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Smart Wireless Message Display: Enhancing Communication with Intelligent Technology

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ABSTRACT

A digital notice board, consisting of a unified display with LED panels, enhances the visibility of announcements and other essential information for the general public, students, and staff. To promote effective communication at both the internal and external levels, it is feasible to consistently exchange multimedia files such as documents, PDFs, videos, and photographs. Campus contact with students is being replaced by digital technology, rendering paper notice boards obsolete. It provides proactive management that is both rapid and effective. The text covers the SWNB's software, hardware, and key features. The user receives important system operation and use information. The paper also discusses the SWNB's feasibility, reliability, growth potential, maintenance, user feedback, testing protocols, and improvements. This cutting-edge solution helps institutions and organizations streamline communication, boost efficiency, and adapt to the digital age. Innovative solutions are needed to fix conventional bulletin boards' inflexibility and inability to update immediately. This article covers Smart Wireless Notice Board (SWNB) setup, programming, and planning. The SWNB can display dynamic content, remotely modify it, and seamlessly integrate with existing communication infrastructures. It uses Raspberry Pi's versatility and multiple wireless connectivity options to do this.

Keywords: Smart wireless notice board; Smart classroom; Raspberry Pi; Internet of things (IoT).

1. Introduction

Wireless communication is the process of transmitting data across different places without relying on continuous directed media like optical fiber, electrical lines, or other infrastructure [1]. Both short and long radio waves have the ability to transmit information. Bluetooth, for instance, has a limited range of just a few meters, but deep-space radio has the potential to operate at distances of millions of kilometers. Alongside wireless networking, cell phones, two-way radios, and personal digital assistants (PDAs) are included in the wide array of mobile, portable, and fixed devices [2]. In addition to radios, headphones, and earbuds, several other items utilize radio wireless technology, including broadcast and satellite television, cordless phones, radio antennae, and garage door openers. Wireless communication utilizes various electromagnetic phenomena, including sound, light, magnetic fields, and electric fields, albeit less frequently. The phrase "wireless notice board" is overly limiting in the context of this article due to its broad spectrum of potential interpretations. A display device, such as an LCD, can present a message or notification within this system [3]. By utilizing the SMS feature on your mobile device, you may quickly configure or alter this message from any location. Sending an SMS with the required message's prefix and suffix is a straightforward process. The digital notice board we offer has numerous advantages compared to traditional wooden notice boards. This technical innovation will accelerate the dissemination of notifications to individuals worldwide. A functional notice board may be created with a Raspberry PI that displays messages through LED lights and also communicates them audibly [4]. Moreover, only authorized personnel have access to the transfer of information. Persons with disabilities, such as hearing or vision impairments, are urged to make use of this method. The system stands apart from traditional bulletin boards due to its commitment to distributing pertinent information to a wide audience. A "digital notice board" refers to an LED screen that is used for communication purposes among the public, students, or employees [5]. Employees have the ability to distribute a range of resources,

including as PDFs, documents, images, and videos, for both internal and external discussions, at any given time. On college campuses, digital screens are quickly becoming the primary means of communication, overtaking traditional paper message boards [6]. Furthermore, due to its efficiency and ease, it acts as a stimulus for managers to participate in proactive planning. Dividing your board into parts or categories will enhance users' ability to locate pertinent content [7]. Use tape to assign titles and mark off areas to ensure that each category contains only relevant content. Noticeboard postings are efficient for promptly resolving straightforward situations. Editors can use the request command to ask for a more detailed response. The SWNB aims to modernize bulletin boards by offering a dynamic and interactive wireless communication system that facilitates rapid information sharing in various settings such as schools, corporations, and public areas.

