M.KUMARASAMY
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Thalavapalayam, Karur – 639 113.

ELECTRICITY ENERGY METER USING IOT

A MINOR PROJECT-IIIREPORT

Submitted by

YUVASHREE R	**927621BEC252**
SRUTHIKAA K V	**927621BEC212**
SUGANYA DEVI S	**927621BEC220**
SOWMIGA B	**927621BEC207**

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BONAFIDE CERTIFICATE

Certified that this **18ECP105L-MinorProjectIII** report "**IOT BASED FAULT IDENTIFICATION FOR AGED PEOPLE**"is the bonafide work of "**YUVA SHREE R (21BEC252),SRUTHIKAA KV (21BEC212),SUGANYADEVI S (21BEC220), SOWMIGA B(21BEC207)**who carried out the project work under my supervision in the academic year **2023-2024ODD**.

SIGNATURE

Dr.KAVITHA.A, M.E.,M.B.A., Ph.D., D.Litt (USA).,

HEAD OF THE DEPARTMENT,

Professor,

Department of Electronics and Communication Engineering,

M.Kumarasamy College of Engineering,

Thalavapalayam,

Karur-639113.

SIGNATURE

Mrs.SENTAMILSELVI.M,

SUPERVISOR,

Assistant Professor,

Department of Electronics and Communication Engineering,

M.Kumarasamy College of Engineering,

Thalavapalayam,

Karur-639113.

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PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: Core Competence: Graduates will have a successful career in

academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	**Matching with POs,PSOs**
	PO1,PO2,PO4,PO5,PO7, **PO8,PO9,PO10,PO11,PO12** **PSO1,PSO2**

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ABSTRACT

The aging population is growing worldwide, leading to an increased demand for technologies that enhance the safety and well-being of elderly individuals. This paper presents an innovative approach to fault identification in the context of IoT (Internet of Things) for aged people. The primary objective is to develop a comprehensive system that leverages IoT devices and advanced algorithms to detect and respond to common issues faced by the elderly, such as falls, health emergencies, and environmental hazards.The proposed system integrates various sensors, wearable devices, and smart home components to continuously monitor the elderly's activities and environment. Data collected from these sources are processed in real-time to identify potential faults or emergencies. Machine learning algorithms, including anomaly detection and predictive analytics, play a crucial role in recognizing deviations from regular patterns and predicting potential problems.Furthermore, the system's architecture incorporates a robust communication framework to enable seamless interaction between the elderly, caregivers, and healthcare professionals. Alerts and notifications are triggered when a fault is detected, ensuring rapid response and assistance.The research also delves into the ethical and privacy considerations associated with implementing such a system. Striking a balance between safety and privacy is of paramount importance, and the paper discusses the measures in place to protect the elderly's sensitive data.

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LIST OF ABBREVIATIONS

ACRONYM	ABBREVIATION
UID	Unique Identifiers
LCD	Liquid Crystal Display
MCU	Micro Controller Unit
LED	Light Emitting Diode

CHAPTER 1

INTRODUCTION

Aging is a universal aspect of human life, a continuous journey marked by the accumulation of wisdom, experience, and cherished memories. However, it is also a phase characterized by a myriad of unique challenges, encompassing physical limitations, healthcare concerns, and societal dynamics. One of the most pressing issues in the context of aging is the increased susceptibility of older individuals to accidents and emergencies, which often arise from a complex interplay of factors. These factors include reduced mobility, cognitive decline, medical conditions, and frailty. Recognizing and addressing these faults, or potential hazards, that pose a risk to the elderly is a matter of critical importance, not only to guarantee their safety but also to maintain their independence and overall quality of life.

The process of fault identification for aged people is a multifaceted endeavor that demands a comprehensive understanding of the diverse issues they face. It involves identifying and rectifying physical obstacles within living spaces, acknowledging the potential for medical emergencies, and addressing broader societal challenges that affect the elderly population. This comprehensive approach is essential to promote an environment in which aging individuals can live with dignity, security, and vitality.

