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# ShieldRing: Smart Companion for Senior Citizen and Physically Challenged.

*Omkar Hawaldar[1], Omkar Pawar[2], Pradnya Payannavar[3], Chaitanya Patil[4], Abhinandan Mangaonkar[5]*

[1]Dept. of Computer Science and Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India. omkarkh0603@gmail.com
[2]Dept. of Computer Science and Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India. ompawar2109@gmail.com
[3]Dept. of Computer Science and Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India.
pradnyakadam214@gmail.com
[4]Dept. of Computer Science and Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India. pchaitanya550@gmail.com
[5]Assistant Professor, Dept. of Computer Science and Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India.
abhinandanm@sgbit.edu.in

**ABSTRACT—**

ShieldRing is an innovative smart companion designed to cater to the unique needs of senior citizens and individuals with physical challenges. This project aims to enhance safety, convenience, and connectivity for this demographic by leveraging advanced technology and compassionate design. The primary objective of Shielding is to prioritize the well-being and independence of its users. It incorporates a range of features such as safety alerts, fall detection, and prevention, health monitoring, location tracking, voice assistance, and personalized reminders. These features work together to address concerns related to emergencies, falls, health monitoring, social isolation, and daily tasks. Shield ring's safety features include an emergency call button that can be activated during critical situations, ensuring prompt assistance by notifying emergency services or designated contacts. Fall detection and prevention algorithms help minimize the risk of falls and provide users with guidance to maintain balance and stability. ShieldRing's user-friendly design ensures ease of use for individuals of varying technological proficiency. It can be worn as a ring or attached to other accessories, ensuring it is readily accessible at all times. ShieldRing revolutionizes the lives of senior citizens and individuals with physical challenges by combining advanced technology, safety measures, health monitoring, social connectivity, and user-centric design. It empowers users to lead fulfilling and independent lives while providing reassurance to their caregivers and loved ones.

Keywords—ShieldRing, Health monitoring, Location tracking, Voice assistance.

## Introduction

Shieldring is a groundbreaking project that brings together cutting-edge technology and compassionate design to create a smart companion specifically tailored to the needs of senior citizens and individuals with physical challenges. It is a comprehensive solution aimed at enhancing safety, convenience, and connectivity for those who may require additional support in their daily lives [1].

At its core, ShieldRing is built to prioritize the well-being and independence of its users. It incorporates a range of features that address key concerns faced by seniors and individuals with physical limitations, while also offering personalized assistance and fostering social engagement.

One of the primary focuses of ShieldRing is safety. It is equipped with advanced sensors and algorithms that enable it to detect and respond to emergencies. Whether it's a fall, a medical incident, or any critical situation, Shieldring's emergency call button can be activated, promptly notifying emergency services or designated contacts with the user's precise location information. This quick response system provides peace of mind to both users and their loved ones, ensuring timely assistance when it is needed most.

ShieldRing also pays close attention to fall prevention and monitoring. By utilizing state-of-the-art technology, it can detect falls and offer guidance on maintaining balance and stability. The device's proactive approach to fall prevention aims to reduce the risk of accidents and empower users to maintain their independence with confidence. Health monitoring is another essential aspect of Shielding. By continuously tracking vital health metrics such as heart rate, blood pressure, and sleep patterns, it allows users to stay informed about their well-being [2]. Additionally, Shieldring can provide medication reminders and support users in following their prescribed exercise routines, contributing to a healthier and more active lifestyle.

With its built-in GPS technology, ShieldRing enables location tracking and geofencing capabilities. Caregivers and family members can easily monitor the whereabouts of their loved ones, receiving alerts when the user enters or exits predefined areas. This feature adds an extra layer of security, allowing for immediate intervention if necessary. Shieldring is not just a safety device—it's also a smart companion designed to foster social interaction and combat

loneliness. Through voice recognition and natural language processing, users can engage in conversations with Shieldring, accessing information, entertainment, and even emotional support. With internet connectivity, Shieldring provides access to online services such as music streaming, audiobooks, video calls, and more, ensuring that users stay connected with friends, family, and the world around them.