2. Literature Survey

The advent of digital technology has profoundly transformed communication in various domains in recent years, encompassing public spaces, workplaces, and educational institutions [8]. An increasingly popular innovative concept is the Smart Wireless Notice Board (SWNB). Through the utilization of cutting-edge technology, it completely revolutionizes the manner in which news and other forms of communication are disseminated. The objective of this literature review is to examine the main characteristics, advantages, feasibility, and challenges of SWNB systems, with a specific focus on their applications using Raspberry Pi technology [9]. By utilizing a solitary screen and LED panels, a digital notice board enables the convenient display of announcements and vital information to all members of the community, encompassing staff, faculty, and students [10]. The demand for rapid and efficient methods of communication is driving the transition from traditional bulletin boards to their digital counterparts. SWNB systems facilitate seamless exchange of documents, PDFs, videos, and photos among organizations. Therefore, communication is made easier both within and outside the organization [11].

The Raspberry Pi is an integral component of SWNB systems, known for its affordability and versatility as a microcomputer. The Raspberry Pi is the optimal choice for powering smart wireless notice board setups due to its multitude of advanced functionalities, minimal energy usage, and wide array of wireless connectivity alternatives. The modular architecture of the system facilitates the addition and modification of components, while also enabling it to adapt to various communication systems and changing requirements [12]. SWNB systems differ from conventional notice boards due to their ability to be managed remotely, display dynamic content, and facilitate fast and efficient communication [13]. SWNB systems offer the advantage of streamlining communication and lowering hardware expenses, enabling businesses to enhance productivity and adapt to the increasing reliance on digital technology [14]. The multimedia and interactive components of these systems effectively transmit announcements and information to the audience while also captivating and sustaining their interest [15]. The potential of SWNB systems to enhance information sharing and communication is immense. Therefore, it is crucial to carefully plan their feasibility, reliability, and scalability. Several crucial factors, including maintenance requirements, user feedback, testing procedures, and continuous enhancement, significantly influence the effectiveness of the SWNB system's setup and operation. In order to enhance the reliability and functionality of smart wireless notice board configurations, it is imperative to address these issues.

3. Proposed Methodology

An intelligent wireless notice board system, based on the Raspberry Pi platform, is designed to display dynamic content, enable remote administration, and promote user involvement. Raspberry Pi's exceptional versatility allows for effortless integration with various input devices, wireless modules, and display panels. One of the elements that allows for the presentation of text, graphics, and multimedia files is the ability to remotely change content and displays. The system can be implemented in various settings, such as public spaces, business establishments, and academic institutions. It simplifies the process of recruiting volunteers and spreading information. The method's simplicity in setting up and replicating makes it a cost-efficient and flexible approach for modifying bulletin board messages.