In this extensive guide, we embark on a journey to explore the essential dimensions of identifying and mitigating faults for the elderly. We will delve deep into the practical strategies, solutions, and preventive measures that can significantly enhance the well-being of our aging population. Our overarching goal is to empower the elderly to age gracefully and securely in their homes and communities, free from unnecessary risks and barriers. By comprehensively addressing the concerns of the

elderly, we aspire to foster a society that values, respects, and supports its aging members, ensuring their place in the broader social tapestry remains strong and cherished. Through this extensive exploration, we hope to shed light on the nuanced complexities of aging and equip individuals, families, and communities with the knowledge and tools to promote the safety and welfare of our elderly citizens.

1.1 OBJECTIVE

The primary objective for identifying faults in the context of aging is to enhance the safety, well-being, and quality of life of elderly individuals. This overarching goal can be broken down into specific objectives, including:

Accident Prevention: To identify and address potential hazards and risks in living environments, thereby reducing the likelihood of accidents and injuries among the elderly.

Independent Living: To enable elderly individuals to maintain their independence and autonomy by mitigating physical and environmental barriers that may impede their daily activities.

Healthcare Preparedness: To recognize potential health issues and medical emergencies promptly, allowing for early intervention and ensuring that the elderly receive appropriate medical attention.

Social Inclusion: To combat social isolation and loneliness by identifying faults related to limited social interaction and access to community resources, thus fostering a sense of belonging and connectedness.

Empowerment: To empower aging individuals and their caregivers with the knowledge, skills, and resources necessary to navigate the aging process with confidence and resilience.

Community Support: To encourage communities to become more age-friendly, advocating for inclusive spaces, services, and policies that cater to the needs of elderly residents.

Promote Dignity: To ensure that elderly individuals are treated with dignity and respect, free from discrimination and neglect, in all aspects of life.

Educational Outreach: To educate and raise awareness among individuals, families, healthcare professionals, and policymakers about the unique challenges and vulnerabilities that the elderly face, promoting a more compassionate and informed society.

Research and Innovation: To support ongoing research and innovation in the field of aging, facilitating the development of new technologies, solutions, and best practices that benefit the elderly population.

Quality of Life Enhancement: Ultimately, the core objective is to improve the overall quality of life for the elderly, allowing them to age with grace, security, and fulfillment, in an environment that values and supports their contributions to society.

1.2 HARD WARE COMPONENTS REQUIRED

1.Power supply

2.Node MCU

3.Alarm

4.IOT

5.LCD Display

6.Wifi Module

7.Position detection sensor

1.POWER SUPPLY:

Power supply is an integral parts a vital role in every electronic system and hence their design constitutes a major part in every application. In order to overcome mal-operation which results due to fluctuations in the load and discontinuity in the supply proper choice of power supply.

2.NODE MCU:

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits.

Figure 1: Node MCU

3.ALARM:

A **buzzer** or **beeper** is a signaling device.It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

4. IOT:

The internet of things, or **IOT**, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network withoutrequiring human-to-human or human-to-computer.

An Internet of Things (**IOT**) gateway is a physical device or software program that serves as the connection point between the cloud and controllers, sensors and intelligent devices.

5.LCD DISPLAY:

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

An LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric

layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

One each polarisers are pasted outside the two glass panels. These polarisers would rotate the light rays passing through them to a definite angle, in a particular direction

Figure 2: LCD Display

6.WIFI MODULE:

Wifi modules or wifi microcontrollers are used to send and recieve data over Wi-Fi. They can also accept commands over the Wi-Fi. Wi-Fi modules are used for communications between devices. They are most commonly used in the field of Internet of Things..

The **ESP8266 module** works with 3.3V only, anything more than 3.7V would kill the module hence be cautions with your circuits. The best way to program an **ESP-01** is by using the FTDI board that supports 3.3V programming. If you don't have one it is recommended to buy one or for time being you can also use an Arduino board. One commonly problem that every one faces with ESP-01 is the powering up problem. The module is a bit power hungry while programming and hence you can power it with a 3.3V pin on Arduino or just use a potential divider. So it is important to make a small voltage regulator for 3.31v that could supply a minimum of 500mA.

