International Journal of Aquatic Science
ISSN: 2008-8019
Vol 12, Issue 03, 2021

Design Of Women Smart Safety And Health Reporting Device Using Iot And Mobile Mesh Networkingtechnologies

A.Kodieswari[1], D.Deepa[1], C.Poongodi[3], P. Thangavel[4]

[1]*Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu, India*
[2]*Kongu Engineering College, Perundurai, Tamilnadu, India*

Emails: [1]kodieswaria@bitsathy.ac.in, [2]ddeepa@bitsathy.ac.in,
[3]poongodic@bitsathy.ac.in, [4]ptvelmech@gmail.com

Abstract.Women safety is a very big issue even in this modern world running with advanced technologies. After a history of times, women got a freedom of equality at the workplace, asset rights, family law, and education. Even Feminist Movement, claimed during 20th Century, Women are not safe anywhere and violence against women and girl child's happening everywhere during the lonely travelling on roads, picnic spots, work and deserted places. Though we have many armies and super forces to protect everybody, the day to day crime rate against women has not been reduced. There are several safety devices available to protect the women during the violence, but need more human intervention such as entering the data, or shaking the device roughly. We propose a solution for a secure and peaceful environment for women with handbag safety hand-held devices with the aim to provide false proof women safety devices by overcoming the disadvantages in existing system. When we are talking more about Women empowerment, Women achievements it is also very important to think about women safety since a huge numbers (848) of women's are Indian Women Are Harassed, Raped, Killed Every Day. The proposed work aims at IoT based women safety device by hardware controller attached to the handbag, android application and Bluetooth connectivity in Smartphone. By pressing the controller button, the device alerts the first holder, relatives stored in the database and police when a woman is not safe. The main advantage of the work is, the device works without internet connectivity. Additional features such as protecting the valuable things to be stolen by thieves in crowded places or buses by a separate alarming system, heartbeat sensor setup to monitor heart rate, fingerprint scanner for effecting accessing of the devices and also the mobile android application provide the victim's location to reach the women and safeguard the women from any harassment at the right time. The main thought of this paper is that it will not only protect the women from physical harassment during odd hours but also safe the women health when it is found abnormal, as a single device comparatively.

Keywords: Bluetooth LF, Mesh Topology, Heartbeat Monitoring sensor, Alert sound, Automatic call, Location tracking, IoT, Android application, Women safety, Smart device.

1. INTRODUCTİON

Women safety is always considered to be a substantial issue in India even equipped with modern and advanced technologies. Women empowerment has been emphasized for past decades not sensed the crimes against women as a series issue. India is known for promising superpower, a financial hub, matured powerful women freedom fighters and also postulated for a precarious place for women. Though various security gadgets are available for women safety more human intervention is required to activate the device by pressing the buttons, rash shaking of the device, pressing the buzzers etc while or after sensing the woman was in danger. If a woman forgets to do any of these jobs to activate the device, the system will not work and the woman cannot be saved and the purpose of the device fails. In a developing country like India, the crime against women is higher than its human population. The crimes against woman are listed as harassment, rape cases, burglary case, murder case, violence so on.

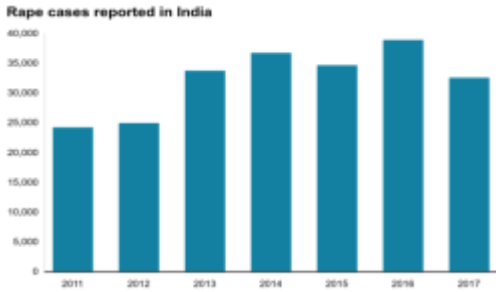

Fig.1.Total number of Rape Cases in India (Source: National Crime Records Bureau)

According to Georgetown University's Institute for Women, Peace and Security ,India is ranked 133 out of 167, report of the year 2019.Also, Thomson Reuters Foundation ranked India as the most dangerous place for woman because of high sexual violence, lack of access to justice in rape cases, child marriage, female feticide and human trafficking. The cases against woman are registered at the rate of 83% in between 2007 and 2016 and for every hour four rape cases are recorded. Child marriage is the crime frequently happening in India and also estimated around sixty three millions women are missing due to sex-selective abortion and twenty one millions of unwanted girls, disfavoured by the parents .In the year 2016, India is reported with 38,947 rape cases and the attacks happens when they women travelling alone in remote areas when find no one to help or assist. After Nirbhaya Delhi case, the whole nation triggered to safeguard the women in India who faces crimes, social challenges and violence using the technology. This paper suggested intelligence security systems and health monitoring with IoT technology to accost necessities and demands during crime against women. The prognosis of such an incident is not feasible hence to reduce the possibility of harassment by using helpful tools equipped to safely escape from violent situations. This reduces risk and brings assistance whilst needed. Features included in the proposed work for the support women safety are as follows:

1. Sending messages from the device to registered mobile numbers and nearest police station from the victim's mobile phone.
2. Spot the current location of the victim using Google map usage.
3. Monitors the heartbeat and in-case of any medical emergency messages will be sent to the contacts registered.