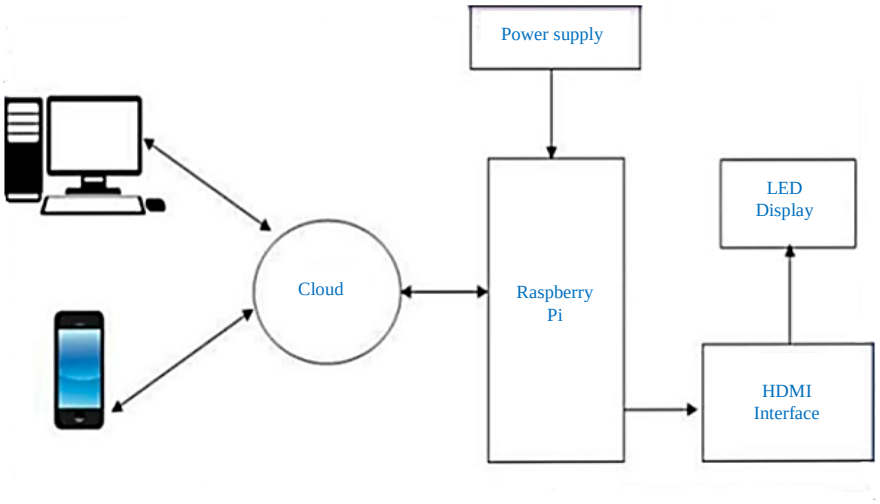

Figure 1. Block diagram of wireless notice board

Figure 1 illustrates the Raspberry Pi serving as the central processing unit (CPU) of the system. Here, the operation truly takes effect. In addition to content management and operation, it has the capability to communicate with devices that are not directly connected to the bulletin board. You can examine the integrated Wi-Fi and Bluetooth radios of the Raspberry Pi. Content can be altered and managed through remote device communication, using platforms such as laptops, tablets, or mobile phones. They enable inter-device communication. Display screen blocks refer to the graphical representations of LCD or LED screens connected to the Raspberry Pi. Currently, the majority of users utilize this platform to access multimedia content, including text, images, and videos. The notice board system is accessible via a range of devices. The package includes tangible buttons, keyboards, mice, and touch-sensitive screens. They enable the execution of diverse tasks, such as the generation of materials, navigation, and configuration. The CMS section showcases the software or service that manages the content of the notice board. It may encompass features such as content generation, user verification, remote upgrades, and scheduling, among other functionalities. Subsequent sections will explore the various techniques through which users can connect to the bulletin board system using the internet and mobile devices. This platform greatly simplifies tasks such as adjusting settings, overseeing content, and implementing remote changes. The integrated power supply block provides electrical energy to the Raspberry Pi, the display, and other connected components of the system. Integrating backend services, such as data analytics platforms and cloud storage, can improve the system's

scalability, usability, and practicality.

3.1. Hardware Requirements

A number of various parts are required to construct a wireless smart notice board with a Raspberry Pi. One can create a sophisticated wireless bulletin board system using a Raspberry Pi. A bulletin board can be posted to by an administrator from any location, and the message will appear right away. Situated near a Wi-Fi network, the little computer known as a Raspberry Pi can connect. The sender messages the Raspberry Pi once they have both successfully joined to the same wireless network. One could send from a mobile device or a stationary computer. To show the message, the Raspberry Pi will next send it to a monitor. Among the many operating systems that Raspberry Pi is compatible with are Ubuntu, Raspberry Pi OS (formerly Raspbian), and many others. With these operating systems, one can reliably and adaptably manage the wireless connections as well as the notice board software. Programming languages supported by Raspberry Pi include Python, JavaScript, and C/C++. This enables Raspberry Pi use by developers with different degrees of experience. Its versatility allows the notice board paper to provide features and functions that are especially designed to satisfy its needs. Screen of display Because of their low power consumption, broad size range, and reasonable price, LCD screens are widely used in smart notice boards. These excellent images allow one to view text, pictures, and even some simple animations. Direct connection of LCD screens with Display Serial Interface (DSI) or HDMI ports to the Raspberry Pi simplifies the setup process. One can use the Raspberry Pi to build an LCD-equipped wireless message board.

No matter where in the globe the Raspberry Pi is, it can receive and display text messages on its LCD screen. An other feature of this system is its ability to display sent text messages and interact with an Android phone.Usually all Raspberry Pis need to run is a 5V DC power supply. Verify that the power supply is consistently delivering 5V of output. Check that the Raspberry Pi model you're using has an amp-based current rating. For example, a power supply rated at 2.5A (2500mA) is usually needed for the Raspberry Pi 4 Model B; but, this can vary based on the model and the peripherals attached to it. It collects data kept on the cloud. The LINUX software is used in order to retrieve data from the cloud. An HDMI cable is needed to link the LCD screen and Raspberry Pi. The standard ways of interacting with and navigating through the menus, applications, and settings of the Raspberry Pi are a USB keyboard and mouse. They must be present for the smart notice board system's first setup and configuration as well as for its continuous maintenance.