The design of Shieldring is centered on user-friendliness and accessibility. It can be comfortably worn as a ring or attached to a wristband or necklace, allowing users to carry it with them wherever they go. The interface is simple and intuitive, ensuring a seamless user experience, even for those less familiar with technology. Shieldring is a game-changer in the field of assistive technology, revolutionizing the lives of senior citizens and individuals with physical challenges. By combining advanced features, safety measures, health monitoring, social connectivity, and user-centric design, Shieldring empowers its users, enabling them to lead fulfilling and independent lives while providing reassurance to their caregivers and loved ones.

## LITERATURE REVIEW

The current study builds upon a significant body of research that has investigated the effects of topic of the study on relevant outcome variables. In this literature review, we will summarize and analyze the key findings from previous studies in this area, highlighting the most important and relevant findings to inform the present study.

In study [3], The purpose of this article is to offer a solution to the problem of sexual harassment that many women face in public areas across the world. According to WHO and NCRB-Social-Government research, around 35% of women are victims of sexual harassment in public places such as bus stops, railway stations and sidewalks. An Android application meant to aid women in perilous circumstances is presented as a solution to this problem. The software may be launched with a single click or by shaking the phone, and it uses GPS technology to determine the user's location. The software will then alert the user's registered contacts as well as neighboring police stations of the user's position. The major goal of this initiative is to improve women's safety in public areas. The planned project's ultimate purpose is to improve women's safety in public places. The project's goal is to create an Android application that can utilize GPS to determine the user's position and send a message to registered contacts and surrounding police stations. A simple click or shaking the phone might initiate this. Organizations such as WHO and NCRB-social-government have highlighted the significance of this issue, which continues to be a major concern globally.

In study [4], This study describes an innovative wireless power transfer method that allows a smart health tracking ring to be charged easily using a smartphone. The technology can send enough energy to charge the smart ring while the user holds the phone by using the reverse wireless charging function of smartphones. The system consists of a transmitter that generates 170.07 kHz signals from a 5 V DC source and a receiver circuit that catches and transforms the magnetic signal into a DC output. This output powers a heart rate monitor and charges a 3.7 V battery. The smart ring in the studies receives a maximum power of 102.4 mW from a 5 V DC smartphone power supply. Using a smartphone's reverse wireless charging capability, the suggested wireless charging method allows for simple charging of the smart health tracking ring. The smart ring can accept a maximum power of 102.4 mW, which is enough to run the device for 24 hours when fully charged in 1.52 hours. The power transfer efficiency of the system is 13.39%, suggesting that a significant amount of energy is wasted during the wireless power transmission procedure. Hours if the smartphone is held for at least 1.52 hours every day.

In study [5], This study presents the design and testing of a smart-ring that can measure heart rate, respiration rate, blood oxygen saturation, and temperature using photoplethysmogram, ECG, and thermistor sensors. The study discovered a strong connection between the experimentally measured heart rate and respiration rate and their respective standards, suggesting the ring's measurement accuracy. The experimentally obtained blood oxygen saturation, on the other hand, showed trial-dependent similarities with its reference standards, suggesting that additional refining of the technology may be required to increase its accuracy. The temperature values were within the typical skin temperature range. Overall, this smart-ring has the potential to be a valuable tool for monitoring numerous health data, particularly for people who want to track their health through wearable technology. Using photoplethysmogram and ECG sensors, the Kick Ring LL smart-ring created and assessed in this study reliably detects heart rate and respiration rate. The blood oxygen saturation values, on the other hand, exhibited some trial-dependent similarities with their reference standards, indicating space for improvement. Temperature values were within the typical range for skin temperature. Overall, the smart-ring has the ability to monitor health data and might be useful for people who wish to manage their health and wellness using wearable technology.