2. RELATED WORK

Md. Milon Islam, AshikurRahaman and Md. Rashedul Islam proposed a Smart Healthcare Monitoring System in IoT Environment (2020) [1 The patient data's will be sent to the physicians to analyse the present condition of the patient detected by the sensors. The password protected data access is provided to ensure the security of the patient data. Any medical staff with internet access can view the patient data.Prof. Sunil K Punjab, et al. proposed Smart Intelligent System for Women and Child Security (2018) [2] which provides immediate response during harassment in public place. The system solves the security issues for both women and children using portable devices using pressure switches. The pressure sensor in the device will sense the continued pressure of the victim and send the message along with the victim message to the registered parents or guardian number along with the cal. If a call is not answered for a long time then the call is diverted to the nearest police control room and the same message will also be forwarded.Dr. M. Yuvaraju and M.C.Kalaiselvi proposed a Patient Monitoring and Women Safety System Using IoT (2018) [3]. The embedded system is designed to monitor the patients with blood pressure and chronic diseases. The device also monitors fall detection of aged peoples inside home. The system is designed to detect temperature, blood pressure, heart rate and smoke in the atmosphere. This helps patients not to meet the doctors always and can be monitored through mobile phones.Prof. BasavarajChougula, et al. developed a Smart Girls Security System (2017) [4], with an alarm system and a module to send the message. The system used the advanced technology ensemble within wearable belt which tracks the location of the victim using Global Positioning System and message delivery using Global System for Mobile Communication to the first 2 emergency contacts and nearby police station. G C Harikiran ,KarthikMenasinakai and SuhasShirol (2016) [5] proposed a Smart Security Solution for Women Based on Internet of Things (IOT). A smart band is designed by integrating multiple hardwares and sensors that could interact with the mobile phone with internet access when the victim is under discriminating condition. The band is programmed with all human behavioural and reactions data like anger, anxiety and fear .Based on the human behaviour the signal is transmitted to the mobile phone and software will get activated to access Global Positioning System to share the location and SMS services to send the help request to the nearby police station and relatives with the applications.

3.WORKİNG OF SMART WOMEN SAFETY DEVİCE USİNG DİFFERENT COMPONENTS

Bluetooth (BT) is a wireless device used to exchange information between the mobile device and fixed device within a short distance. BT covers around 10m radius for communication between the devices and the top coverage range is around 100m.It can transmit signals through walls and supports transmitting power from -20 dBm (0.01 mW) to +20 dBm (100 mW).Nowadays most of the mobile phones and IoT devices are with Bluetooth technology because of the following reasons.

3.1 Low Cost

The cost of a Bluetooth LE chip or SOC is in the range of two- three dollars. If Bluetooth Low Energy Protocol stacks need to be utilized with less cost as BLE then in addition to BLE Application, Simple link Bluetooth Smart Wireless MCU with USB is a better choice. In the

commercial market, different silicon companies like Atmel & ST are also available with low cost Bluetooth devices.

3.2 Low Power Consumption

The prime advantage of BLE is low power consumption. Due to low power consumers, BLE can be used in android apps to communicate with strict power requirement devices like proximity sensors, heart rate monitors, and fitness devices. According to Bluetooth classic, the BLE device can respond & filter best-required messages and keep the connection between devices during data sharing.

3.3 Longer Battery Life

Bluetooth Battery life on average of 8-20hrs for audio accessibility is achieved.

3.4 Reduced Data Rate

In the IoT-enabled tool, when two gadgets are connected to exchange the information, the data rate is considered to be an important factor. The data transferring rate of BLE is within the limited range of one Mbps to two Mbps. This range is enough for IoT-enabled applications that makes it more demandable than Bluetooth classic.

3.5 Typical Range

The typical coverage relies upon hardware and antenna capability. The classic range for Bluetooth LE is 100m -400m, based on the versions.

