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WIRELESS SENSOR NETWORK BASED BAN (BODY AREA NETWORK) BASED ALERTING SYSTEM FOR ELDER PEOPLE

Vardelli Rakesh[1], Purushotham Sharath[2], Rade Raviteja[3] and Tipparti Anil Kumar[4]

Department Of Electronics and Communication Engineering,

CMR Institute of Technology,

Hyderabad, Telangana, India – 501401

Abstract—

This paper provides an overview of a wireless sensor network (WSN) based body area network (BAN) alerting system designed for elderly human individuals. This system aims to monitor the health and well-being of the elderly people and provide timely assistance in case of emergency health issues. The BAN consists of sensors placed on the body of the elderly person, including heart rate monitors, temperature sensors, accelerometers, fall detection sensors. etc. These sensors collect real-time data, which is transmitted to a central monitoring unit using wireless technologies such as Bluetooth, Zigbee, or Wi-Fi. The monitoring unit processes the sensor data, analyses it against predefined thresholds or patterns, and generates alerts when abnormal readings or potential emergencies are detected. Designated authorities receive the alerts through message, email, phone call, or a dedicated mobile application, enabling them to initiate immediate action. The system also allows for long-term data analysis and trend monitoring, which can assist healthcare professionals in assessing the overall well-being of the elderly individual. Privacy and security considerations are essential in the implementation to protect personal health information. The WSN-based BAN alerting system provides a viable solution for enhancing the well-being of elderly people.

1.INTRODUCTION

The aging population worldwide has brought attention to the need for advanced technologies and systems to ensure the safety and well-being of elderly individuals. One area of focus is the development of WSN-based BAN alerting systems tailored specifically for the elderly. These systems leverage wireless sensor networks and wearable devices to monitor the health parameters of elderly individuals in real-time and provide timely assistance in case of emergencies or health issues. The objective of a WSN-based BAN alerting system for the elderly is to enhance their safety, improve their quality of life, and enable them to maintain their independence. By continuously monitoring vital signs, physical activity, and other health-related parameters, these systems can detect potential health risks or emergencies and generate alerts to notify caregivers, family members, or medical personnel. The key components of such a system include sensors placed on the body of the elderly person, a wireless communication network to transmit data from the sensors to a central monitoring unit, and an alerting mechanism to notify designated individuals in case of emergencies. The system also enables long-term data analysis to identify trends and patterns in the elderly person's health, supporting proactive healthcare management and preventive interventions. Addressing the lack of timely assistance, limited mobility, caregiver support, fall detection, and long-term health analysis, the WSN-based BAN alerting system presents a promising solution to overcome these challenges. It offers a comprehensive approach to monitor and respond to the health needs of elderly individuals, ensuring their safety and well-being. In this project, we will explore the design, implementation, and evaluation of a WSN-based BAN alerting system for elderly people. We will examine the selection and placement of sensors, the wireless communication protocols, the algorithms for health monitoring and alert generation, and the data analysis techniques for long-term trend identification. The goal is to develop an efficient and reliable system that can make a significant impact on the lives of elderly individuals, their caregivers, and healthcare providers. By harnessing the power of wireless sensor networks and wearable devices, the WSN-based BAN alerting system has the potential to revolutionize the way we care for and support the elderly population, enabling them to age gracefully and with a higher level of safety and well-being. As the global population continues to age, ensuring the health, safety, and well-being of elderly individuals becomes increasingly important. WSN-based BAN alerting systems have emerged as a promising solution to address the unique challenges faced by the elderly population. These systems leverage wireless sensor networks and wearable devices to monitor vital signs, detect emergencies, and provide timely assistance. The aging process often brings with it a range of health issues and vulnerabilities. Falls, heart problems, temperature fluctuations, and other emergencies can have severe consequences for elderly individuals if not promptly addressed. Traditional caregiving methods may fall short in providing immediate monitoring and response, necessitating the development of innovative technologies like WSN-based BAN alerting systems. The fundamental objective of a WSN-based BAN alerting system for the elderly is to enhance their safety, independence, and overall quality of life. By integrating wearable sensors into a wireless network, the system enables continuous monitoring of the individual's health parameters in real-time. These sensors, strategically placed on the body, capture vital information such as heart rate, body temperature, activity levels, and even location. The collected sensor data is transmitted wirelessly to a central monitoring unit, where sophisticated algorithms and analysis techniques are employed. This unit serves as the brain of the system, processing and analysing the data to detect anomalies, patterns, and potential emergencies. When a critical event or health issue is identified, the system generates alerts that are communicated to caregivers, family members, or emergency services. In addition to real-