Utilising web-based interfaces or mobile apps, you can remotely operate and manage the smart notice board. When users link their mobile devices to the bulletin board via Wi-Fi or Bluetooth,5 a connection that wirelessly allows them to write messages, upload media, and even schedule future content updates. A smart wireless notice board can be set up by connecting a Raspberry Pi to a computer or phone using a Wi-Fi module. Because the Raspberry Pi 3 has Wi-Fi, Bluetooth, and USB built in, it is a multipurpose device. Connecting via the Wi-Fi networks made accessible by the Raspberry Pi 4, 3, and Zero is another option. One can build an intelligent wireless communication board using a Raspberry Pi and a Bluetooth module. This arrangement allows a matrix display board to show messages received from a working mobile phone. A microcontroller regulates the Bluetooth module. Serial data is converted to parallel data for communication with the matrix and microcontroller.

A display and your Raspberry Pi 1, 2, or 3 can be connected using a typical HDMI to HDMI cable. With Raspberry Pi 4 you can use a micro HDMI to HDMI adapter or a standard HDMI to HDMI cable. There are HDMI connections compatible with both of these cables. To use it, just plug the HDMI cable into the matching port on your monitor or television. Built around the Raspberry Pi, every part of a smart wireless notice board system is powered by an electricity supply. This covers the Raspberry Pi itself, the LED display and the node MCU. One can connect the Raspberry Pi to a monitor using an HDMI cable or a VGA to HDMI converter cable. Use of the system also requires a USB keyboard and mouse.

Using a micro USB cable is usually how a Raspberry Pi is connected to a power supply and transferred data. The power connector on the Raspberry Pi is a micro USB port, same as those on smartphones. Additionally included is a 1.5-meter-long micro USB cable. Four USB ports total on the Raspberry Pi can support currents of up to 2.5A. Included with the screen and Raspberry Pi are separate power cables and connectors. USB cables allow connection to be established between input devices and other peripherals.

3.2. Software Configuration

Software Dependencies and Libraries

Install necessary software dependencies and libraries required for the operation of the notice board system. Examples include Python packages for GPIO control, display drivers, web servers (if applicable), and wireless communication libraries. Develop the notice board application software using a programming language such as Python, JavaScript, or another suitable language. Implement functionalities for displaying text messages, images, and multimedia content on the connected display screen. Integrate wireless communication capabilities for remote content updates and management. Optionally, develop a web-based or mobile application interface for remote control and configuration of the notice board.

User Interface Design

Design the user interface (UI) for the notice board application, ensuring intuitive navigation and user-friendly interactions. Create templates or layouts for displaying messages, images, and other content elements on the notice board screen. Consider accessibility and readability aspects, especially for users with varying levels of technical proficiency.

Content Management System (CMS)

Integrate a content management system (CMS) or database backend for storing and managing content to be displayed on the notice board. Implement features for content scheduling, rotation, and dynamic updates based on predefined rules or triggers.

Documentation and Deployment

Document the software configuration process, including installation steps, dependencies, configurations, and usage instructions. Prepare deployment instructions for installing the notice board software on Raspberry Pi devices in different environments. Provide documentation for end-users, administrators, and developers, covering setup, operation, and maintenance procedures.

Iterative Development and Updates

Adopt an iterative development approach to continuously improve and enhance the notice board software based on user feedback and emerging requirements. Release updates and new features regularly, ensuring the notice board system remains up-to-date and aligned with evolving needs and technologies.

Wireless Connectivity Configuration

Configure the Raspberry Pi's wireless connectivity settings, such as Wi-Fi or Bluetooth, to enable remote communication with other devices or networks. Set up network credentials (SSID and password) for Wi-Fi connectivity and establish a reliable connection to the internet. A smart wireless notice board powered by Raspberry Pi revolutionizes traditional communication methods, allowing for seamless remote updates and management from anywhere with internet access. By leveraging Raspberry Pi's affordability and advanced functionalities, this system significantly reduces hardware costs while providing dynamic content display and wireless communication capabilities. The modular design of Raspberry Pi facilitates easy customization and expansion, catering to diverse communication needs and evolving requirements. Furthermore, its low power consumption ensures energy efficiency, minimizing electricity costs and environmental impact compared to conventional notice board setups. With support for various programming languages and interfaces, Raspberry Pi seamlessly integrates into existing communication infrastructures, enhancing interoperability and compatibility. The interactive features and multimedia capabilities of this system enhance user engagement and attention, effectively conveying information and announcements to the audience. Moreover, Raspberry Pi-based notice board systems can effortlessly scale to accommodate growing user bases and expanding communication networks, making them ideal for deployment in diverse environments and settings.