3.6 Heartbeat monitoring sensor

Heartbeat sensor, an electronic device used to monitor the speed of the heart. Heartbeat is usually measured from hand wrists or neck and with the advancement of sensor devices, a heartbeat sensor is used. The sensor measures number of times the heart beat is expanding or contracting in a minute. Based on this bpm which is said to be beats per minute is calculated and displayed to the user. Pulse sensor is used in this research to monitor the heartbeat of user and update frequently as a display.

3.7 Pulse Sensor

Pulse sensor is a plug and play heart-rate sensor to monitor bpm. Normal heartbeat of children ranges from 70-100 bpm and adult's ranges from 60-100bpm.The sensor will measure the expansion and contraction of capillary blood vessels and if the signal crosses the threshold level the message is delivered to the registered users in the App database.

3.8 Mobile mesh networking

Mobile mesh networking is a kind of network to create device-to-device connections from mobile phone to IoT .Connections for mobile mesh networking can be established through Bluetooth, Wi-Fi Direct and available mobile technologies. The working of mobile mesh networking happened in two ways, namely, Single hop and multi hop modes. The Single hop mode connects the device with another device whereas multi hope mode connects to multiple devices. The multi hop is utilized in this paper since the multi hop mobile mesh networking send the message until it reaches the endpoint in offline mode over greater distances. This

technology helps the woman to safeguard even when internet connection is unavailable. The direct routing algorithm is used to send messages to the nodes and effective resource utilization.

Even people available with Wi-Fi or fast internet access everywhere , due to the requirement of expensive infrastructure, lack of connectivity occurs in deep rural areas and outside town areas .In such outer areas when internet is very slow, unreliable, expensive, or simply non-existent possibility of woman gets attacked by strangers and seems helpless due to unreliable internet access. Hence Right Mesh mobile mesh network fulfil the requirement of message sharing when internet fails and safeguard the woman .The direct routing algorithm searches for the node through Bluetooth technology till it finds and send message connected in the mobile mesh networking.

A Smart Handbag also works in case of any theft or stealing occurs. When the handbag rope is tried to cut, the burglar alarm in the handbag is activated and produces a huge sound in the form of alarm and alert the neighbours and makes the thief panic. When women travel in bus or train by standing, there is possibility of annoying person to steal a handbag. At that time, the alert removable stripe attached to the handbag gets locked and alerts the user by burglar alarm.

Mobile mesh networking is becoming a self-regulating network to enhance global information sharing in all aspects. It establishes the connection even during the natural disasters as an emergency responder.

4. EXPERİMENTAL RESULT

Formulating exclusive techniques is a really perfect and specific solution for many unresolved problems, so the method applied beneath two distinct categories is referred to as a device can be activated by simply pressing an emergency button. This tool gets activated and sends instant vicinity with an alert message to the police and the pre-registered numbers and also connects phone calls to the police with the help of a Bluetooth module (HC05). Since Mobile Mesh Networking is implemented Bluetooth is enough to connect with other mobile phones without any internet connection to track the victim’s location. Since mobile phones are connected to Bluetooth Module HC05 it can establish a connection to our mobile even if it is 100m apart. So it is not essential for the mobile phone to be in hands to make phone calls and track locations during emergency situations.

A woman should switch-on the Smart Handbag in advance in case she is walking in a lonely or dark lane or far-flung area. Only the woman authenticated to the gadgets can begin the system by way of fingerprint experiment. The device constantly experiments the woman’s finger on the device every 1 minute, if any uncertainty with finger trace the device sends to the vicinity's authorized pre-registered phone number or police station via SMS message as a safety measure. Smart Handbag also consists of another security system to monitor heart-beat rate using pulse monitoring sensor. The pulse monitoring sensor keeps on monitoring the pulse rate of the women and when the pulse rate is above the threshold level fixed, the device understands the conditions of emergency and sends the messages to vicinity's authorized pre-registered phone number or police station as a safety measure. The health safety is also considered in the device since health is most important to any human being.