time monitoring and emergency alerting, the WSN-based BAN system enables long-term data analysis. By accumulating and analysing data over time, healthcare professionals can gain valuable insights into the individual's health trends, identify risk factors, and formulate personalized care plans. This proactive approach can help prevent adverse health events and optimize the elderly person's well-being. Privacy and security are paramount considerations in the design and implementation of a WSN-based BAN alerting system. Safeguarding the personal health information of the elderly individual is crucial to ensure confidentiality and comply with privacy regulations. By addressing the challenges of timely assistance, limited mobility, caregiver support, fall detection, and long-term health analysis, the WSN-based BAN alerting system offers a comprehensive solution for the aging population. It empowers elderly individuals to live independently, provides peace of mind to caregivers, and facilitates better healthcare management. In this project, we will delve into the development and deployment of a WSN-based BAN alerting system tailored for the specific needs of elderly individuals. Through a combination of sensor selection, wireless communication protocols, intelligent algorithms, and secure data management, we aim to create an effective and reliable system that can significantly improve the quality of life for elderly individuals and enhance their overall care. The advancement in wireless sensor networks and tiny hardware technologies, it is now promising to devise wireless networks that operate in and around human body. A WBAN is a networking concept that has developed with the idea of monitoring crucial and important physiological signals from low power and tiny in-body or on-body sensors. The gathered data from sensors are then transmitted to a remote node via a wireless medium, where the data is sent to a higher layer application to be decoded. WBAN communication takes place in three major categories; communication between body node to an outside base station, communication between two on-body nodes, and communication between an in-body node to and on-body node. These three categories can be called off-body communication, on-body communication and in-body communication respectively [1]. For making Physical Layer (PHY) and MAC protocols for short range, low power and highly reliable wireless communication schemes that could also operate in, on and around the human body, the IEEE wireless body area network standard (IEEE 804.15.6 TG6) [2] had been made.

2.REVIEW OF LITERATURE

The system aims to achieve the following objectives: Real-time Health Monitoring: The system collects real-time data from various sensors placed on the body of the elderly person to monitor their vital signs, physical activity, and other health-related parameters. The objective is to track their health status continuously and identify any deviations or abnormalities. Early Detection of Health Issues: By analysing the collected sensor data, the system aims to detect early signs of health issues or emergencies, such as abnormal heart rate, high temperature, sudden falls, or lack of movement. The objective is to identify these issues promptly and alert caregivers or medical personnel for immediate intervention. Emergency Alert Generation: When the system detects a potential emergency or abnormal health condition, its objective is to generate timely alerts. These alerts can be communicated to caregivers, family members, or emergency services through various communication channels like SMS, email, phone calls, or mobile applications. The objective is to ensure that the right people are notified promptly and can provide assistance as needed. Fall Detection and Assistance: One specific objective of the system is to detect falls, which are common among the elderly and can lead to serious injuries. The system aims to identify fall incidents accurately and quickly, triggering an alert to caregivers or emergency services to provide immediate aid. Long-term Health Monitoring and Analysis: The system's objective includes the storage and analysis of collected data over time. By analysing long-term trends and patterns, healthcare professionals can gain insights into the overall health status and well-being of the elderly person. This objective helps in making informed decisions regarding their care and proactive interventions to prevent future health complications. Privacy and Security: Ensuring the privacy and security of the collected health data is a crucial objective of the system. It should implement appropriate measures to protect personal health information, maintain data confidentiality, and adhere to relevant privacy regulations.

3.BLOCK DIAGRAM

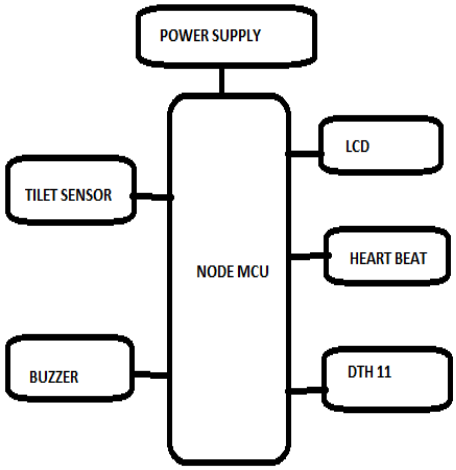

Fig. 1: Block diagram of the proposed system

3. EXISTING SYSTEM:

The existing system for monitoring and alerting elderly individuals often relies on traditional caregiving methods and manual monitoring, which can be limited in terms of timely assistance and comprehensive health monitoring. Here are some key aspects of the existing system: Manual Monitoring: Caregivers or family members are responsible for manually checking the well-being of elderly individuals at regular intervals. This may involve taking vital signs, observing physical activity, and assessing overall health status. However, this approach has limitations due to its intermittent nature and the potential for human error or oversight. Emergency Response: In the existing system, the response to emergencies or health issues relies on the caregiver or family member's ability to recognize the problem and take appropriate action. This response may be delayed, especially if the individual is alone or the issue occurs during the caregiver's absence.

