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IOT based Social Safety Android Application using Geolocation for Real Time Tracing

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Abstract: Women's security is a critical issue in today's world, and it is very crucial for every individual to be acting over such a problem. But this problem is not only limited to women but also to other citizens like old people and children. Today most of the old people and children are victim of illness and child abuse. Crime against senior citizens in the New Delhi city rose by 22% in 2021 compared to 2020 as published by National Crime Records Bureau (NCRB). According to NCRB crime against children in 2019 recorded were 1,48,185 cases, which means an average of 400 crimes were committed every day in the country. These society problems led the motivation for development of a social safety application.

This paper presents an alert system for social safety using common commercially available electronic devices to alert the emergency contacts and the nearby public by sending immediate location. The user just needs to press the panic button on the app or shake the phone. The alert can even be activated with the help of IoT device which would act as an alternative. The location coordinates with message and health details would be sent to emergency contacts and people within 500 m range. The system consists of an android app consisting of a number of features integrated with the IOT module which further can be used to sense Fall detection, blood pressure, Spo2, Heart rate, body temperature etc. and deliver the information to the registered contacts. So, the ultimate goal is to ensure that the user/victim receives the help in the earliest time. The app along with the IOT module in future would be integrated with other smart devices like Bluetooth smart watches that could act as an alternative.

Keywords: Smart Phone, Android, GPS location, Women safety, SOS, GPS, Bluetooth, Geolocation.

I. INTRODUCTION

There was a 46% rise in cases against women in the past eight months compared to the last year statistics, and over half of these were from Uttar Pradesh, as per reports published by the National Commission for Women (NCW). The NCW recorded a total of 19,953 complaints of crimes against women from January to August this year, up from 13,618 as in 2020, it said. As per reports published by NCRB "A state-wise analysis shows that Madhya Pradesh, Maharashtra, Uttar Pradesh, West Bengal and Bihar represent nearly half of all crimes against children (49.3 percent) in India," the NCRB said. Compared to 2019 data West Bengal has replaced Delhi while seeing a sharp increase in cases by more than 63 percent. Crime against the elderly has increased by up to 22% in Delhi in 2021.[10]

There are systems that describe GPS based women security mechanism and an android based application. The security device has a combination of GPS device as well as provide alerts to the nearby people and sends SMS (Short Message Service) to the emergency contacts. The transmitter and receiver are used by which the system provides alert and sends messages automatically when the RF signal between the receiver and transmitter goes low.[14] There are applications to send the message to the registered contacts continuously for every five minutes until the " stop " button in the application is clicked. Continuous location tracking information via SMS helps to find the location of the victim quickly and can be rescued safely.[19] Besides there are some applications which have audio recording facility and the alert can be generated by using voice commands i.e., voice controlled.

The operation of our proposed application is divided into three stages: insertion of emergency contacts, activation of the alarm, and transmission of an emergency message and users health parameters. When the SOS button is pressed, the alarm will trigger making a loud noise until the SOS button is again pressed. Not only the app sends location and the message but it has some sections like the basic safety protection, privacy laws and liberty rights etc. Also, we have a feedback mechanism to collect users feedback so as to improve the overall app performance and tackle the issues faced by the users. In addition, our project has an IOT module which will collect the health parameters like SpO2, heartbeat, Blood pressure. The location coordinates will be updated after every specific interval of time. The difficulties in the existing application are the lack of situational awareness and communication terminology among their respective. In respect of the safety of public with the support of the network provider the application runs in the android phones in an efficient way to identify and recover the problem caused by some unnatural incidents.

