SMARISA: A Raspberry Pi based Smart Ring for Women Safety Using IoT

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Abstract—**Every day, every woman, young girls, mothers and women from all walks of life are struggling to be safe and protect themselves from the roving gaze of the horribly insensitive men who molest, assault and violate the dignity of women on a daily basis. The streets, public transport, public places in particular have become the dominion of the hunters. Due to these atrocities that women are subjected to in the present scenario, a smart security wearable device for women based on Internet of Things is proposed. It is implemented in the form of a smart ring (SMARISA) and comprises of Raspberry Pi Zero, Raspberry Pi camera, buzzer and button to activate the services. This device is extremely portable and can be activated by the victim on being assaulted just by the click of a button that will fetch her current location and also capture the image of the attacker via Raspberry Pi camera. The location and the link of the image captured will be sent to predefined emergency contact numbers or police via smart phone of the victim thus preventing the use of additional hardware devices/modules and making the device compact.**

Keywords-Internet of Things, Women Safety, Computer Networking, Smart Ring, Raspberry Pi, Mobile Application

I. INTRODUCTION

In the present scenario, women are keeping pace with men in every walk of life but unfortunately at cost of being subjected to abuse, harassment, violence in public and even at their own houses. They cannot step out of their houses at any time of the day, cannot wear clothes as per their will, nor can they even go for work in peace. There is some kind of inhibition that women are subjected to which not only takes away their sense of freedom but also shatters their confidence and dreams [1].

Due to the above said reasons, it is quite apparent that there is a striving need for women security in the country. However, it is a point worth to note that advancement in technology has paved its path in almost all walks of life. As such, it is now possible to intelligently apply the benefits of current technology to resolve societal issues. This paper, therefore, aims to apply the current trend in technology, i.e., Internet of Things (IoT) to eliminate fear filled lifestyle of female folks. The Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet [2]. It refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to areas such as smart cities [3]. In the recent past, issues on women harassment are accentuating at great heights, creating anguish and distress among the women of today. As a matter of grave concern, this paper introduces a Raspberry-Pi based wearable device called the Smart Ring that proves constructive to the women in danger and helps them to fight such odds [4]. The main objective of the system is to intimate an instant location and a help message through an Android app to a registered number of contacts and the police, so that untoward incidents could be prevented and to provide real time evidence for swift action against the perpetrators of the crime.

Fig 1. depicts the applications of IoT which is gradually evolving in all frontiers of mankind.
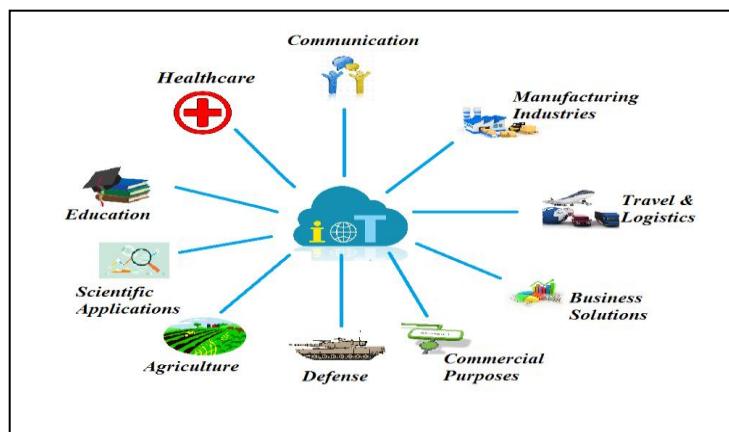

Figure 1. Applications of IoT

Such a wearable device is much easier to conceal as well as reach and can be worn easily with much lesser risks of being lost or broken in a scuffle and can be used efficiently to call for help. This device is a real-time, portable, securable system that consists of a button that triggers the Raspberry-Pi, which sends the alert message, victim's current location with a recorded image of the crime and also produces a high frequency alarm to draw the attention of others. Although this device has been designed primarily for women security, it can also benefit other members of the society including elderly people, a girl child or anyone who faces an unsafe situation.

Considering the present situation of women and how they are objectified, molested, abused and violated ruthlessly by insensitive men, it is high time that some steps are taken to make the women of our world safer and stronger. Most of the times women face such atrocities in the most unexpected place and time where it is really difficult to ask for help and even if they do so by the time help reaches them, the deed is done. The most difficult thing is to send her current location as soon as the victim senses some danger. Moreover, sometimes such incidents are so sudden that there is hardly any scope of collecting the evidence against the criminal and the guilty escapes punishment just because of lack of evidence. This is the reason why women are still vulnerable and scared to raise their voice and fight for justice.

Hence, the aim of this paper is to develop a device which can protect women in such situations where communication via mobile also becomes challenging.

