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Women Safety Emergency Calling System

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***Abstract*—Women Safety Emergency Calling System is a high-tech device. created to increase safety and security of women especially during emergencies. In most surroundings, women encounter threats, which include harassment, assault, and violence, amongst others. and conventional ways of asking assistance may be not prompt enough and not behind the scenes. This system is a mobile app, smartwatch, and real-time GPS tracker integration to offer. real time alerts and notifications. Through voice commands, automatic or panic button. voice recognition, women can promptly inform trusted parties or the authorities when they are at home. danger, provision of quicker and more effectual response. The Panic Button is one of the main characteristics of the system that is activated by a single touch. or article voice command via a mobile application or wearable gadget. The system transmits an on activation. alert and the actual location of the user, and in certain applications, starts a recorded live audio or video. Moreover, the Voice Detection algorithms may also be added to detect distress. autonomous triggers of an emergency response are any sounds, including shouting or a high-pitched voice. This makes sure that the alarm is notified even in the situation when the user cannot activate the alarm manually, providing a confidential and effective way of notifying the authorities or the loved ones without attracting attention. attention.**

***Index Terms*—Women Safety, GPS Tracking, Voice Detection, Emergency Alert System, IoT.**

I. Introduction

The safety of women nowadays is the burning question of our time with the growing concerns related to it. bullying, rape and beating in the streets and homes. Despite the ongoing efforts to these, governments, organizations and advocacy groups should act, personal security is one of the challenges that many women have to face on a daily basis. As a result of this increasing demand, technology has intervened by coming up with new solutions such as the Women Safety Emergency. Calling System. This system will ensure the women come up with a fast, convenient, and accessible system. guaranteed channels of communicating a rescue in case of emergency, sometimes all that the user has to do is press a button. These systems have empowered by using mobile devices, wearables, and special applications. women to be the ones who are able to control their own safety particularly under the circumstances of vulnerability. Most Women Safety Emergency Calling Systems are based on the core of the panic button feature, that enables users to contact the authority, friends, family, or any emergency responder. action. In most of the cases, the system can be turned on by pressing a special button on their. smartphone or a wearable device, such as a smartwatch or pendant. When activated, the system is able to send an emergency text to pre-determined contacts, as well as real-time GPS. location information, so that assistance can be given to the distressed woman as fast as possible. This immediate connection to help is provided to make users feel of reassurance and it becomes easier to users. Most of these systems also have voice detection in addition to the panic buttons. technology, which is able to identify distressing sounds such as shouting or abrupt sound automatically. raise in the amount of background noise. This enables this system to issue an alert even at a time when the user is. not able to activate the device with physical means because of the character of the threat. For example, in cases when a woman is being assaulted or when she is in distress, the system will be able to identify the sounds of. experience difficulties or verbal discomfort and automatically make a call to emergency contacts or officials, who give crucial details such as location and the type of emergency. This hands-free solution provides the ability to call the help even in cases where the user cannot do anything. themselves. A mix of panic buttons, live tracking of the location, voice recognition, and two-way. Women Safety Emergency Calling System is a powerful tool due to communication. protecting the female health. Such systems are meant to be non-discreet and non-obtrusive. intrusive where they can be activated by women without attracting attention to them. situations that could be considered hazardous. As an example, one can be silent alerts or voice commands. enabled to send an alert to contacts, but not to an attacker, giving an additional level of protection. protection. Moreover, other features like safety tips, risk assessment of, can also be found in many apps. community reporting, and other places, even more so, facilitating a feeling

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of safety. awareness.

II. RELATED WORK

Over the past few years, the increased concern regarding the safety of women has resulted in the rise of numerous technological solutions that strive to be as fast and effective as possible in case situations of an emergency occurred. The developers and researchers have been interested in mobile apps, wearable safety devices, and the Internet of things (IoT)-based systems to enhance personal security. The primary characteristics of these technologies include real-time communication services, tracking location, automated notification, and evidence gathering. Most safety solutions that are used today have more than one technology, which is aimed at minimizing the response time and enhancing the coordination of users and the emergency responders.

The most widespread of the solutions to improve the safety of women is mobile safety applications. Emergency alert features of these applications include SOS messaging and live location sharing as well as prompt communication with trusted individuals or authorities. There are also applications that enable one to record audio or video when in an emergency to give evidence and enhance the effectiveness of response. Some of the applications have also implemented voice-based activation features where a user can make predefined commands, which allow him or her to activate alerts when it is not possible to interact manually. The reason why these systems are so popular is that they are available and easy to install on smartphones. Mobile applications are usually however very reliant on network connectivity and device accessibility, and thus, their usefulness might be restricted under some conditions.

