International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

wSafe24/7- A Personalized Women Safety Application

Poorna B.R[1], Jesna Mohan[1], J. Haripriya[1]
[1]Department of Computer Science, Mar Baselios College of Engineering and Technology, APJ Abdul Kalam Technological University, Thiruvananthapuram, Kerala, India-695016

***Abstract*—** *Personal security has always been a major concern for women and various potential solutions have been discussed on how technology can be incorporated to solve the problem. Rapid increase in the usage of smartphones enables one to efficiently implement personal security through effective utilization of hardware and software. Existing security methodologies require user input of some kind and usage of only pre-selected contacts. wSafe24/7 is a one-stop smart security system that is mobile and wearable device compatible. This application has the feature to send the tracked location and SOS message, to scan fingerprints with or without the presence of sensors, virtual bot etc. The proposed system offers dual levels of security- one initiated by users and the other initiated automatically. This application avoids false detection of panic situations and false messages by smart utilization of sensors. The user can activate the panic key provided in the application that will activate vital parameter modules like heart rate monitor, temperature monitor, scream and fall detection, accelerometer etc., using fuzzy logic.*

***Keywords*—** *Alerts, application, fuzzy logic, natural language processing, safety, security, sensors.*

I. INTRODUCTION

The crimes against women are increasing at a higher rate. According to UN Women, one in three women around the world experience some form of sexual assault at least once in their lifetime. India's average rate of reported rape cases is about 6.3 per 100,000 of the population as of September 2019 [1]. With escalation of female employees in industries and other sectors of the commercial market, it is now becoming a necessity for females to travel at late hours and visit distant and isolated locations as a part of their work regime. However, the exponential increase in assault, violence and attacks against women in the past few years, is posing a threat to the growth and development of women. This paper proposes an efficient response mechanism that helps women in trouble.

The Government has been actively exploring technology for implementing a smart alert system for women safety that works effectively under various conditions like absence of network coverage, high power consumption rate, low/no internet connection, access to smart gadgets etc.

Artificial Intelligence (AI) and Machine learning (ML) play a crucial role in this field. A global platform called OMDENA partnered with Safecity- a platform for anonymous but credible crowd mapping- for predictive modelling where the Safecity dataset for Mumbai and Delhi were used to identify probability factors of 'safe' and 'unsafe' spaces depending on the reports given by the users under diverse conditions. Various techniques of modelling were used to layer data including infrastructure like schools, colleges, hospitals, cinema theatres, public parks and surrounding areas to get a sense of what risk factors might be involved [2]. Correlations, common patterns and trends that could indicate problematic locations were done using AI and ML.

The main aim of the woman safety alert system is to provide an immediate way to contact for help such as nearby police stations or relatives or users in the proximity by sending alert messages and tracking the location. This application can also be enhanced in the future in the form of smart gadgets like jewelry, mobile phones, watches etc.

II. LITERATURE REVIEW

There are a large number of existing systems that attempt to enforce women safety.

The core problem in police investigating cases of female abuse resides in limitations that prohibit them from responding promptly to distress signals. These limitations include not knowing the exact position of the crime, and not recognizing the violence is happening at all: it is a challenge at the end of the victim to approach the law enforcement officers with certainty and discretion. To help eliminate these constraints, [3] launches a smartphone application named WoSApp (Women's Safety App), which offers a secure way for women to make an urgent call to the police station. The person can simply and stealthily activate the calling mechanism by shaking the phone, or by interacting explicitly with the application's user interface by simply pressing a PANIC button on the screen.

Eyewatch SOS, is a smartphone application that captures video and audio of the user's environment and directs it along with an alert message to the registered contacts. This framework was lauded for its high location precision, working without the functionality of internet and Safety confirmation. The user should alert their contacts by pressing the 'I am Safe button' after entering the location safely. A similar app called Abhaya facilitates the identification of the location through GPS and sends out a message to the registered contacts that includes the location URL and also calls on the first registered contact to help the one in dangerous situations. This application's unique feature is to transmit the alert continuously to the selected contacts every five minutes until the software's "stop" button is pressed [4].

FEMME, is a protection device, developed especially for women in danger. It makes use of an ARM controller and android application in which both the device and the smart phone are synchronized using Bluetooth to trigger them independently at the same time. Audio recording feature is

Poorna B.R, Jesna Mohan, and J. Haripriya, "wSafe24/7- A Personalized Women Safety Application," *International Research Journal of Advanced Engineering and Science*, Volume 5, Issue 3, pp. 171-174, 2020.

available which can be used for investigation purposes. It sends an alert call and message to the preset contacts with the user's current location every 2 minutes that can be tracked live within the application. FEMME supports hidden camera detection as well to ensure privacy [5].