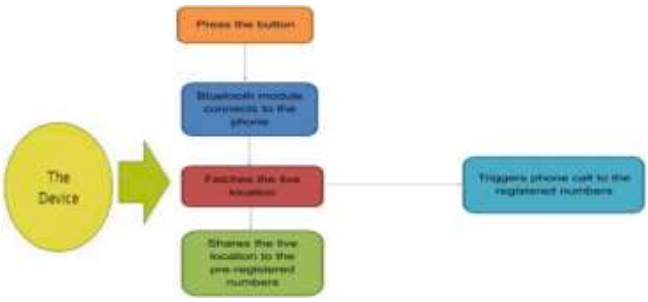

Fig.2. Flow diagram of function Mobile App for Smart Safety and Health Monitoring Device

In the 21st century, the contribution of women to any kind of work is equal to men. Most of the times, when women travel in bus or trains they go by standing, at that time unknowingly handbag might be removed from them, or it might be robbed by the thieves knowingly, to overcome this problem an additional removable strap is attached to the handle so they can fix it on their shoulder, and it won't be removed until the user removes it. In case of any forceful pull, the strap just rolls over the shoulder. This strap will be more user- friendly.

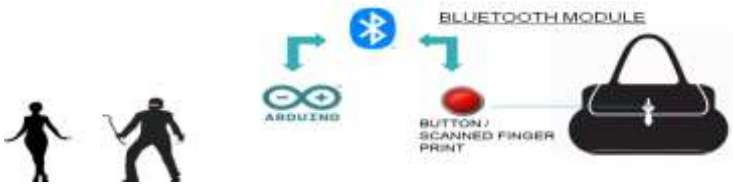

Fig.3. Operations of Smart Handbag

4.1 Strap and Alert Sound

As the device is tied to the handbag, safety of handbag and valuable things inside the handbag are sustansible factor to be considered. According to the reports it is observed that for every 3 minutes, a burglary, robbery, or a break-in is taking place in India, and also time to reconsider the protection degrees of home security. Robbery is another major problem confronted by women in India while they travel or out of office. To tackle this hassle, when an unknown person attempts to reduce the rope of the handbag to steal the things from a handbag the sensor sense and automatic alarm is generated to alert the user about the robbery. The immediate sensing of the sensor and alert signal safeguard the valuables of the women. It can also be used for any community peoples. The important components responsible to enable the operations are LDR, LED, buzzer, wires, and resistors. The light will be constantly falling on the photo resistor (LDR) and when the damage happening to the handbag rope the light stops falling to LDR and the alert signal gets activated and produces a sound alarm.

Fig.4. Panic Environment Alarming

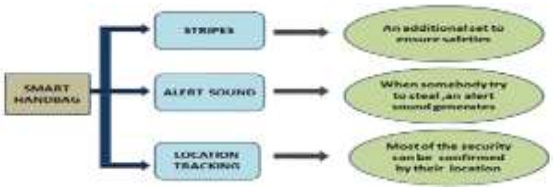

Fig.5. Working of Smart Safety and Health Monitoring Device

4.2 *Location Tracing*

Women are subjected to be in most difficult conditions while in a problem, due to the anxiousness and unable to handle the situation though a device to safeguard is available. The device is designed in such a way to respond to the other end by sharing location at high speed by pressing the button outside the handbag. The victim's location will be shared to the pre-registered phone numbers and nearest police station. The vicinity is tracked by means of a mobile application that is to be established on the user's cellular phone.

Fig.6. Health Monitoring System

The user mobile Bluetooth is associated with the HC-05 module and HC-05 is a cool module that can add two-way (full-duplex) wireless functionality. The module is to transmit information between microcontrollers and Bluetooth of a Phone. The module communicates with the assist of USART at 9600 baud rate hence it is easy to interface with any microcontroller that holds USART. We can also compose the default values of the module by using the command mode. The location is shared as a SMS and recorded voice message so there is no need for the internet. The recorded voice message lets the helper understand the situation and shares the location as directed by Google maps.

Fig.7. Android Interface for Women Safety

Fig.8. Victim Location Tracing

4.3 Android App

When application installed for the first time, you have to register your guardian's phone number. The location is retrieved only on the screen along with the current address of your location and when the emergency button has been clicked, the current location will be shot to the pre-registered numbers and also make a phone call to the police along with the location. As mentioned above, all these processes will happen spontaneously even if the mobile phone is not in the hands and without the internet facility. A woman should switch on this Smart Handbag in advance in case she is walking on a dark avenue or dark lane or far-flung area. The security of the device is also considered as an important concern and women's fingerprint is set as an authenticated input to the gadget.