II. LITERATURE SURVEY

Authors of [5] have worked on the use of Internet of Things (IoT) that leads to the Smart Security technology. They have highlighted the development of a safety device called the Smart Band that communicates with a Smart Phone that has access to the Internet, thereby, alerting the victim's family, friends and police about the incident, aided by GPS tracking and message services [5].

Also, authors of [6] have proposed a smart intelligent security system for women and have shown their concern regarding various issues faced by women. Their proposed system uses two objects, a wrist band and spectacles, where the band incorporates a switch to activate a screaming alarm and tear gas mechanism for self-defending purpose and also sends alert messages and location to emergency contacts. The system also incorporates a mechanism to figure out the attacker using a live streaming video [6].

Authors of [7] have developed a smart security device based on IoT concept. Throwing light on societal challenges faced by women, a device called "watch me" has been proposed that includes a sensor to detect the heart beat rate of a person that will become high when the woman is in danger, generating an alarm sound to grab the attention of nearby people. The device also automatically makes a call to registered contacts and supports GPS tracking to track the victim's location [7].

Authors of [8] have described the deployment of Internet of Things in the physical world across many sectors. The paper presents a novel approach to collect data from the devices using sensors and many case studies in which it can be applied, through a sample demonstration of smart home based on this principle [8].

Suraksha: The device is based on Blood pressure sensors and sends a help message to registered numbers and location tracking [9].

Child Safety wearable device: This device enables to track the daily activity of children and also locate the child using Wi-Fi and Bluetooth services present on the device [10].

HearMe: An application that includes lock screen access and instant siren on the receiver device and can be accessed through hardware buttons to facilitate quick access to the woman [11].

Femme: It consists of a device and a smart phone that are synchronized using Bluetooth, which triggers the instant location to the registered contacts and includes audio recordings [12].

Abhaya app: It is an android app which was mainly developed for women safety that provides instant location to the registered contacts by pressing a single power button in the phone [13].

III. SYSTEM DESIGN

Considering the issues with women of today, the need of the hour is to keep our women in safe hands. The blooming technologies of the 21st century have been best utilized in developing various applications and devices to protect women in distress. Technologies such as IoT and Virtual Reality are in demand and have proved beneficial to the women society[14].

However, still tragedies prevail indicating the need for better approaches. Hence, this paper aims at designing a device that is more accessible and portable to help the victim to reach her family and friends in an emergency. Most of the times, it is challenging to apprehend the criminal. This issue can be solved by the image that is captured by the device that is being developed. Also, there is a need for a system that helps senior citizens of the society to call for help in case of a health crisis where the situation does not favor the person to contact for medical help. This work, thus leads towards the development of a Raspberry-Pi based Smart Ring SMARISA using IOT technology.

Fig 2. shows the architecture diagram of SMARISA comprises of The Raspberry Pi Zero is a low cost single board computer used for interfacing Raspberry Pi camera and buzzer, a buzzer module emits a high frequency alarm to draw the attention of the public towards the victim, a camera module that captures the image of the criminal when the victim is being assaulted thus helping in criminal apprehension on pressing of a button, a Message Sending module that is used to send the current location of the victim tracked via GPS of the user's smart phone and the link of the image captured via Raspberry Pi

camera to the emergency contact numbers using SMS, and an Android application that provides the user interface and selects emergency contact numbers.
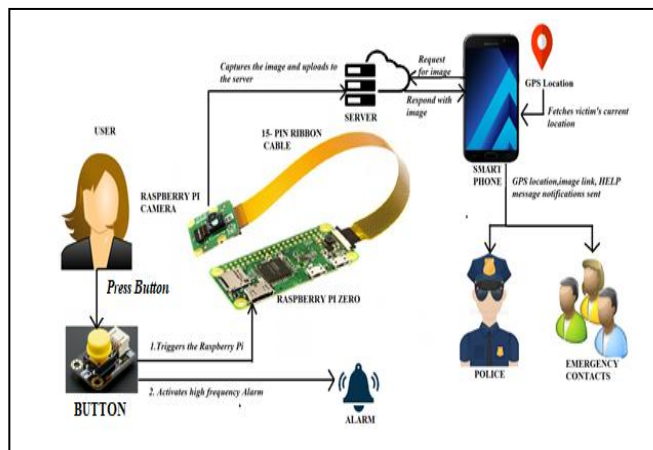

Figure 2. Software Architecture Diagram of SMARISA

IV. WORKING MODALITY OF SMARISA

SMARISA is a wearable Raspberry Pi based device that aims to help women in distress. It is integrated with a smart phone application that uses GPS tracking to find the victim's location, a camera module to record the crime for evidence and Messaging services to aid in alerting the emergency contacts with the incident, thereby, proving to be a boon to women.