SpotnSave Feel secure, which was classified as one of the most advanced safety applications, sends a warning message every two minutes along with the location to the pre-selected contacts. If the user has no access to the phone, they can use the wristband that goes with the application and tap on the button provided on it. This operates in the same manner as a phone does via Bluetooth.

bSafe is a stop shop-in-one security product for women that provides feature varieties. It has a bSafe warning that sends the exact coordinates and audio-video of the nearby neighborhoods to the contact you have selected previously. Another 'Follow me' feature allows the user to be tracked virtually via GPS tracking mechanism, until they get to the safe location. Fake calling functionality in this system allows users to make false calls to avoid any awkward or unusual events from happening. There is a 'timer alarm' functionality in this application that helps in setting up an auto alarm to inform the user's contacts about their current location.

[6] discusses on an effective protection system that makes use of various modules like: database Module for storing emergency contact numbers, SOS Key Press Module and Voice Recognition Module, auto receiving call module to accept call from emergency contact without explicit interaction with the device, Global Positioning System (GPS) module to track precise location, Spy camera detection module that detects the infrared rays coming from every night-vision hidden cameras placed in changing rooms, Intrusion Detection Module, Area zone module, Fake call Tool Module, Generate Electric Shock for Self Defense module, Screaming Alarm Siren module etc. for complete safety of women and children.

Based on the studies and the implementations it can be concluded that there is a necessity for improvement that starts with making the application user friendly and device compatible. It should not be mandatory to take the aid of a wearable device or any external hardware to stay safe.

III. PROPOSED SYSTEM

The proposed system can operate with or without wearable devices by taking advantage of the sensors available in the user's phone. It is intended to run in the background or even when a phone is locked.

The overall architecture of wSafe24/7 involves the following processes:

1. Registration

At the time of installation, the users are prompted to sign-in using their mobile number. The app asks for the user to select a set of 'emergency contacts' to alert in case of emergency. The user's device details are collected by the application to check for the availability of the hardware/ resources required- fingerprint scanner, sensors, nearby wearable devices etc.

If a wearable device is detected, the application prompts the user to install wSafe24/7 onto that device to utilize resources offered by it. The wearable application's main objective is to gather the data stated by the smartphone demand. A native application running on the smartphone subscribes to wearable sensor events as a listener. The wearable application alerts for new data regularly (with the help of Bluetooth), and it is processed by the smartphone [7]. This collection of information has to be transmitted efficiently (using the DataAPI). MessageAPI can be introduced to watch for incoming request events at the wearable device's end [8]. Proper functioning of established connection or response can be given a test run in wSafe24x7 trial mode.

If the user doesn't have a wearable device, the smartphone is checked for proper functioning of sensors and prompts the user to store their fingerprint. This finger print is later used for fake call initiation or stopping the panic alert.

2. Data Feeding

In order to understand the abnormality in the user's activity, the application requires the user to be monitored at the time of installation. Pre-trained models may raise false alarms or may not raise an alert due to varying parameters of individuals. So, wSafe24/7 requires a model that is an incremental learning model which can learn from real time data and adapt to new environments over the course of time. This adaptation will mean relying on a person's personal movement style, and also adjusting to changes in a person's movement over time for accurate classification [9].

The user is prompted to train this model by allowing the application to monitor their activity using the necessary sensors. This data is then fed to the lightweight classifier. This training is done at regular intervals which makes it truly custom built i.e., a true personalized model.

3. Panic Avoidance

Certain situations can be avoided while travelling late at night. The application has a built-in virtual bot that is capable of having a natural conversation with the user. The bot has a real time speech to text conversion system that transforms the words spoken into text form in exactly the same manner the person recites them even in a noisy environment. The voice input from the user is converted to text for a word by word textual analysis using an efficient speech disclosure algorithm [10]. The bot then identifies the keywords from the tokenized text and formulates an appropriate response to the user [11]. This calling operation can be initiated with a fingerprint. If a fingerprint reader is not available in the phone (rear and in-display), exclusive tapping on the call button initiates the call.

4. Alert

According to the availability of the wearable devices, alert system of wSafe24/7 can be divided in two:

A) Using embedded sensors
B) Using wearable device sensors

Poorna B.R, Jesna Mohan, and J. Haripriya, "wSafe24/7- A Personalized Women Safety Application," *International Research Journal of Advanced Engineering and Science*, Volume 5, Issue 3, pp. 171-174, 2020.