In study [6], - This study describes the creation of a wearable smart ring intended to increase women's safety. The study focuses on harnessing IoT technology to improve the device's functioning, allowing it to link to a smartphone application and transmit notifications in the event of an emergency. The article describes the smart ring's design and development process, showcasing its features and capabilities. The gadget is lightweight, inexpensive, and simple to use, with a dependable connection and enough battery life to be helpful in everyday scenarios. According to the study, the smart ring might be used to track a wearer's whereabouts and deliver notifications if they approach a risky region or are too far away from a predefined safe zone. The study culminated in the creation of SMARISA, a smart ring that employs Raspberry Pi technology to improve women's safety. This wearable gadget is intended to communicate with a smartphone app via the Internet of Things (IoT) and can be used to warn contacts in the event of an emergency. The gadget is lightweight, inexpensive, and user-friendly, with a dependable connection and a long battery life appropriate for daily usage. According to the study, the smart ring might also be used to monitor the wearer's health by sending notifications in the case of a medical emergency, such as a fall. It may also track the wearer's whereabouts, alerting contacts if they approach a risky region or leave a predefined safe zone.

In study [7], The following article analyses the present status of research on smart rings and wearable gadgets and identifies research needs. The research design is then thoroughly discussed, including participant recruiting and procedures. The ARO smart ring is a gadget that enables users to connect with digital devices such as cellphones and PCs by utilising hand and finger motions. Participants in the research were instructed to do various activities while

wearing gloves, carrying bags, or holding other things in their hands. Data on job completion time, accuracy, and user feedback on the ARO smart ring's design and usability were collected. According to the study, the ARO smart ring proved efficient in allowing users to engage with digital gadgets even while their hands were occupied. "ARO: Exploring the Design of Smart-Ring Interactions for Encumbered Hands" is a paper that offers a research on the design of smart-ring interactions for people who have encumbered hands. The paper investigates potential use cases and design requirements for such interactions and presents ARO, a prototype system. The article describes ARO's design and assesses its efficacy through a user research. The findings indicate that ARO is a possible option for those who have burdened hands, as well as a new route for developing wearable devices that might help with daily chores.

## METHODOLOGY

The aging population, physically challenged individuals often face challenges with daily activities, which can lead to a lower quality of life and increased dependence on caregivers. Additionally, women around the world experience sexual harassment in public places and children suffer from security concerns. To normalize these issues, the ShieldRing project aims to create a smart companion device in the form of a wearable ring that offers communication and emergency assistance, as well as feature such as, location tracking. The project focuses on developing a user-friendly interface, ensuring the device is comfortable to wear, and providing a high level of accuracy and reliability. The device is intended to improve the safety, independence, and overall well-being of these individuals.

The wearable device aims to provide a compact and convenient solution that enhances the safety, independence, and quality of life for aging and physically challenged individuals. It includes an emergency calling feature for immediate assistance, daily activity assistance to support their needs, safety and security features such as location sharing, and a user-friendly interface accessible to a diverse range of users. By promoting independence, ensuring safety, and offering a higher level of autonomy, the device seeks to improve the overall well-being and quality of life for its wearers. The scope of the Shield Ring project includes the design, development, and testing of a smart companion device in the form of a wearable ring that can assist senior citizens and physically challenged individuals in their daily activities. The device will include a range of features such as emergency calling, location tracking.

The ShieldRing project plans to review wearable technology and smart companion devices to identify areas for improvement and opportunities for innovation and will develop a user-friendly interface that is intuitive and easy to navigate for senior citizens and physically challenged individuals. Designing the hardware and software components of the device, including sensors, connectivity, and battery life. Conducting extensive testing to ensure the accuracy and reliability of the device. Developing a robust supply chain and manufacturing process to ensure the availability of the device at an affordable price point.

People who live alone, such as the elderly, physically challenged adults, women, and children, may have to rely on phoning for aid or having a personal emergency response system installed in their houses. This may not be viable for people who do not have access to or cannot afford these services. Consider three distinct sorts of smart rings, each with its own intended function and set of constraints. SMARISA, for example, is intended to improve women's safety through the use of IoT technology, but it is subject to security concerns and costs more than comparable solutions on the market. The other smart ring, Women Safety-Saviour Android Application, attempts to combat sexual harassment in public areas by utilizing GPS technology to identify a user's whereabouts.