Fig 3. shows the block diagram of SMARISA.
The Smart Ring SMARISA consists of a button, a Raspberry-Pi Nano board, a camera module and a buzzer. When a woman is in danger, she presses the button that triggers the Raspberry-Pi Nano that enables the camera module to capture an image of the incident.
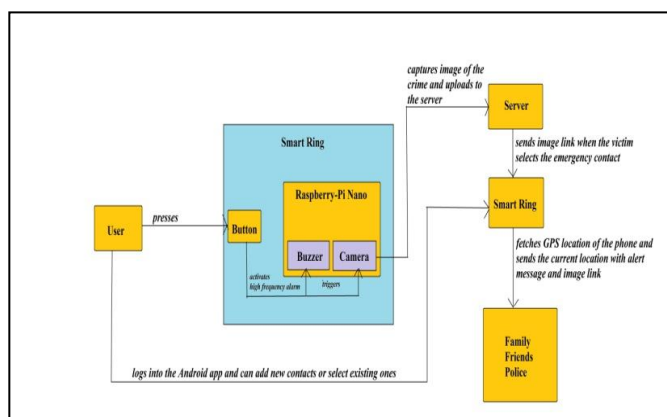

Figure 3. Block Diagram of SMARISA

The captured image is stored in a local host server that is run on a machine. The user logs into an Android App, specially designed for the ring, that allows her to select from a list of existing contacts or add a new contact with whom she wishes to communicate. Once the desired contact is selected, the image link fetched from the server, a help message along with the current GPS location of the victim is sent to the emergency contact and police. The buzzer connected to Raspberry-Pi is activated and it generates a high frequency screeching alarm to seek the attention of the people in that vicinity and also serves as a warning to the intruder, on the click of the same button.

In woman safety application camera is used to find out location of the user and send surrounding images to emergency contact numbers respectively. This device is better than the existing systems and can be really helpful to individuals in danger because of the following reasons:

- Criminal Identification
- Increased accessibility and portability
- A boon to senior citizens and people suffering from medical issues
- Can also employed for children safety thus preventing crimes like child abuse and child trafficking
- Need for a movement towards safer environments

This paper is an endeavor to develop an effective self-defense gadget which would provide protection to women in case of any assault or unsolicited contact. The major merit of this product is its simplicity and is also economical and effective handy device for women who travel alone. This gives more confidence to the women about their safety. Since it is implemented in the form of a ring the device can be easily concealed and extremely accessible in dangerous situations. But there is always room for improvement. Some improvements can be made so that it expects to enhance the performance without altering the existing design. Presently the application is compatible only to android smart phones. So by making it compatible with any OS, can improve the system. The system can be further developed by adding few sensors to sense the fear and anxiety and thus automatic response can be obtained. Addition of a voice recognition system for the access will also help to improve the performance.

V. CONCLUSION

The existing systems are not powerful enough to prevent crimes against Woman. Main purpose of the system is fast process, low cost of development, acceptable quality, accurate tracking.
This paper put forth a technique where a woman, when in danger, can instantaneously intimate to the concerned authorities. The proposed technique uses GPS tracking of the smart phone to get the device's co-ordinates. This technique further uses URL of the image and alert message to inform the family and police personnel.

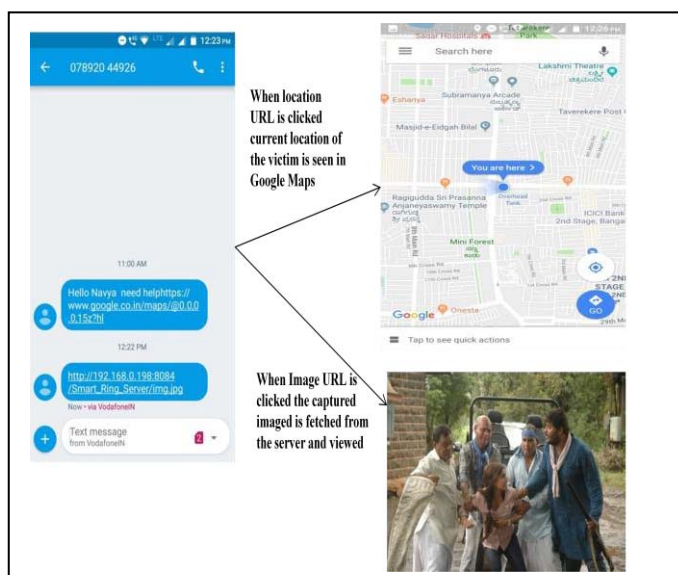Fig 4. shows the results of SMARISA depicting the location of the victim along with the captured image.

Figure 4. Results of SMARISA showing the location and captured image

However, this technique is effective only with the availability of smart phone to the victim and the contact personnel. Hence, there is a scope for further improvements by using GSM and GPRS aspects in the approach.

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