A. Using Embedded Sensors

More than 70% of the smartphones include a tri-axial gyroscope and accelerometer, along with sensors for orientation. These detectors indicate the movement and rotation rate across three coordinate axes (X, Y, and Z). Rather than using other sensing devices affixed to the human body, we can pinpoint various activities with these sensors [12]. The user has to turn 'on' the application for it to start it's processes. Activated app constantly reads the sensor data and feeds it to the classifier. If an unusual pattern is detected by the classifier, the sensors are shut off and the control is transferred to the alert system. This segregation of modules is done to avoid extra power consumption.

GPS is turned on and current coordinates are fetched accurately. The app searches in its database for the registered users that are from the same location as the currently fetched coordinates. Alerts are sent to the nearby users from within the application. The alerts are also sent to the nearby police station and the preselected emergency contacts. The alerts sent to the registered users nearby is a vibrating flash message that will ensure that the panic signal is acknowledged.

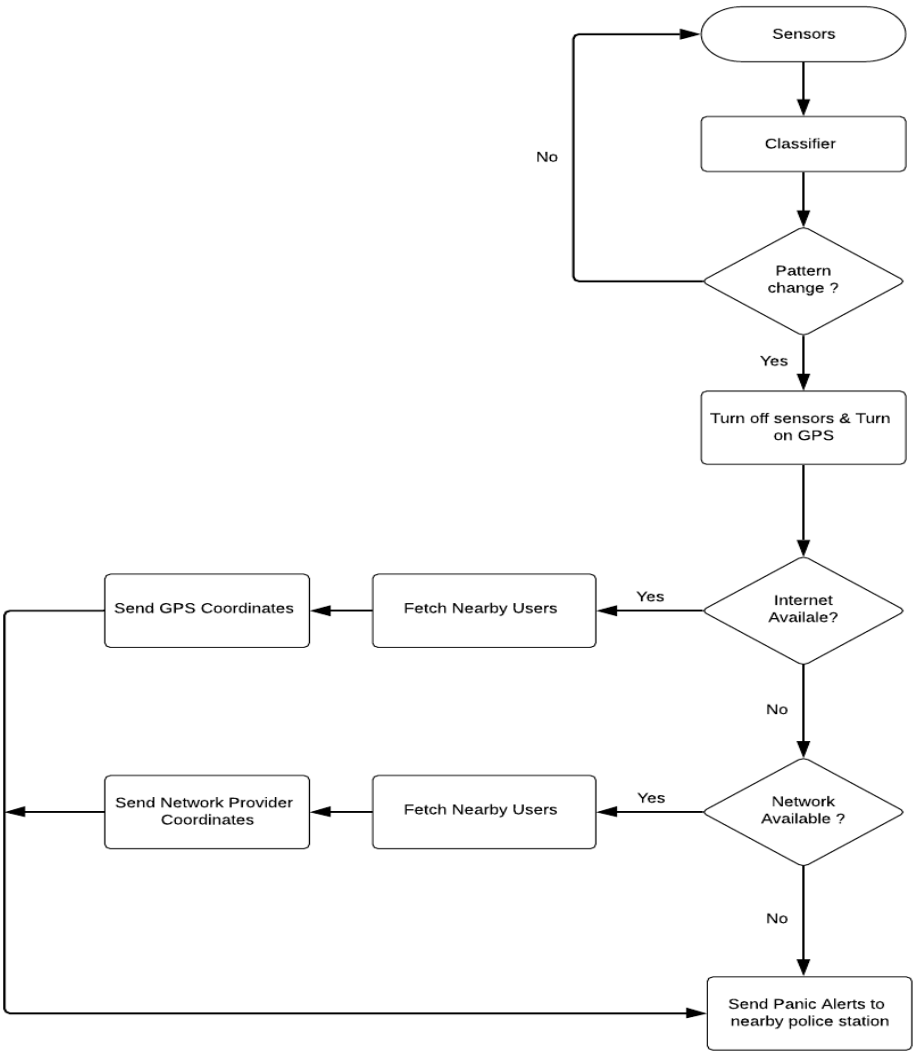

Fig 3.1: Workflow of Embedded Sensor Alert System

If the internet service is unavailable, the user's network location is fetched and sent to the stakeholders. The location updates are sent once in every 10 seconds. The panic alert is shut off only if there is no position change after 10 minutes.

B. Using Wearable Device Sensors

The application makes use of wearable device's sensors to get body parameters such as Accelerometer, Gyroscopes, Magnetometers, Global Positioning System (GPS), Heart Rate Sensors, Pedometers, Pressure Sensors etc [13]. A rough hold on the wrist containing the wearable device, sudden change in heart rate, unusual movement detection etc., can be taken as the panic key.