## PROPOSED SYSTEM

The current system lacks consideration for the factors that directly affect one or two parameters, such as health monitoring and location tracking resulting in incomplete, insufficient results and complication in handling such device. To achieve consolidated overall cost and time, we require a system that can deliver accurate and efficient outcomes. These existing systems are using IoT to alert the emergency services. Thus, IoT is not being used in our system because it can lead to data leakage and raise security concerns. Instead, we are using Bluetooth to connect the device with the application which will deliver emergency calling services. It also includes GPS tracking for location-based safety alerts and additionally, users can customize features according to their requirements in the mobile app.
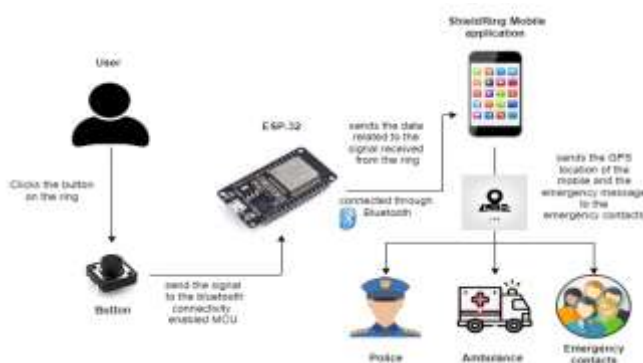


Fig 1. Proposed Architecture of ShieldRing

The ShieldRing is a ring-shaped device that will have four inputs (Single click, Double click, Triple click and long press) with different functionalities. The user performs various functionalities with the help of these inputs. For example, the user can set emergency contact number for a single click, so whenever the user single click's the ring, the contact has been called and informed. The Android App is provided for setting these functionalities. The user can customize the functionality as per his/her requirement for each input. The input data is sent to the application and stored. This data is accessed, and relevant action is taken such as sending location of the user, emergency calls, etc.
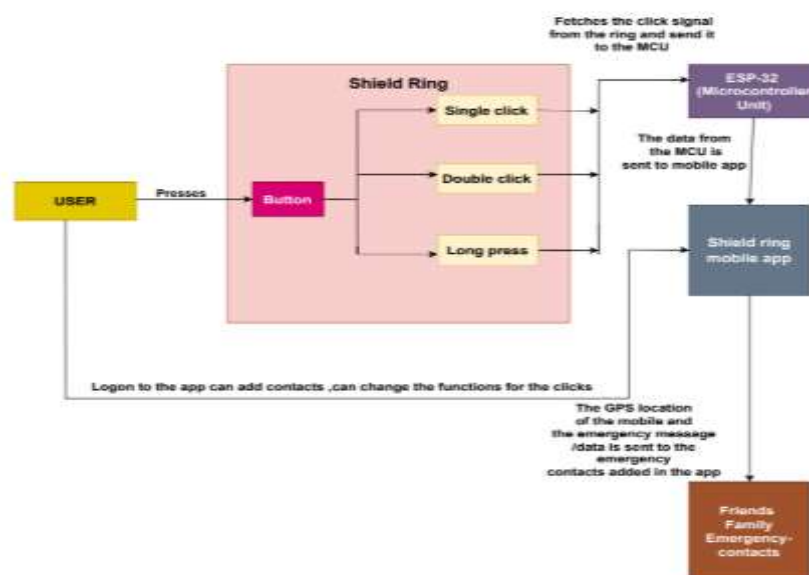
## PROPOSED METHODOLOGY



Fig 2. Overview of the ShieldRing

The proposed methodology for shielding for handicapped individuals involves a systematic approach to ensure their safety and well-being. The methodology can include the following steps:

**Design and prototyping:** Developing a concept and designing for the ShieldRing, including the shape, size, and materials. This may involve sketching, rapid model, diagrams or other prototyping techniques.

**Sensors and components:** Choosing and integrating the sensors and components required for the desired features of the ShieldRing, such as a Bluetooth sensor for connectivity to the application, a button/sensor for touch controls.

**Electronics:** Designing and integrating the electronics that power the ring, including a micro-controller, battery, and wireless connectivity for data transmission.

**Android Application:** Developing an android application that includes the user interface which processes data from the sensors and store in the database and provide the functionality accordingly.

