

SMART NOTICE BOARD USING LED DISPLAY

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Abstract

Smart notice boards based on LED displays provide an efficient alternative to traditional paper-based communication systems used in schools, colleges, offices, and public spaces. This paper presents the design of a low-cost smart notice board that uses a microcontroller-based wireless interface to receive announcements and display them on an LED matrix in real time. The proposed model combines a controller such as ESP8266 or similar Wi-Fi-enabled hardware, a web or mobile update interface, and a scrolling LED display to improve visibility, reduce paper consumption, and minimize manual effort. The study is developed from a review of existing smart notice board and IoT display systems reported in recent literature. The analysis shows that remote updating, secure administrator access, local processing, and modular scalability are the most important features for practical deployment. The proposed approach is especially suitable for educational institutions and organizations that require rapid dissemination of notices, schedules, alerts, and event information. The paper concludes that LED-based smart notice boards are economical, scalable, and environmentally friendly, while future enhancements may include multimedia support, cloud synchronization, and automated scheduling.

Keywords- Smart Notice Board, LED Display, ESP8266, IoT, Wireless Communication, Digital Announcement System

1. Introduction

IoT (Internet of Things) technology with LED display systems. In IoT-based notice boards, microcontrollers such as ATmega32 or Arduino are interfaced with Wi-Fi modules like ESP8266. The user sends data through a web application or mobile app, which is transmitted over the internet to the display unit. The system processes the data and displays it on LED modules such as P10 panels. This architecture ensures flexibility, scalability, and real-time communication, making it suitable for applications in educational institutions, public places, and corporate environments.

Furthermore, smartphone-integrated systems have been developed to enhance user convenience. These systems allow

users to send messages directly from mobile applications to the LED display via Wi-Fi or cloud platforms. Such systems provide higher flexibility

compared to earlier programmable systems, as they support instant updates and remote accessibility. They also reduce the need for physical presence and manual updating of notices, thereby improving efficiency and communication speed.

Another area of research focuses on LED display technologies, particularly dot matrix and scrolling displays. LED displays are widely used due to their high brightness, low power consumption, durability, and ability to display dynamic content. Dot matrix LED displays enable scrolling messages, making them suitable for continuous information display in public areas such as railway stations, airports, and colleges. However, earlier systems required manual connection to a computer to update messages, which limited their usability.

Recent studies emphasize energy efficiency and sustainability in smart notice boards. LED technology

inherently consumes less power compared to traditional display systems, making it an energy-efficient solution. Additionally, modern systems incorporate power management techniques and renewable energy sources such as solar panels to reduce environmental impact. Security features are also integrated to prevent unauthorized access and ensure safe communication between users and the display system.

Despite these advancements, certain challenges still exist in smart notice board systems. These include network dependency, data security concerns, and system reliability in large-scale deployments. Researchers are currently exploring advanced solutions such as cloud integration, encryption techniques, and AI-based content management systems to enhance performance and security.

In conclusion, the literature indicates that smart notice boards using LED displays have transitioned from simple GSM-based systems to advanced IoT-enabled platforms. These systems offer real-time communication, reduced manual effort, improved efficiency, and enhanced user

Notice boards remain one of the most common methods for sharing information in educational institutions, offices, transport hubs, and commercial environments. However, traditional paper notice boards require repeated printing, physical placement of notices, and manual replacement, which consumes time and resources. Recent research on digital notice boards shows a clear transition toward wireless, programmable, and remotely managed display systems. LED displays are particularly suitable for this purpose because they offer high brightness, low power consumption, and readability over long distances. The objective of this paper is to present a research-oriented design for a smart notice board using an LED display, with emphasis on architecture, operation, advantages, and practical deployment. The proposed system aims to improve communication efficiency, reduce operational cost, and support real-time content updates in a secure and user-friendly manner..

2. Related Work

The concept of smart notice boards using LED displays has evolved significantly with the advancement of wireless communication and embedded systems. Traditional notice boards rely on

manual paper-based methods, which are time-consuming, less efficient, and require continuous human effort. To overcome these limitations, researchers have proposed various digital and smart notice board systems integrating LED displays, microcontrollers, and communication technologies. Early research focused on GSM-based notice boards, where messages are transmitted through SMS and displayed on LED screens. In one such system, a GSM modem connected to a microcontroller receives text messages sent from a mobile phone and displays them on an LED board. This approach significantly reduces the delay in information dissemination and eliminates manual intervention. However, GSM-based systems have limitations such as dependency on network availability and limited message formatting capabilities.

