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IoT-Based Smart Digital Notice Board for Real-Time Wireless Information Display using ESP32

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Abstract - **Information sharing is very important in schools, businesses, and public areas. Notice boards are often used to share news, schedules, event details, and other important messages with many people. However, traditional notice boards use printed paper that needs to be changed by hand, which takes a lot of time, uses a lot of paper, and requires regular care. Also, messages on old boards might not grab people's attention quickly. New technologies like the Internet of Things (IoT) and wireless communication have made it possible to create smarter and more efficient ways to display information. A Wireless LED Notice Board is a modern solution that shows messages electronically through the internet. Users can update the notices from a phone or computer without having to go to the board's location. This system uses a NodeMCU ESP8266 microcontroller and an LED dot matrix screen. Through a mobile app, messages can be sent wirelessly to the board and displayed instantly. This real-time feature helps spread information more quickly and reliably, and it uses less paper and fewer people to manage. This system works well in schools, colleges, offices, hospitals, airports, shopping centers, and other places where fast communication is needed. By using IoT and digital displays together, this system is a practical, cost-effective, and eco-friendly way to share information and announcements.**

Keywords - Android Application, Bus Location Tracking System, Real-Time Global Position System Tracking, Smart Transportation, College Bus Monitoring, Seat Occupancy Detection, IoT-Based Monitoring, Mobile Notification System.

I. INTRODUCTION

In places like schools, offices, transport stations, and other public spaces, notice boards are used to share important messages, event details, alerts, and other updates with many people. These boards typically use printed paper that needs to be created, placed, and replaced every time there's new information. This process takes a lot of time and can lead to delays in getting the message out. Also, paper notices might not grab people's attention, especially in busy areas, which makes them less effective. Another problem with old notice boards is that they require a lot of manual work. Workers have to print, put up, and take down notices often, which adds to their workload and costs. Using a lot of paper also uses up resources and can be bad for the environment. Plus, traditional notice boards can't update messages quickly, which makes it hard to share urgent information. To fix these issues, a new type of digital notice board that uses IoT technology has been created. This system uses wireless communication and an LED display to show information clearly and attractively. People with access can send messages from their phones, tablets, or computers connected to the internet. The information appears on the display instantly without needing to go to the notice board location. By replacing paper with a digital system, this solution reduces manual work and makes communication faster. Real-time updates allow people to get the latest news quickly, and the bright LED display makes it easier to see and more engaging. This system is also more cost-effective, better for the environment, and works well for modern organizations looking for smart, automated ways to communicate. It helps send accurate messages to the right people in a reliable and eco-friendly way.

II. LITERATURE REVIEW

Several researchers have worked on improving IoT-based digital notice boards over the years. In 2017, Kumar and Srivastava created a smart digital notice board that used IoT to update LED displays through a web interface in real time, which helped save paper and make information more visible. The same year, Raut et al. made a Wi-Fi-enabled notice board using Arduino, allowing users to send messages directly from their mobile phones. In 2018, Nirmale and Patil developed a cloud-connected digital notice board that let people update content remotely through the internet. Katapur et al. built a Raspberry Pi-based system that showed scrolling messages to improve communication. Selva Kumar et al. (2019) introduced a low-cost IoT notice board aimed at schools and colleges, making it easier to share announcements. The same year, Behera et al. made a digital notice board using Arduino and LED dot matrix technology, allowing instant remote updates. Shaik et al. added cloud support to create a wireless notice board platform that enabled users to manage content from anywhere. Patoliya et al. (2020) proposed a scalable IoT notice board with scheduling features, making information management more organized. Patil and Patil developed a real-time notice board with remote control and better readability. Akasha et al. made an Android-based notice board where authenticated users could update content from their smartphones. In 2021, Dudwadkar introduced an IoT notice

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board with advanced user authentication and scheduling. Robert made an Arduino-based system that used less power and reliably sent messages. Uprikar created a web-controlled wireless notice board using IoT communication and LED displays. Modi worked on automated scheduling and notifications, while Bhardwaj improved how messages were displayed through better formatting and visuals. In 2022, Teja made an IoT-driven LED notice board for schools that supported multiple users and was more scalable. Darryl Jacob built a real-time digital notice board with automatic refresh and error handling to make it more reliable. Recent studies have focused on advanced features and smart system improvements. Anitha (2023) added AI techniques like Optical Character Recognition (OCR) and automated summarization to an IoT notice board. Sharma and Gupta looked into secure ways to keep users from accessing the system without permission. Reddy et al. worked on making sure multiple LED displays in large campuses stayed synchronized. Research in 2024 expanded smart notice board features. Li and Wang studied energy-saving communication methods to reduce power use in IoT displays. Patel and Mehta introduced QR codes for collecting user feedback, allowing interaction with displayed content. Verma and Singh looked into better mobile app interfaces to make posting messages easier. Ibrahim et al. suggested using cloud databases for secure data backup and management. Das and Roy developed multilingual notice boards to help users who speak different languages. These studies show how IoT-based digital notice boards keep getting better. They're focusing on better connections, security, scalability, energy efficiency, and making things more convenient for users.