4. Results and Discussion

A prime illustration of how communication and technology are merging, the Raspberry Pi-powered Smart Wireless Notice Board simplifies the way that current information is distributed.

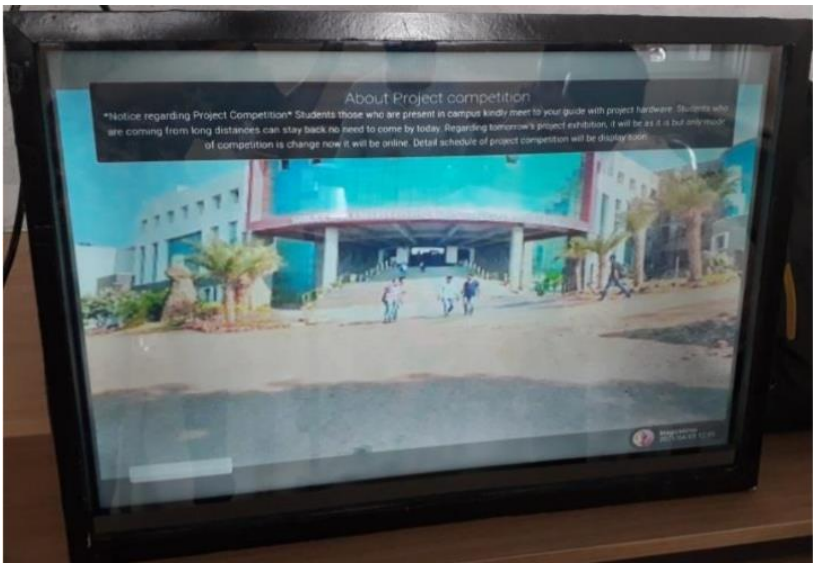

Figure 2. Output view of wireless notice board

When wireless connection is combined with the flexible computing capabilities of Raspberry Pi, traditional bulletin boards become more practical and user-friendly. Information presented in a digital format is guaranteed to be interesting and current in addition to allowing dynamic content.Transforming communication infrastructure, the Smart Wireless Notice Board offers improved efficiency, adaptability, and environmental friendliness.

Future versions of intelligent notice boards may integrate advanced communication capabilities, such as instant messaging, video conferencing, and interactive surveys, to enhance engagement and interactivity. By integrating with Internet of Things (IoT) devices and sensors, smart notice boards can collect up-to-date environmental data, track occupancy levels, and deliver notifications that are tailored to user behavior and preferences.

5. Conclusion

This paper gives users the freedom to manage and update displayed content from a distance, independent of geography. Utilising the open-source ecosystem of the Raspberry Pi, developers can further personalize and extend its capabilities to meet a range of requirements. Additionally, by lowering the amount of paper used with traditional notice boards, the Smart Wireless Notice Board encourages sustainability. This is the leading solution as society moves toward digitalization; it embodies the ability of technology to improve human connection and simplify routine chores.

Declarations

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Competing Interests Statement

The authors declare no competing financial, professional, or personal interests.

Consent for publication

The authors declare that they consented to the publication of this study.

Authors' contributions

All the authors took part in literature review, analysis and manuscript writing equally.

References

[1] Yücel, Murat & Muharrem Açikgöz (2023). Optical communication infrastructure in new generation mobile networks. Fiber and Integrated Optics, 42(2): 53–92.