The use of wearable safety devices has also attained great attention because of their convenience and portability. All these gadgets are not only made to be small and convenient to carry around, but also fitted with panic buttons, GPS positioning systems and wireless communication devices. Other advanced wearable devices have voice recognition abilities that enable the user to enable alerts via voice command or boredom sounds. Wearable safety devices have been quite handy in such a scenario where a user is unable to reach his or her smartphones within a short period. Some researchers have discussed the implementation of sensors like accelerometers and motion detectors in the wearable computing to automatically detect atypical movement or fall and send alerts in case of emergency. In spite of these benefits, wearable devices could have issues associated with battery life, cost of devices and connection.

Besides mobile and wearable solutions, a number of IoT based safety systems have been suggested to enhance real time monitoring and communication. IoT systems are normally combined with microcontrollers, sensors, GSM communication modules, GPS modules to have automated safety systems. These systems are capable of sending location-based notifications of alerts and emergency to pre-set contacts or emergency services. There are also IoT-based solutions that have environmental sensors to detect unsafe environments and automatically raise alarms. Application of IoT technology allows the system to communicate faster, and it enhances the reliability of the system because it does not require manual operations.

Mobile safety platforms have also been launched by government and nonprofit making organizations to assist women in their security. Some of these applications created by the government include emergency alert buttons, direct communication with law enforcement zones, and tracking services over the location. These platforms will be aimed at improving the integration of people and emergency agencies, which will provide additional speed in responding to emergency cases. Moreover, sensitization and safety measures have promoted the use of such technologies by the people.

Even with the modern technique of safety among women, there are a number of restrictions. Most of the systems that exist rely too much on network connectivity which can also influence their performance in remote or low connectivity locations. There are also issues of false alerts, slow response, and low integration with emergency services with some systems. Additionally, the matters of user privacy and the security of data are still prominent when working with sensitive data including location data and personal information. These problems emphasize the necessity to develop better systems that would integrate various technologies to offer correct, credible, and swift emergency response. Thus, the given Women Safety Emergency Calling System is aimed at combining the features of GPS-tracking, GSM communication, voice recognition, and automatic alert systems to eliminate the drawbacks of the current ones. The proposed system would contribute to quicker reaction, increased stability, and enhanced individual security care in case of an emergency by integrating several technologies into the same system.

III. METHODOLOGY

The Safety Emergency Calling System that the authors propose to women is created through a systematic approach that fastens quick reaction and achieves credible communication in emergency scenarios. Embedded hardware components that have been used to design the system include arduino microcontroller, GPS, GSM, sound sensor, panic button and buzzer all of which combine to identify the presence of an emergency and create alerts. During the first phase, system requirements were considered in order to know the problems women encounter in the case of an emergency. The system was configured according to these needs, which included both manual activation with the help of a panic button and automatic one with voice recognition. The sound sensor picks up the distress sounds or predefined voice instructions, whereas the panic button provides it with a quick manual activation. In the implementation, Arduino IDE, embedded C language, was used in programing the system. Once the system is switched on, the Arduino interprets the input signals and gets real-time location data on the GPS module. The GSM module subsequently sends out an emergency message with location information to predetermined parties or to emergency

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responders. The system status LCD display is used to indicate system status and the buzzer is used to give audible alert to show that the system is activated. Lastly, system testing was also conducted in various simulated emergency scenarios to test and assess performance, response time, and accuracy. Manual and voice activation were both tested in different environments. The findings demonstrated that the system is effective in identifying an emergency and communicating an alert in the shortest time possible. Such an approach guarantees the proposed system is stable, easy to use, and practical in terms of the application to the real-world women safety.

IV. TOOLS AND COMPONENTS

The suggested system of the Women Safety Emergency Calling System is developed with the help of the mixture of hardware and software in order to obtain reliability, prompt reaction, and effective communication during the emergency cases. The system incorporates communication technologies and embedded hardware modules to come up with a real-time and user friendly safety solution. All of the components are chosen according to their performance and cost-effectiveness, as well as compatibility with the system design.

The primary hardware of this system is the Arduino Uno microcontroller which is a central processing unit. It gets the input signals of the different modules, processes them, and gives control to the operation of the systems. The Arduino Uno is popular in embedded systems on an easy to use, flexible, and it supports several input and output connection points. In this system, it controls disease detection of emergencies and module-to-module communications.