III. RESEARCH GAP

Looking at the current wireless and IoT-based notice board systems, there have been many improvements in areas like sending messages from far away, showing information in real time, and automatically managing messages. However, there are still some problems. Many systems focus mostly on sending and displaying messages but don't pay enough attention to making the user experience easy and simple. Also, security and ways to confirm who is using the system are often not strong enough, making the systems easier to hack or have messages changed without permission. Some systems use RFID, barcodes, or computer vision, but they don't work well with cloud-based systems that help manage everything from one place and keep everything up to date in real time. Moreover, most systems don't handle multiple languages well, which is important in schools and public places with people from different backgrounds. Another issue is that many systems are only set up for small areas and can't easily manage multiple screens in big campuses or organizations. Also, many systems only let messages go one way and don't let users know if the message was received or if there's any feedback. There's also not enough attention given to making the system use less energy, be accessible to everyone, and work well with modern smart campus setups. Because of these issues, there is a need for a new kind of wireless digital notice board that uses IoT and is secure, scalable, and connected to the cloud. It should also be easy to use, support multiple languages, have strong security, and let users manage things from a distance. The goal is to create a reliable, affordable, and eco-friendly way to communicate digitally in today's world.

IV. OBJECTIVE

The primary objectives of the proposed Wireless Digital Notice Board using IoT are as follows:

1. Create a digital notice board that uses IoT technology to receive and display messages through Wi-Fi and the Internet.
2. Build a simple mobile or web system that allows approved users to create, edit, and manage notices from any location.
3. Set up secure login and permission systems to prevent unauthorized changes to the messages.
4. Ensure quick communication by allowing messages to be updated and displayed in real time.
5. Build a strong and adaptable system that works well in schools, offices, transport hubs, and other public areas.
6. Improve the speed and quality of information sharing while ensuring messages are accurate, reliable, and easy to access.

V. METHODOLOGY

The Wireless Digital Notice Board system uses Internet of Things (IoT) technology to provide a modern and efficient way to share information. The system includes a Wi-Fi connected controller such as NodeMCU (ESP8266) or Raspberry Pi, an LED dot matrix screen, a power supply, and a cloud-based server for sending and storing data. All these components are connected so that the main processor can communicate smoothly with the display.

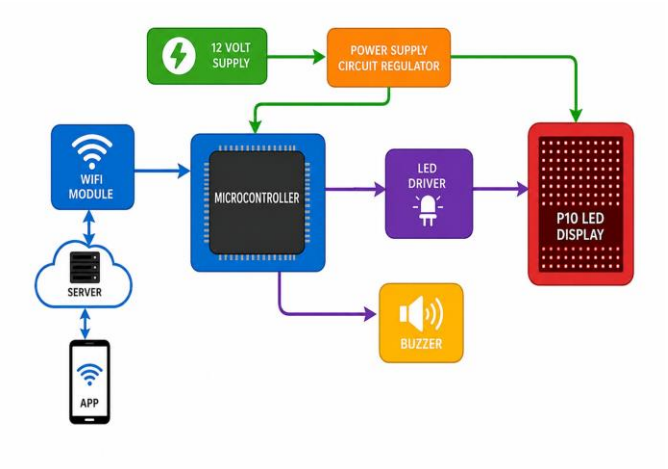

Fig. 1 Block Diagram of Smart Digital Notice Board Using IoT

There is a special app for phones or computers that lets only certain people create, edit, and send messages from anywhere. When someone uses the app to send a message, it sends the message to a cloud server through the internet. The microcontroller stays connected to the server and checks for new messages. If it finds one, it gets the message and displays it right away on the LED screen. To make sure everything is safe, the system has rules to check who can log in and edit messages. After that, the whole system is tested in different

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situations to check how well it works, how fast it responds, how clearly messages are shown, and how secure it is. This method gives a safe, easy-to-grow, and quick way to share information that works well for schools, offices, and public places.

