously, the Neo-6M GPS module captures the user's

current location, which is sent along with the alert, allowing responders to reach the individual quickly.

In addition to the communication features, the system incorporates an audible buzzer that activates when the panic button is pressed. This buzzer serves to alert nearby individuals, encouraging them to provide immediate help. The combination of these elements is designed to enhance personal safety by ensuring that assistance is readily available in critical situations.

To support the system's functionality, various hardware components will be utilized, including the panic button, SIM800L module for reliable communication, Neo-6M GPS module for accurate location tracking, and an LM2596 Buck Converter for efficient power management. An Arduino or Raspberry Pi microcontroller will serve as the central unit, coordinating the various components and managing the alert process. Overall, this methodology focuses on creating a streamlined and effective Emergency Alert System that addresses the unique safety needs of vulnerable populations, ultimately improving their independence and security.

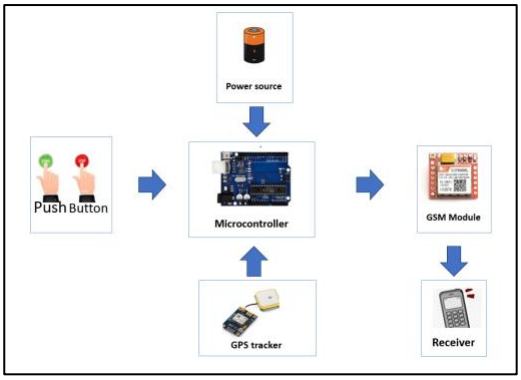

Fig.2: Block Diagram of Emergency Alert System for Physically Disabled and Senior Citizens

V. RESULT ANALYSIS

The emergency alert system designed for physically disabled individuals and senior citizens proved to be an efficient and reliable solution, leveraging GSM, GPS, Arduino Uno, a buck converter, a buzzer, and a Li-ion battery. The system successfully transmitted emergency alerts via GSM, accompanied by precise real-time location tracking through GPS integration. The Arduino Uno served as the core controller, coordinating input signals and ensuring seamless communication between the components. The buzzer provided an immediate audio alert to nearby individuals, enhancing the effectiveness of the system in emergencies. The buck converter regulated the power supply for stable operation, while the Li-ion battery ensured portability and prolonged functionality. The system demonstrated excellent performance, delivering timely alerts with accurate location data, stable power management, and robust functionality, offering a dependable safety mechanism for senior citizens and physically disabled individuals.

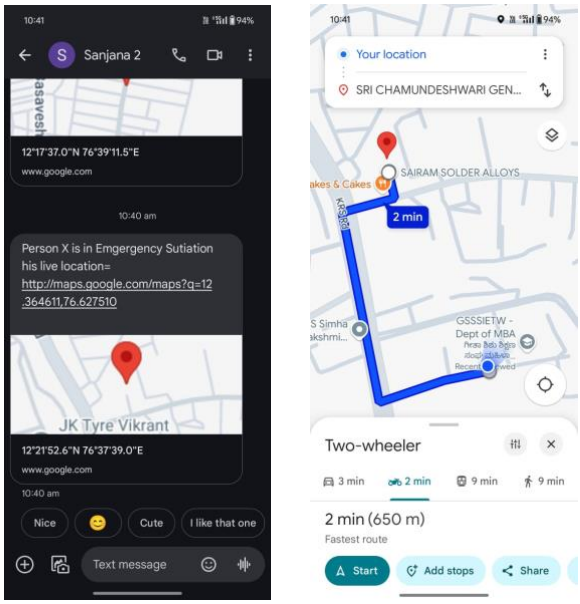

Fig.3: Location Tracking

VI. CONCLUSION

The emergency alert system for seniors and individuals with disabilities provides a practical solution for enhancing safety. By combining a GPS module, GSM module, panic button, and buzzer, it allows quick alerts to caregivers or emergency services with real-time location tracking. Its simplicity and ease of use make it accessible for those with limited technical knowledge. Future upgrades, such as voice assistants, health monitoring, wearable devices, and AI-based features like fall detection, will improve its functionality. Overall, this system can significantly enhance emergency response, offering greater peace of mind for users and their caregivers.

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