GPS module makes a very important contribution in real time tracking of location. After the system has been switched on, the GPS module reads accurate latitude and longitude readings and transfers them to the microcontroller. This is followed by adding these coordinates in the emergency alert message to allow the responders to easily determine the position of the user. GSM module takes care of the wireless communication and will transmit alert messages to the pre-defined contacts via the mobile network. The GPS and GSM modules have been integrated to make sure that there is a fast and reliable way to communicate emergencies even when in the outdoors.

The voice activation of the system is made possible by the sound sensor. It picks out distress sounds or programmed voice commands and translates them into electrical signals which are processed by the microcontroller. This will enable the activation of the hands free system when there is a need to interact manually which is not feasible. Moreover, it has a panic button to offer an easy and direct manual activation in case of an emergency. These two-parameter ways of activation enhance reliability and usability of the system.

Other features like the LCD screen and buzzer provide the user with more interaction and feedback. System status messages are displayed in the LCD display and this assists the user to understand how the system works in times of emergency. Buzzer gives audible alarm to show when the system is successfully activated. The other supporting components like jumper wires, power supply and connecting cables are also part of the hardware integration, and they make it stable. Arduino IDE software and embedded C programming language are the used software tools in the implementation of the system. Arduino IDE is an open-source software that is used to write, compile, and upload programs onto the microcontroller. It allows the effective coordination of the hardware modules, and proper performance of the system functions. The logic to be programmed in embedded C will be the one needed to carry out emergency detection, communication and control of the system.

In general, these hardware and software solutions together will form an efficient, stable, and practical safety system that can be appropriately used in the real-life work in emergencies. Combination of several elements provides quick response, proper communication, and enhanced personal safety assistance in emergent cases.

V. SYSTEM ARCHITECTURE

The proposed Women Safety Emergency Calling System is based on the system architecture that aims at availing the quick, secure and effective communication in the cases of emergency. The hardware is also merged into the architecture with Arduino Uno microcontroller, GPS, GSM, sound sensor, panic button, LCD display, and buzzer as modules to form a complete safety solution. Such elements collaborate in order to identify the state of emergency, process signaling, and relay warning signals.

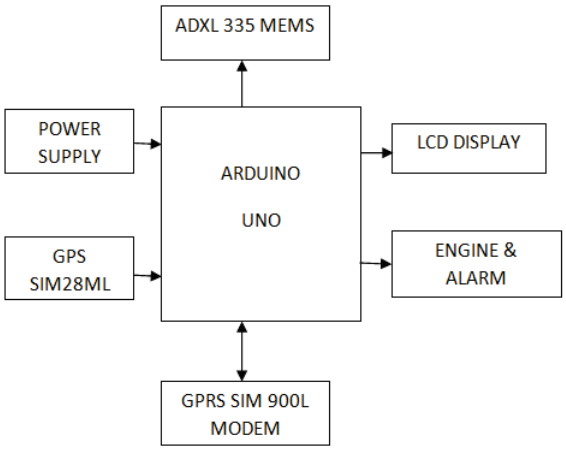

Fig. 1. Women Safety Emergency Calling System Architecture

The block diagram of the proposed Women Safety Emergency Calling System indicates the functional relationship among various hardware modules applied in the emergency detection and communication. The system comprises of input modules, processing unit, communication modules and output devices which combine to achieve rapid response in case of an emergency.

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The panic button and sound sensor are incorporated in the input section. The panic button is activated manually, and the sound sensor to the voice detector recognizes any distressing sounds or a set of voice commands. These messages are transmitted to the Arduino microcontroller which is the central processing unit and controls the functioning of the system.

When it is switched on, the GPS module retrives the real time location coordinates and transmits them to the microcontroller. The GSM module will then send emergency alert messages and the location information to predefined contacts.The LCD display and the buzzer are other features that provide supportive materials giving visual and auditory warning in order to make system usage and reliability more reliable. The proposed system incorporates GPS and GSM modules as depicted in Fig. 1, which will provide real time location tracking and communication with predefined contacts in the event of an emergency. The first part of the system is the input modules which have the panic button and sound sensor. The panic button can be activated manually, whereas the sound sensor receives the distress sounds or voice commands that are programmed. The Arduino microcontroller processes these signals and regulates the system in general.

After that, the GPS module will receive real time location co-ordinates of the user and transmit them to the microcontroller. The GSM module then sends an emergency alert message with details of the location to predetermined contact or emergency responder via the mobile network. At the same time, the LCD display presents status information in the system and the buzzer gives an audible signal of system activation.