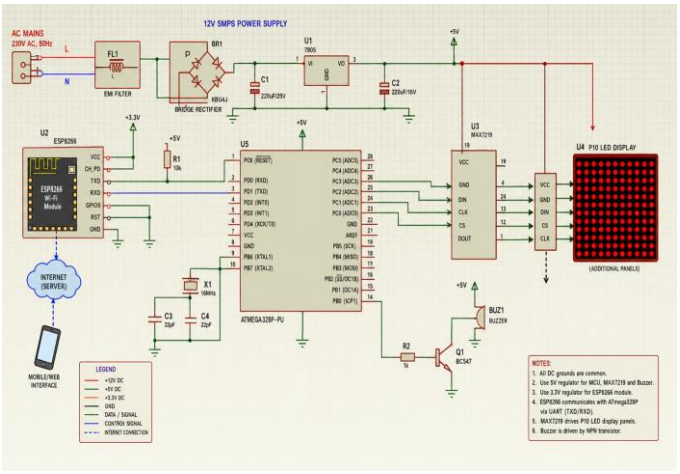

Fig no. 2 schematic Diagram of Smart Digital Notice Board Using IoT

VI. RESULT

Using a Wireless Digital Notice Board with IoT technology was a smart and efficient way to share information without using paper. By connecting the device to the system, users can send and display messages through a web, mobile app, or device using the internet. The system uses a microcontroller along with a Wi-Fi module to send messages to the LED board in real time, without needing any physical help. The system worked smoothly by linking the server, microcontroller, and display. It could show both scrolling and static messages on the P10 LED board with clear visibility and quick response time. Using IoT in schools, offices, railway stations, and other public places helped spread information more effectively. There was also a loud alert whenever a message was sent to the manager to inform the user. The notice board could be controlled remotely through cloud or server-based communication via the internet. This notice board uses less paper, less manual work, and is cheaper than traditional notice boards. It is also an eco-friendly, cost-effective, and easy-to-use system. The proper working of hardware like ESP8266 Wi-Fi module, Arduino Uno, LED Driver, and P10 LED Display helped keep the system running smoothly. This project can easily be updated for future features like multimedia notices, mobile alerts, and other functions, making the system adaptable and scalable. The Wireless Digital Notice Board using IoT proved to be an efficient system and met all its intended goals. It provides a modern, safe, reliable, and cost-effective solution for digital communication systems.

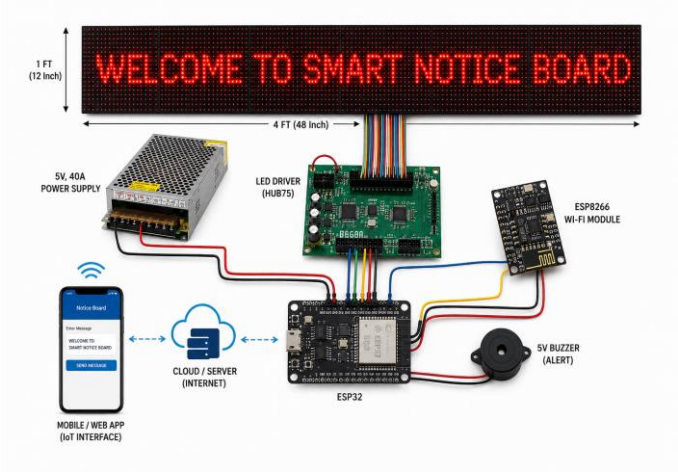

Fig no. 3 Final connection & Output of Smart Digital Notice Board Using IoT

VII. CONCLUSION

The wireless digital notice board using IoT has been created successfully and works well for sending messages quickly. This system helps replace traditional notice boards with digital ones that can be updated instantly from anywhere using a web or mobile app. The system uses a small computer chip that connects to Wi-Fi and an LED screen, making it quick, safe, and efficient without needing anyone to be there. This project shows how IoT can make communication better in schools, offices, public areas, and smart campuses. It uses less paper, doesn't need extra workers, and can show messages anytime and anywhere as long as there's an internet connection like Wi-Fi. The system is good for different sizes of use in terms of how it looks, how much power it uses, and how much it costs. It can also grow in the future to include more features such as scheduling, showing videos or images, and storing messages in the cloud. Overall, the Wireless Digital Notice Board is a new and creative electronic solution.

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