[2] Alenoghena, Caroline Omoanatse, Henry Ohiani Ohize, Achonu Oluwole Adejo, Adeiza James Onumanyi, Emmanuel Esebanme Ohihoin, Aliyu Idris Balarabe, Supreme Ayewoh Okoh, Ezra Kolo & Benjamin Alenoghena (2023). Telemedicine: A survey of telecommunication technologies, developments, and challenges. Journal of Sensor and Actuator Networks, 12(2): 20.

[3] Guerrero-Ulloa, Gleiston, Alex Andrango-Catota, Martín Abad-Alay, Miguel J. Hornos & Carlos Rodríguez-Domínguez (2023). Development and assessment of an indoor air quality control IoT-based system. Electronics, 12(3): 608.

[4] Salih, Mohammed Mubarak, Wasan Saad Ahmed, Subhi Hammadi Hamdoun & Vadym Shalenko (2024). Displaying a Message on the Notice Board Using a PC. In 2024 35th Conference of Open Innovations Association (FRUCT), Pages 642–651, IEEE.

[5] Mauri-Medrano, Marta, Sara González-Yubero, Carolina Falcón-Linares & María Jesús Cardoso-Moreno (2024). Gamifying the university classroom: a comparative analysis of game dimensions through educational Escape Room and a digital board game. Frontiers in Education, 9: 1354674.

[6] Haleem, Abid, Mohd Javaid, Mohd Asim Qadri & Rajiv Suman (2022). Understanding the role of digital technologies in education: A review. Sustainable Operations and Computers, 3: 275–285.

[7] Suresh Kumar, K., Radha Mani, A.S., Sundaresan, S., Ananth Kumar, T., & Harold Robinson, Y. (2021). Blockchain-based energy-efficient smart green city in IoT environments. In Blockchain for Smart Cities, Pages 81–103, Elsevier.

[8] Akour, Mohammad & Mamdouh Alenezi (2022). Higher education future in the era of digital transformation. Education Sciences, 12(11): 784.

[9] Gemeda, Mulugeta Tegegn, Ayane Lebeta Goshu, Mohammednur Worku Sherif & Leta Lebeta Goshu (2021). Design and Development of a Smart Wireless Electronic Notice Board System. International Journal of Advances in Engineering and Management, Pages 717–723.

[10] Manchala, Manasa, Kutukanur Pramod Reddy, Parimishetty Manasa, Sanvally Ankush Reddy & Sangameshwar, U. (2024). KGRCET Notice Board. In MATEC Web of Conferences, Volme 392, Page 01093, EDP Sciences.

[11] Suresh Kumar, K., Ananth Kumar, T., Sundaresan, S., & Kishore Kumar, V. (2021). Green IoT for sustainable growth and energy management in smart cities. In Handbook of green engineering technologies for sustainable smart cities, Pages 155–172, CRC Press.

[12] Rangani Dhara, G., & Nikunj, V.T. (2017). Smart notice board system. In 2017 3rd International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT), Pages 209–214, IEEE.

[13] Pramanik, Aniket, Vikash Nagar, Satyam Dwivedi & Biplav Choudhury (2016). GSM based Smart home and digital notice board. In 2016 International Conference on Computational Techniques in Information and Communication Technologies (ICCTICT), Pages 41–46, IEEE.

[14] Paul, Liton Chandra, Sayed Shifat Ahmed & Kallol Krishna Karmakar (2022). A smart multi-user wireless nurse calling system and E-notice board for health care management. In Proceedings of the Third International Conference on Trends in Computational and Cognitive Engineering: TCCE 2021, Pages 421–431, Singapore: Springer Nature.

[15] Kumar, Venkatesh S., Amirthasri, S., Ananya, M., & Esther, S. (2022). A Novel Method of IoT Based Smart Notice Board Using Raspberry PI. In 2022 International Conference on Computer, Power and Communications (ICCPC), Pages 60–64, IEEE.