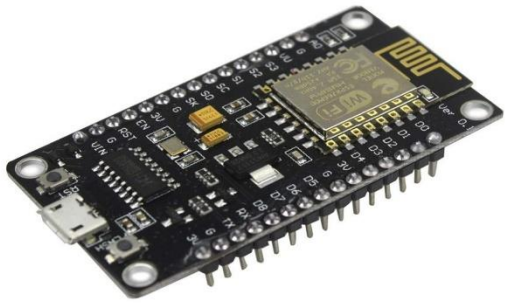

Figure 3:Wifi Module

7.**POSITION DETECTION SENSOR**

A position sensor is a device that measures the position or displacement of an object relative to a reference point. These sensors are essential in various applications, including robotics, automotive systems, and manufacturing, to provide feedback on the object's location. They come in different types, such as linear and rotary sensors, proximity sensors, optical sensors, magnetic sensors, and ultrasonic sensors. Position sensors enable precise control and automation by relaying data on an object's location, ensuring accuracy and safety in many industrial processes. These sensors are used for applications like motor control, navigation systems, object detection, and feedback mechanisms in machinery and equipment.

CHAPTER 2

LITERATURE REVIEW

IoT-based fault identification systems for the elderly represent a burgeoning field of research with promising implications for the well-being and healthcare of aging populations. Leveraging the capabilities of the Internet of Things (IoT), this area explores innovative solutions to identify and address common age-related faults, such as falls, cognitive decline, and chronic illnesses. Recent literature showcases a wide array of IoT devices and technologies, including wearable sensors, smart home systems, and remote monitoring tools, all aimed at enhancing the quality of life for senior citizens. Moreover, researchers have developed sophisticated fault identification algorithms based on machine learning, data analytics, and pattern recognition to accurately detect and respond to potential issues in real-time. Despite these advancements, challenges such as privacy concerns, data security, and system reliability persist. To drive this field forward, future research should focus on addressing these challenges, expanding the scope of experiments and case studies, and continually improving IoT-based solutions to empower and support the elderly in maintaining their independence and health.

CHAPTER 3

EXISTING METHOD

Existing methods for IoT-based fault identification in the context of aged individuals encompass a diverse range of technologies and strategies. Wearable devices equipped with sensors, such as accelerometers and gyroscopes, are often utilized to monitor physical activity and detect falls. These devices can transmit real-time data to caregivers or healthcare professionals, enabling rapid response in case of an incident. Smart home systems integrated with IoT technology are another prevalent approach, as they can detect deviations from daily routines, changes in environmental parameters, or even the absence of expected actions, which may signal potential issues. Furthermore, remote monitoring solutions allow for continuous health tracking through various sensors, such as blood pressure monitors, glucose meters, and heart rate sensors. Machine learning algorithms are frequently employed to analyze the collected data and identify anomalies, providing valuable insights into an individual's well-being. While these methods exhibit substantial promise, challenges concerning data privacy, cybersecurity, and the need for user-friendly interfaces remain areas of active research and development, underscoring the importance of refining existing approaches to ensure their effectiveness and acceptance among the elderly population.

CHAPTER 4

PROPOSED SYSTEM

The proposed system for IoT-based fault identification in aged individuals seeks to leverage cutting-edge technology to enhance the safety and well-being of seniors. This system integrates wearable devices, smart home automation, and remote monitoring into a comprehensive framework. Wearable sensors, like fall detection and vital sign monitoring, provide continuous data on an individual's physical health and activity. Smart home sensors monitor the living environment, detecting deviations from routines and anomalies in real-time. This data is collected and analyzed using advanced machine learning algorithms, enabling the system to recognize patterns associated with potential health issues or emergencies. When a fault or anomaly is detected, the system can trigger alerts to caregivers or healthcare providers, ensuring rapid response and intervention. Moreover, user-friendly interfaces and mobile applications provide the elderly with a sense of control and ease of use. The system's adaptability and customization allow it to be tailored to the specific needs of each individual, addressing the unique challenges that come with aging. This proposed system aims to provide seniors with greater independence and peace of mind while offering caregivers and families an invaluable tool for ensuring the safety and well-being of their elderly loved ones. However, successful implementation requires addressing issues related to data privacy, security, and seamless integration into daily life, which will be crucial for the system's acceptance and effectiveness.