II. LITERATURE SURVEY

Reference No.	Key findings	Limitations
[1]	The paper presents a device which has a button which when pressed twice considers it as an emergency and then sends alerts to emergency contacts, nearest police box and the volunteers. This victim's location is updated every 5 seconds. The most important and unique feature of this app is that when the user is in trouble then he/she will be rescued by their fixed or mobile volunteers.	The size of the bracelet is slightly larger, so it becomes difficult to carry it in the hand. This system is tested in a very small locality. The volunteers need to be found by the system so the number of people who will help becomes less.
[2]	This paper proposes sending alert messages by the application to the stored contacts and on WhatsApp messenger. Location link is also sent to the user tracker portal. The user can shake the phone which acts as a trigger event to send alerts. The application created is very light-weight so it can work on low-end devices too.	This application is dependent on applications like WhatsApp to send alerts so this is not a good mechanism in the long run. The people to whom the alert is sent to are limited people, so the number of people who can help remains limited.
[3]	This paper proposes a device which contains a temperature sensor, pulse rate sensor to check if the user is in some kind of emergency if the temperature and pulse rate are different than abnormal if changes observed alert will be transmitted to the emergency contacts. This paper makes use of the ZigBee network to send data over large distances which consumes less power.	This paper uses Logistic Regression to detect if the user is in some kind of emergency. The logistic regression model is not very accurate which is not good because sending alerts if there is not an emergency is not a good practice. In this paper there is no data abstraction as it is receiving the data as sent by the ZigBee module.
[4]	This application can be activated by voice command or an SOS key. The alert message with location is sent to the user defined contacts every five minutes until the system is turned off.	Most of the cases remain unsolved due to lack of the evidence so there is a feature of audio recording to keep evidence. This paper depends solely on the android application. If the user does not carry his/her phone then they won't be able to send the alerts in case of emergencies. In case of emergency the alert is sent only to the registered contacts. So, these people may take more time to reach the victim so this is also a risk that is present in the system.

- 1) This paper proposes a device that sends location in case of emergency both in offline and online mode also it alerts the nearest police station and provides user with a safe house location nearby. But the limitation of this device is it is a little bit bigger in size which makes it uncomfortable to wear on wrist. Also, even to send location it needs user to press the SOS button which is not favorable all time.
- 2) The Anuti app sends victims location via SMS and through WhatsApp to selected contacts and also to a location tracker portal. It activates when the mobile phone is shaken to a certain intensity and is quite small application in size. But the drawback is that the user needs to specially be dependent on the mobile phone for safety and there is no alternative in case the phone is lost or switched off.
- 3) The paper deals with the idea of sending location and health parameters like body temperature and pulse rate to the contacts. Moreover, the device works in absence of internet using a ZigBee protocol for long distance communication. But if a person's pulse rate for a reason increases due to heavy task or intensive training this device would trigger an alert even when user is not in actual trouble based on logistic regression model by just analyzing the various patterns in body changes.
- 4) This paper proposes an app, LifeCraft which sends location through voice commands or SOS key. It also has functionality of audio and video recording. But the major drawback is when there is no network then it cannot share location of user to family or other people.

- 5) The paper highlights some key features of the app Superwomen, like the voice-controlled lock screen access, one click police call, one click ambulance call, online medical store facility, finding nearby hospital etc. The app is primarily concerned with women security and is totally reliant on internet for its functioning which at times may not be possible to work in case of no network.
- 6) In the paper titled “Women Safety Devices and Applications” the prime idea is to develop a device that can be designed to have 2 or 3 colored buttons on it, when the threat arrives a specific button can be pressed, where in the buttons will be programmed with required and necessary functions. The proposed device has 4 colored buttons on it i.e., red, blue, green and yellow. When the red button is pressed it triggers the alarm sensor, the blue button sends an emergency message to the present contacts, the green button records the audio and finally the yellow button helps detect hidden cameras. This device needs the buttons to be pressed manually which at times is not feasible for the victim to press the button and alert the people. So, there is need of some automatic or semi-automatic mechanism of triggering the buttons when needed.
- 7) In the paper the IOT devices functions as if child is crying then it will trigger the microcontroller which will in result trigger the GSM modem and parents will be informed of their child’s crying. Setup with parents may have android phone or any other phone which is capable of browsing option. On the Google map location of the child will be shown to parents. But not necessarily that a crying child is in difficulty or is abused or harassed, it can have various reasons such that the child might not be well or might be feared of something or anything unnatural happening etc. So, the device may send the alert.
- 8) In the paper titled “Emergency Contact and Location Sharing System for Women Safety” the prime focus is on the IOT device which sends location to the emergency contacts. But the major shortcoming is that the device is quite large to carry in pocket or wear on wrist making it uncomfortable. Also, the device needs continuous power supply and needs to be connected to a battery or a power backup to function which is not possible all time. Also, the user needs to manually trigger the button by physically pressing it which is not possible in some dangerous situations.