5. CONCLUSİON AND FUTURE WORK

The proposed Smart women safety and health monitoring system aims to prove an exhaustive security for women in this 21st technology century. The main aim of the research is to reach the rural areas and the women can benefit from the device at a lower price and come out without any fear. The alarm sounds make the women safe during the travel and also alerts the near-ones about grotesque. The considerable features like sending messages, dial a phone call, sharing the location and alarm sound alerts the relatives and near-ones and help to trace the victims location .If required the location of the victim can be snapped and shared as a group message. In addition to the hardware design, an android app is developed to provide additional safety features like sending group text messages, recorded audio and safe nearby location share audio recording.

The research paper presents the prototype of a smart women safety and health monitoring device and performance metrics have to be considered for further analysis to prove its efficiency. In the future, the device may be added with features like greater processing speed, additional health monitoring features and burglar sound during emergencies.

6. REFERENCES

[1]. Islam, Md. M., Rahaman, A., & Islam, Md. R..: Development of Smart Healthcare Monitoring System in IoT Environment. SN Computer Science, 1(3), Springer (2020). https://doi.org/10.1007/s42979-020-00195-y

[2]. Akram, W., Jain, M., &Hemalatha, C. S.: Design of a Smart Safety Device for Women using IoT. Procedia Computer Science, 165, 656–662, Elsiver (2019). https://doi.org/10.1016/j.procs.2020.01.060.

[3]. Prof. Sunil K Punjabi, Prof. SurvarnaChaure and Prof. UjwalaRavale.: Smart Intelligent System For Women & Child Security," IEEE 9th annual information technology, electronics and mobile communication conference"pp. 451-454,IEEE (2018).
[4]. Dr. M. Yuvaraju and M.C.Kalaiselvi.: Patient Monitoring And Women Safety System Using IoT ,International Journal of Scientific Research in Computer Science, Engineering and Information Technology,pp.50-57, (2018).
[5]. Taştan, M..: IoT Based Wearable Smart Health Monitoring System. Celal Bayar Üniversitesi Fen BilimleriDergisi, 343–350, (2018). https://doi.org/10.18466/cbayarfbe.451076.
[6]. Ahir, S., Kapadia, S., Chauhan, J., &Sanghavi, N.: The Personal Stun-A Smart Device For Women's Safety. In 2018 International Conference on Smart City and Emerging Technology (ICSCET) (pp. 1-3),January, IEEE ((2018).
[7]. Sogi, N. R., Chatterjee, P., Nethra, U., & Suma, V.: SMARISA: A Raspberry Pi Based Smart Ring for Women Safety Using IoT. In 2018 International Conference on Inventive Research in Computing Applications (ICIRCA) (pp. 451-454), July IEEE (2018).
[8]. Saha, J., Saha, A. K., Chatterjee, A., Agrawal, S., Saha, A., Kar, A., Saha, H. N.: Advanced IOT based combined remote health monitoring, home automation and alarm system. In Computing and Communication Workshop and Conference, IEEE 8th Annual, pp 602-606, (2018).
[9]. Thibaud, M., Chi, H., Zhou, W., Piramuthu, S.:Internet of Things (IoT) in high-risk Environment, Health and Safety (EHS) industries: A comprehensive review, Decision Support Systems, 108, 79-95, Symmetry (2018).
[10]. M. Sathya, S. Madhan and K. Jayanthi :Internet of Things(IoT) based health monitoring system and challenges, International Journal of Engineering & Technology(IJET), 7 (1.7) 175-178 , IJET (2018).
[11]. T. BhanupriyaandDr.TVP.Sundararajan, "Activity Tracker Wrist Band for Children Monitoring using IoT", International Journal on Recent and Innovation Trends in Computing and Communication, ISSN: 2321-8169, Vol. 5, Issue 11, November, (2017).
[12]. Prof. BasavarajChougula, et al.: Smart Girl Security System.International Journal of Application or Innovation in Engineering & Management,pp.281-284 , (IJAIEM) (2017).
[13]. Harikiran, G. C., Menasinkai, K., &Shirol, S.: Smart security solution for women based on Internet Of Things(IOT),International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), (2016). https://doi.org/10.1109/iceeot.2016.7755365.
[14]. Shweta M, Tanvi P, Poonam S, &Nilashree M.: Multipurpose Smart Bag. Procedia Computer Science, 79, 77–84,(2016). https://doi.org/10.1016/j.procs.2016.03.011 .
[15]. L. Ashwin Kumar.: ARPN Journal of Science and Technology. Mobile Application for News and Interactive Services,pp 01-06, (2012).