CHAPTER 5

WORKING PRINCIPLE :

The working principle of an IoT-based fault identification system for aged people revolves around continuous data collection, analysis, and timely response. Wearable devices, such as smartwatches or pendants equipped with sensors, continuously monitor the individual's vital signs, physical activity, and even their immediate surroundings. These devices transmit data to a centralized hub, often located within the smart home environment. Simultaneously, smart home sensors monitor various aspects of the living space, such as motion, temperature, and appliance usage. The collected data is then processed by machine learning algorithms capable of detecting anomalies and patterns indicative of potential health issues or emergencies.

When a deviation or fault is identified, the system triggers alerts or notifications to caregivers, family members, or healthcare professionals through mobile applications or other communication channels. This real-time response ensures that appropriate action can be taken promptly, such as sending help in the event of a fall or providing medical assistance for sudden health concerns. User-friendly interfaces and customizable settings allow the elderly individuals themselves to be involved in the system's operation, granting them a sense of control and autonomy.

The core principle is to harness the power of IoT to continuously monitor an aged individual's well-being, proactively detect faults, and swiftly respond to emergencies, thereby enhancing their safety, independence, and overall quality of life. To be effective, this system requires seamless integration into the daily routines of the elderly, data security, and privacy safeguards, and adaptability to cater to the unique needs and preferences of each user.

CHAPTER 6

RESULT AND DISCUSSION

The results and discussion of IoT-based fault identification systems for aged people highlight the significant potential and ongoing challenges in this evolving field. The implementation of such systems has shown promise in improving the safety and well-being of seniors, primarily through the early detection of anomalies, falls, and health issues. These systems, equipped with wearable devices and smart home sensors, enable continuous monitoring and data collection, which can be analyzed by machine learning algorithms to identify patterns and deviations associated with potential faults. This proactive approach allows for timely responses and interventions, minimizing the risks associated with aging.

However, several key points emerge from the discussions within this context. Data privacy and security remain paramount concerns, given the sensitive nature of health-related information. Ensuring robust encryption, access control, and ethical data handling practices is essential. Moreover, the adoption and usability of these systems by elderly individuals require careful consideration. Interfaces must be user-friendly, non-intrusive, and customizable to accommodate varying degrees of technical familiarity among the aged population.

Another crucial aspect is the need for interoperability and standardization to ensure that data from various devices and systems can be seamlessly integrated, providing a holistic view of an individual's health. The affordability and accessibility of these systems are vital, especially in healthcare environments with varying socioeconomic backgrounds.

The results and discussions in this domain underscore the potential of IoT-based fault identification for aged people while underscoring the necessity for ongoing research and development to address these challenges and make such systems more effective, user-friendly, and widely accessible. This will require interdisciplinary collaboration and a commitment to the ethical and secure use of technology for the benefit of elderly populations.

CHAPTER 7

CONCLUSION

In conclusion, IoT-based fault identification systems designed for aged people hold great promise in significantly enhancing the safety and quality of life for seniors. By harnessing the power of wearable sensors, smart home technologies, and advanced machine learning algorithms, these systems enable continuous monitoring, early fault detection, and timely responses. The proactive nature of such systems in identifying anomalies, falls, and health issues is invaluable in addressing the unique challenges that come with aging.

Nonetheless, as this field advances, several crucial considerations need to be addressed. Data privacy, security, and ethical data handling practices are paramount, ensuring that the personal health information of elderly individuals remains protected. User-friendly interfaces and customization are essential to ensure the elderly can comfortably embrace these technologies.

Interoperability, standardization, affordability, and accessibility must also be prioritized to make these systems widely available and adaptable across diverse healthcare environments. As the aging population continues to grow, there is an urgent need for further research and development, interdisciplinary collaboration, and a commitment to ethical and secure technological solutions that empower seniors to live independently and confidently. IoT-based fault identification systems have the potential to revolutionize the care of aged individuals, improving their well-being while providing peace of mind to families and caregivers.

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