4. Proposed Objectives

The proposed system is a WSN (Wireless Sensor Network) based BAN (Body Area Network) alerting system designed specifically for elderly individuals. It aims to address the limitations of the existing system by providing comprehensive monitoring, timely assistance, and proactive health management. Here are the key features of the proposed system: Continuous Health Monitoring: The proposed system utilizes wearable sensors placed on the body of the elderly person to continuously monitor vital signs, physical activity, and other health parameters. These sensors collect real-time data, providing a comprehensive view of the individual's health status. Wireless Communication and Central Monitoring Unit: The sensor data is wirelessly transmitted to a central monitoring unit using technologies like Bluetooth, Zigbee, or Wi-Fi. The central monitoring unit serves as the control centre of the system, receiving and processing the sensor data in real-time. Intelligent Algorithms and Alert Generation: The central monitoring unit employs intelligent algorithms to analyse the sensor data and detect anomalies, patterns, and potential emergencies. When a critical event or health issue is identified, the system generates timely alerts to notify caregivers, family members, or emergency services. Fall Detection and Assistance: The proposed system incorporates fall detection mechanisms to identify falls accurately. It utilizes accelerometers and motion sensors to detect sudden changes in position or abnormal movements. When a fall is detected, the system triggers an alert, enabling immediate assistance to be provided to the elderly person. Timely Assistance and Emergency Response: The system ensures timely assistance by notifying designated individuals or emergency services when an alert is generated. Alerts can be communicated through various channels, such as SMS, email, phone calls, or a dedicated mobile application, allowing caregivers or medical personnel to respond promptly to the situation. Long-term Health Analysis and Trend Monitoring: The proposed system facilitates long-term health analysis by storing and analysing the collected data over

time. Healthcare professionals can gain insights into the individual's health trends, identify potential risks, and make informed decisions regarding their care. This proactive approach enables preventive interventions and personalized healthcare management. Privacy and Security: The proposed system prioritizes the privacy and security of personal health information.

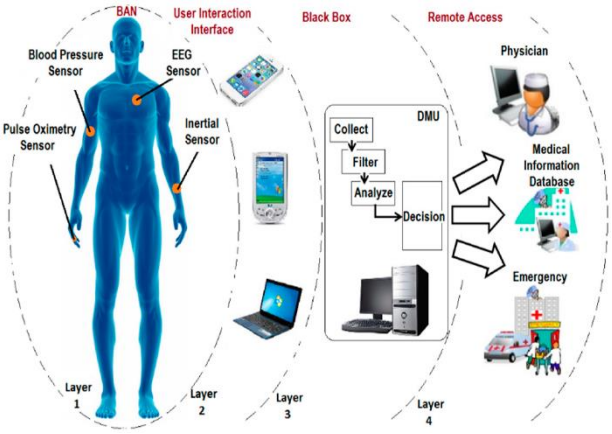

Fig.2: Body area network

5. Methodology

This unit serves as the brain of the system, processing and analysing the data to detect anomalies, patterns, and potential emergencies. When a critical event or health issue is identified, the system generates alerts that are communicated to caregivers, family members, or emergency services. In addition to real-time monitoring and emergency alerting, the WSN-based BAN system enables long-term data analysis. By accumulating and analysing data over time, healthcare professionals can gain valuable insights into the individual's health trends, identify risk factors, and formulate personalized care plans. This proactive approach can help prevent adverse health events and optimize the elderly person's well-being. Privacy and security are paramount considerations in the design and implementation of a WSN-based BAN alerting system. Safeguarding the personal health information of the elderly individual is crucial to ensure confidentiality and comply with privacy regulations. By addressing the challenges of timely assistance, limited mobility, caregiver support, fall detection, and long-term health analysis, the WSN-based BAN alerting system offers a comprehensive solution for the aging population. It empowers elderly individuals to live independently, provides peace of mind to caregivers, and facilitates better healthcare management. In this project, we will delve into the development and deployment of a WSN-based BAN alerting system tailored for the specific needs of elderly individuals. Through a combination of sensor selection, wireless communication protocols, intelligent algorithms, and secure data management, we aim to create an effective and reliable system that can significantly improve the quality of life for elderly individuals and enhance their overall care. The advancement in wireless sensor networks and tiny hardware technologies, it is now promising to devise wireless networks that operate in and around human body. A WBAN is a networking concept that has developed with the idea of monitoring crucial and important physiological signals from low power and tiny in-body or on-body sensors.

5. CONCLUSIONS

The WSN-based BAN (Body Area Network) alertingsystem for elderly people is a promising solution to address the challenges faced by the aging population. The system leverages wireless sensor networks, wearable devices, and intelligent algorithms to provide continuous monitoring, timely assistance, and proactive health management. By continuously monitoring vital signs, physical activity, and other health parameters, the system can detect potential health risks, emergencies, and falls. It generates timely alerts to notify caregivers, family members, or emergency services, enabling immediate assistance and intervention. The system also facilitates long-term health analysis, helping healthcare professionals identify trends, risk factors, and make informed decisions regarding care. The proposed system overcomes the limitations of the existing manual monitoring systems, providing a comprehensive and automated approach to elderly care. It enhances the safety, well-being, and independence of elderly individuals, while alleviating the burden on caregivers. Additionally, the system promotes proactive healthcare management, enabling preventive interventions and optimized care plans. However, the successful implementation of the WSN-based BAN alerting system requires careful consideration of sensor selection, wireless communication protocols, algorithm design, and data security measures. Privacy regulations must be adhered to, and user-friendly interfaces should be developed to ensure ease of use for both the elderly individuals and caregivers. In conclusion, the WSN-based BAN alerting system offers significant potential to revolutionize elderly care by providing continuous monitoring, timely assistance, and proactive health management.

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