III. PROPOSED SYSTEM

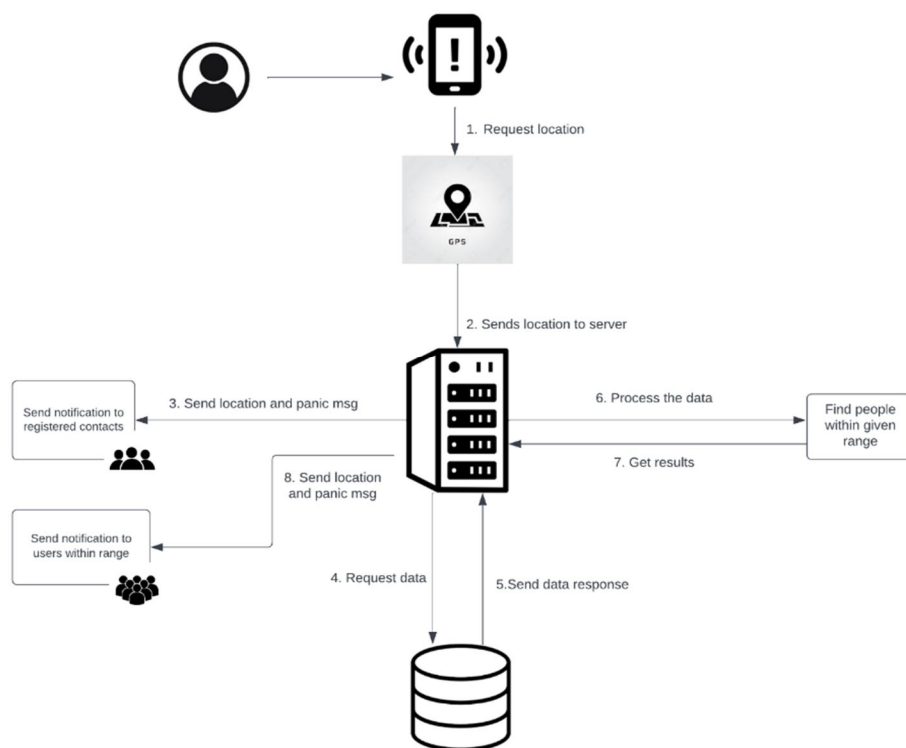


Fig 1. System architecture of app

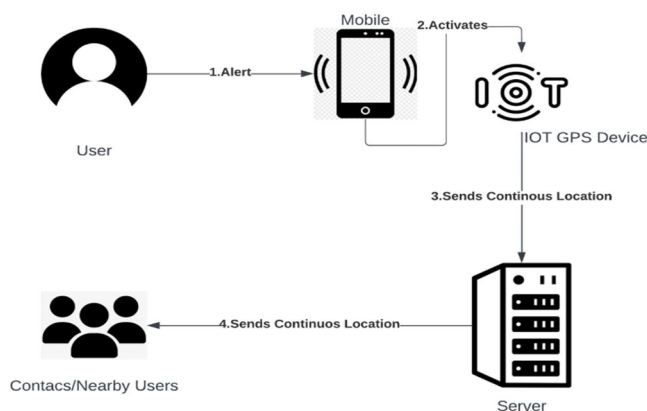


Fig 2. System architecture of IOT module

IV. METHODOLOGY

Geohashing is a geocoding method used to encode geographic coordinates (latitude and longitude) into a brief string of letters and numbers that delimit an area on a map, called a cell, with different resolutions. The more characters inside the string, the greater the unique location. Geohashes use Base-32 alphabet encoding (characters can be zero to 9 and A to Z, excel "A", "I", "L" and "O"). believe the arena is split into a grid with 32 cells. The primary man or woman in a geohash identifies the initial location as one of the 32 cells. This mobile can even include 32 cells, and every such a will include 32 cells (and so forth again and again). including characters to the geohash sub-divides a mobile, correctly zooming in to a greater designated area.

- 1) Step 1. The user will either trigger the panic/SOS button or shake the app with large intensity to activate the alert. Also, the alert can be activated by the IOT module when it is senses a fall detection, or fall or rise in blood pressure, pulse rate, spO2 levels, temperature or humidity above or below a specified optimal value.
- 2) Step 2. When the alert is activated the app as well as the IOT buzzer produces a loud noise till at least the app or buzzer is pressed again to shut it off.
- 3) Step 3. When the alert is activated, the request fetches the server and the server sends an emergency message to the registered emergency contacts along with other health measurements which would be updated after specific intervals of time.
- 4) Step 4. At the same time the server will have access to the location of other app registered users in the locality. The server will send the same msg to all the people who are within a radius of 500 m from the victim so that they can help or rescue the victim at the earliest.
- 5) Step 5. Also, the same request is sent to the admin panel which can further be transmitted to the police station, hospital etc. Moreover the features a section for Laws related to Women, child safety and punishments etc .Also there is a feedback section to record feedback of users to improve the app's performance.