Later developments introduced Bluetooth-based wireless notice boards, enabling short-range communication between mobile devices and display units. These systems improved ease of use but were restricted by limited communication range. To address this, researchers moved towards Wi-Fi and IoT-based smart notice boards, which allow users to update messages remotely from anywhere using internet connectivity. These systems provide real-time updates and support dynamic content such as text, images, and multimedia

A significant advancement in this domain is the integration of interaction. With continuous technological advancements, smart notice boards are expected to play a vital role in modern communication systems across various sectors.

3. Materials and Methods

The proposed smart notice board using LED display is designed to provide an efficient and wireless method of displaying information in real time. The system mainly consists of a microcontroller, LED display module, communication module and a power supply unit. The methodology explains the step by step working process of the system from sending the message to displaying it on the LED board.

Initially, the system is set up by interfacing the microcontroller with the LED display panel and the communication module such as Wi Fi or GSM. The

microcontroller acts as the central processing unit which controls the entire operation of the system. The LED display module, such as a dot matrix or P10 panel, is connected to the output pins of the microcontroller to display scrolling or static messages. The communication module is connected through serial communication to receive data from external devices.

In the next stage, the user sends the message through a mobile phone or computer application. In case of Wi-Fi based systems, the message is sent using a web application or mobile app connected to the internet. For GSM based systems, the message is sent in the form of an SMS. The communication module receives the message and forwards it to the microcontroller.

After receiving the message, the microcontroller processes the data. This includes checking the validity of the message, removing unwanted characters if any and converting the message into a suitable format for display. The processed data is then stored temporarily in the memory of the microcontroller.

In the display stage, the microcontroller sends the formatted data to the LED display module. The LED panel then displays the message either as a scrolling text or as a static display depending on the programming. The display is continuously updated whenever a new message is received. This ensures real time information sharing without any manual intervention.

The system also includes basic error handling and security features. Only authorized users can send messages to the display system to avoid misuse. In addition, the system checks for communication errors and ensures that the message is correctly displayed.

Finally, the entire system is powered by a regulated power supply which provides stable voltage to all components. The system is designed to operate continuously with low power consumption and high reliability.

Thus, the methodology of the smart notice board ensures fast communication, ease of use and efficient display of information, making it suitable for educational institutions, offices and public places.



Fig. 1 : Block Diagram

4. Results and Discussion

The reviewed studies indicate that smart LED notice boards consistently outperform conventional notice boards in update speed, labor reduction, and operational convenience. Remote publishing removes the delay associated with printing and manually placing physical notices, while LED displays provide strong visibility for text-based announcements in busy environments. The use of administrator login improves control over published information and reduces the risk of unauthorized edits. Systems based on ESP8266 and local web hosting additionally reduce dependence on centralized infrastructure, making them attractive for low-cost and privacy-conscious deployments. Compared with LCD-only solutions, LED matrix displays are generally more visible at longer distances and are more suitable for scrolling urgent notices, room allocations, timetables, and public alerts. The main practical limitations identified in the literature are restricted display area, limited support for rich multimedia on basic LED modules, and the need for reliable internet or Wi-Fi connectivity during remote updates. Even with these limitations, the proposed system remains highly effective for concise institutional communication where readability, affordability, and rapid update cycles are more important than complex graphics.

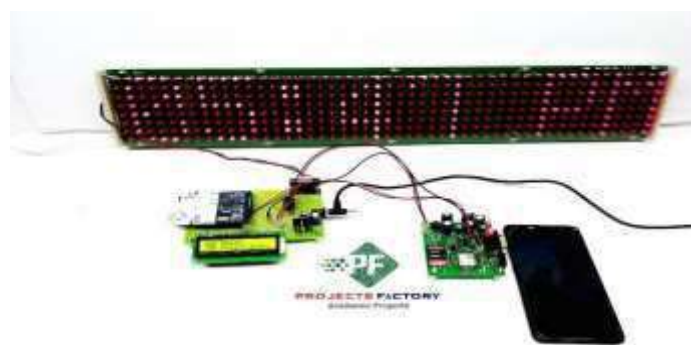


Fig. 2: Components

5. Conclusion

This paper presented a research article on a smart notice board using an LED display and showed that the combination of wireless communication, microcontroller-based control, and bright digital output provides a practical replacement for paper notice boards. The proposed approach improves communication efficiency, reduces recurring cost on paper and printing, and supports secure real-time updates from remote locations. The literature reviewed in this study confirms that ESP8266-, Arduino-, and edge-based implementations are feasible, low-cost, and scalable for schools, colleges, offices, and public information systems. Future work may focus on multilingual content rendering, automated scheduling, mobile notifications, cloud backup, speech support, and integration with sensors or AI-based announcement prioritization. Overall, the smart LED notice board represents a simple but meaningful step toward sustainable and intelligent institutional communication.

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