It is an integrated architecture that guarantees fast response, proper communication and the performance is reliable. The proposed system can provide an efficient answer to the issue of women being safe in the real life because it will integrate both manual and automatic activation systems with real-time tracking and communication technologies.

VII. RESULTS AND DISCUSSION

The Women Safety Emergency Calling System was put to test in the given various simulated emergency conditions to determine the performance, response time, and reliability of the proposed system. Several test cases were carried out whereby manual activation via the panic button was done and also automatic activation via voice commands. The findings imply that the system can effectively identify the cases of an emergency and provide notification of the situation with the precise location information.

The GPS module was also helpful during testing, as it was possible to use real-time location tracking with the minimum delay, and the GSM module also managed to send emergency messages to the contacts. In the normal environmental conditions, the sound sensor was able to detect predefined voice commands and distress sounds. The LCD and the buzzer were a good visual and auditory indication of system activation.

The system was found to take a few seconds to respond in either manual or automatic activation process. Manual activation had a slight fast response than voice-based activation because signal processing was faster. Generally, the system was tested to perform steadily and communicate reliably. These findings verify that the suggested system can be applicable to the practical woman safety issues.

TABLE I
SYSTEM PERFORMANCE RESULTS

Test Case	Activation Type	Response Time (sec)	Message Status
Test 1	Panic Button	3.2	Successful
Test 2	Voice Command	3.8	Successful
Test 3	Panic Button	3.1	Successful
Test 4	Voice Command	4.0	Successful
Test 5	Panic Button	3.3	Successful

he findings indicate that the system is fast responding and has a high rate of communication in case of emergency and the response times were found to be 3-4 seconds and this means that the system is able to detect the emergency triggers and relay information to the individuals who need it without much time loss. The activation using the panic button manually has a response time that is slightly faster when compared to voice activation because the signal processing is faster.

Testing showed that the GPS module was able to give the real-time location and this was always accurate and was able to relay the same via the GSM module in real-time with alert messages. System exhibited acceptable communication with pre-defined contacts when the system was tested in normal conditions. The sound sensor was successful in detecting the predefined voice commands and sounds of distress even though a slight difference in reaction time was noted with the noise level in the environment.

All in all, the findings prove the system under consideration works effectively in various conditions and offers stable functioning in the situation of emergency. The system is also applicable to real-life situations of women safety because the combination of various modules results in rapid reaction, proper communication, and reliable operation.

The American preference of the word acknowledgment is without. an “e” after the “g”. Keep off the artificial mannerism of one of us (R. B.). G.) thanks . . .”. Instead, try “R. B. G. thanks. . .”. Put sponsor recognition in the unnumbered footnote of the first page.

VIII. CONCLUSION

The proposed Women Safety Emergency Calling System is a good and dependable solution to ensuring safety by increasing the personal safety in case of emergency. The system combines the use of embedded technology powered with Arduino and GPS tracking, GSM communication and voice detection to deliver prompt response and effective transmission of alerts. This system is flexible and usable in the real world use where users cannot use their hands to operate their gadgets by combining both a manual mode of operation via use of a panic button and an automatic mode via voice commands.

The experiment results prove that the system allows to offer correct real-time location and valuable communication

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with predetermined contacts. Both manual and voice-based activation methods take a few seconds to respond, which proves the effectiveness and stability of the system. The GPS module provides precise location information all time whereas the GSM module provides the alert emergency to be successfully transmitted most of the time in the normal test situation. There is also the sound sensor that is effective in identifying predefined voice commands and the sounds of distress hence the system is appropriate in a hands-free mode during emergencies.

The combination of several hardware products improves the performance, reliability and usability of the system. The LCD display and the buzzer are the supporting modules that offer a good feedback mechanism (visual and audible) which enhances user awareness and effectiveness of the system. The system is affordable, simple to install, and can be easily deployed in real time on different environments like in the streets, offices, and even in learning institutions.

Moreover, the system suggested is scalable and can be developed in the future. The small size also permits easy incorporation into either wearables or carryable safety implementation. The additional improvements in the future could be the support of the mobile application, cloud-based monitoring systems, and advanced AI-based voice recognition to enhance the accuracy and reliability. Such add-ons like the real-time tracking dashboards, automatic notifications of emergency services, and more advanced sensor integration can also increase the performance of the system.

All in all, the suggested Women Safety Emergency Calling System is quite convenient, effective and user-friendly, which can enhance personal safety. Embedded systems together with communication technologies guarantee quick response, stable functioning and efficient emergency support and are, therefore, very applicable to real-life use.

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