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## WORKING OF PROPOSED METHODOLOGY

1.   The user wears the ShieldRing device.

2.   The ShieldRing device is paired with the user's smartphone using the mobile app.

3.   The user configures the device and adds emergency contact information to the mobile app.

4.   In the event of an emergency, the user presses the button on the ShieldRing device to summon help.

5.   The ShieldRing device sends an alert to the user's smartphone mobile app.

6.  The emergency services respond to the alert and dispatch the appropriate personnel to the user's location.

7.  The user's emergency contacts are also informed of the emergency.

In conclusion, the ShieldRing system is an uncomplicated and effective way for elderly, physically challenged and children to call for help during emergencies. The system is user-friendly and can be customized to suit each user's specific requirements.

## RESULT AND DISCUSSION

The ShieldRing assists the wearer in performing various tasks, such as making emergency phone calls to family members, medical personnel, etc. The user customizes these functionalities via the Android Application for performing different task using ShieldRing. The ShieldRing helps individuals with their independence and security.



Fig 3. Wearable ShieldRing Device

The ShieldRing, a smart companion for senior citizens and physically challenged individuals, yields significant positive results in improving their well-being and quality of life. Through its innovative features and functionalities, the ShieldRing enhances safety, independence, and overall support for its users. The device's emergency calling feature ensures immediate assistance in critical situations, providing peace of mind for both users and their caregivers. The compact and convenient design enables easy wearability and operation, minimizing any burden for individuals with mobility challenges. The ShieldRing's daily activity assistance promotes self-sufficiency by providing reminders, mobility support, and personalized features tailored to individual needs. By incorporating safety and security features like location sharing, it enhances the safety and well-being of wearers, allowing caregivers and family members to monitor their whereabouts and respond promptly if needed. The user-friendly and intuitive interface of the ShieldRing makes it accessible for older adults, individuals with physical challenges, women, and children, ensuring a seamless and enjoyable user experience. Ultimately, the ShieldRing fosters independence, safety, and an improved quality of life for its users, empowering them to live more fulfilling and self-reliant lives.
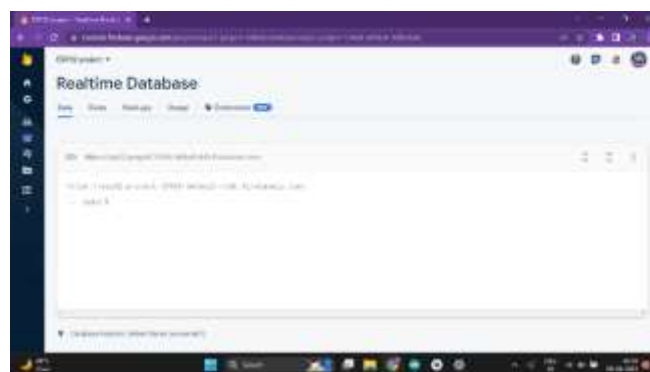


Fig 4. Storing the input data in the Firebase

Fig 5. ESP32 output shown on the Serial Monitor



Fig 6. Output of a Single click



Fig 7. Output of a Double click

Fig 8. Output of a Long Press



Fig 9. ShieldRing Detecting Location of user

## CONCLUSION

In conclusion, The ShieldRing project aims to improve the safety, independence, and overall well-being of elderly people, physically challenged individuals, women, and children. The device is intended to address the limitations of existing systems and provide a user-friendly interface, comfort and reliability. The ShieldRing creates a highly efficient and practical method for improving the quality of life for those who face daily challenges with activities and security concerns.

## FUTURE SCOPE

The ShieldRing project has significant potential for future development and expansion. Enhancing the device's sensor capabilities, increasing power output and efficiency. Improving and enhancing the overall design and comfort of the device, and integrating additional features such as fall detection and medication reminders. The future scope of the ShieldRing project holds great potential for further advancements and improvements in supporting senior citizens and physically challenged individuals. Some potential areas of expansion and development include:

**Advanced Health Monitoring:** Incorporating advanced health monitoring capabilities into the ShieldRing, such as continuous vital sign monitoring, fall detection, medication management, and integration with medical devices, can provide real-time health data and enable timely interventions to prevent medical emergencies.

**Artificial Intelligence and Machine Learning:** Integrating artificial intelligence (AI) and machine learning (ML) technologies can enable the ShieldRing to learn user patterns, preferences, and behavior, allowing it to provide personalized recommendations and anticipate individual needs. This can lead to more efficient and proactive support for users.

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