An additional feature where the nearby users can report on the received panic signal, will help in ensuring that no false signals are processed in this system.

Poorna B.R, Jesna Mohan, and J. Haripriya, "wSafe24/7- A Personalized Women Safety Application," *International Research Journal of Advanced Engineering and Science*, Volume 5, Issue 3, pp. 171-174, 2020.

IV. CONCLUSION

The primary goal of providing a smart security system for women with enhanced personal security could be achieved using the proposed methodology. Proposed system works well with sensors available in the user's phone alone. The incremental learning model proposed can learn from the real time data of user's behavior, which improves the overall accuracy as it can adapt to new environments. The real time voice to text conversion present in the system could be a boon for women during many situations as they reduce the effort to type messages. Alerts are informed to nearby app users as well as to nearby police stations either using triggers from the embedded or from wearable device sensors, which increases the flexibility and ensures that the system works smoothly.

Future enhancements could be proposed to incorporate native language support into the virtual bot. Better video recording and processing techniques could be implemented in the proposed system to compensate for the capability of mobile phones that have inbuilt night vision cameras that offer higher quality video recording at low light.

REFERENCES

[1] Article on gender violence in India with 2019 statistics: https://yourstory.com/socialstory/2019/09/gender-violence-india

[2] Use of Artificial Intelligence in Women Safety related applications and data collection: https://medium.com/@elsamariedsilva/using-ai-for-womens-safety-c0d43fd23cd

[3] D. Chand, S. Nayak, K. S. Bhat, S. Parikh, Y. Singh and A. A. Kamath, "A mobile application for Women's Safety: WoSApp," *TENCON 2015 - 2015 IEEE Region 10 Conference*, Macao, 2015, pp. 1-5, doi: 10.1109/TENCON.2015.7373171.

[4] R. S. Yarrabothu and B. Thota, "Abhaya: An Android App for the safety of women," *2015 Annual IEEE India Conference (INDICON)*, New Delhi, 2015, pp. 1-4, doi: 10.1109/INDICON.2015.7443652.

[5] Monisha, D. & Monisha, M. & Gunasekaran, Pavithra & Radhakrishnan, Dr.Subhashini. (2016). Women safety device and application-FEMME. *Indian Journal of Science and Technology*. 9. 10.17485/ijst/2016/v9i10/88898.

[6] Paradkar, Abhijit and D. Sharma. "All in one Intelligent Safety System for Women Security." *International Journal of Computer Applications*, 130 (2015): 33-40.

[7] de Arriba-Pérez F, Caeiro-Rodríguez M, Santos-Gago JM. Collection and Processing of Data from Wrist Wearable Devices in Heterogeneous and Multiple-User Scenarios. *Sensors* (Basel). 2016;16(9):1538. Published 2016 Sep 21. doi:10.3390/s16091538

[8] B. Berzati, A. Ippisch and K. Graffi, "An Android Wear OS Framework for Sensor Data and Network Interfaces," *2018 IEEE 43rd Conference on Local Computer Networks Workshops (LCN Workshops)*, Chicago, IL, USA, 2018, pp. 98-104, doi: 10.1109/LCNW.2018.8628494.

[9] Siirtola, Pekka, and Juha Röning. "Incremental Learning to Personalize Human Activity Recognition Models: The Importance of Human AI Collaboration." *Sensors* (Basel, Switzerland) vol. 19,23 5151. 25 Nov. 2019, doi:10.3390/s19235151

[10] N. Sharma and S. Sardana, "A real time speech to text conversion system using bidirectional Kalman filter in Matlab," *2016 International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, Jaipur, 2016, pp. 2353-2357, doi: 10.1109/ICACCI.2016.7732406.

[11] S. M. Felix, S. Kumar and A. Veeramuthu, "A Smart Personal AI Assistant for Visually Impaired People," *2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI)*, Tirunelveli, 2018, pp. 1245-1250, doi: 10.1109/ICOEI.2018.8553750.

[12] X. Yin, W. Shen, J. Samarabandu and X. Wang, "Human activity detection based on multiple smart phone sensors and machine learning algorithms," *2015 IEEE 19th International Conference on Computer Supported Cooperative Work in Design (CSCWD)*, Calabria, 2015, pp. 582-587, doi: 10.1109/CSCWD.2015.7231023.

[13] Aroganam G, Manivannan N, Harrison D., "Review on Wearable Technology Sensors Used in Consumer Sport Applications", *Sensors (Basel)*. 2019;19(9):1983. Published 2019 Apr 28. doi:10.3390/s19091983