V. HARDWARE USED

A. SIM7600 GPS GSM 4G LTE Module

The SIM7600 collection is Multi-Band LTE-TDD/LTE-FDD/HSPA+/TD-SCDMA and twin-Band GSM/GPRS/area module solution in a SMT type which supports LTE CAT4 up to 150Mbps for downlink records transfer. It has robust extension capability with wealthy interfaces consisting of UART, USB2.zero, SPI, I2C, GPIO, etc. With ample application capabilities like TCP/UDP/FTP/FTPS or HTTP/HTTPS/SMTP/POP3 and MMS, the module provides an awful lot of ease of integration and flexibility for customers' packages.



Fig 3. Sim7600 gsm

B. Arduino Microcontroller Board

Arduino board designs use a diffusion of microprocessors and controllers. The forums are ready with units of digital and analog input/output (I/O) pins that may be interfaced to diverse expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards function serial communications interfaces, which includes regular Serial Bus (USB) on some models, which can be extensively utilized for loading applications. The microcontrollers may be programmed using the C and C++ programming languages, the use of a trendy API which is likewise called the Arduino language, inspired via the Processing language and used with a modified version of the Processing IDE. Further to the use of traditional compiler toolchains, the Arduino venture offers an included development surroundings (IDE) and a command line device evolved in move.

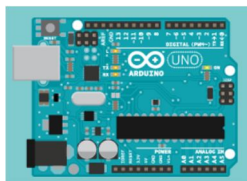


Fig 5. Arduino microcontroller board

C. Pulse Sensor

The is an integrated pulse oximetry and heart-rate monitor biosensor module. It includes internal photodetectors, LEDs, optical elements, and low-noise electronics with ambient light rejection. It provides a complete system solution to ease the design-in process for mobile and wearable devices.



Fig 6. Pulse sensor

D. MPU-6050 3-Axis Accelerometer and Gyro Sensor

MPU6050 sensor module is a complete 6-axis Motion Tracking Device. It combines a 3-axis Gyroscope, 3-axis Accelerometer and Digital Motion Processor all in a small package. Also, it has the additional feature of on-chip Temperature sensor. It has a I2C bus interface to communicate with the microcontrollers. It has Auxiliary I2C bus to communicate with other sensor devices like Pressure sensor, 3-axis Magnetometer etc. If 3-axis Magnetometer is connected to auxiliary an I2C bus, then MPU6050 can provide complete 9-axis Motion Fusion output. The MPU6050 consist of 3-axis Gyroscope with Micro Electro Mechanical System (MEMS) technology. It is used to detect rotational velocity along the X, Y, Z axes.



Fig 7. Accelerometer and Gyro Sensor

E. DS18B20 Body Temperature Sensor

The DS18B20 digital thermometer provides ranging from 9-bit to 12-bit Celsius temperature measurements and has an alarm function with a non-volatile user-programmable upper and lower trigger points. The DS18B20 communicates over a 1-Wire bus that by the definition requires only one data line (and ground) for communication with a central microprocessor. In addition, the DS18B20 can derive power directly from the data line ("parasite power"), removing the need for an external power supply.



Fig 8 . Body Temperature Sensor

F. DHT11 Temperature and Humidity Sensor

DHT11 is a Humidity & Temperature Sensor, which generates calibrated digital output. DHT11 can interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is low-cost humidity and temperature sensor which provides high reliability and long-term stability. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and outputs digital signal on the data pin (no analog input pins needed).



Fig 8. Temperature and humidity sensor

VI. CONCLUSION

This paper presents an overall idea that the safety of citizens is social responsibility and security of individual is not only the responsibility of his/her family, friends but also the entire society contributing and bringing everyone together in case of emergency. The paper presents an IOT based android application for tracing real time location of user and in case of emergency communicating the location and other health condition of victim to the family and other people nearby the victim. The app along with the IOT module in future would be integrated with other smart devices like Bluetooth smart watches that could act as an alternative. The app can ask citizens, users to submit their experiences about security in particular areas. Higher the cases of harassment in an area, darker are the red spots on the crowd map. Other users can identify and assess the security of such areas for a particular time and avoid visiting them if they find it unsafe.

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