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SMART DIGITAL NOTICE BOARD USING IOT TECHNOLOGY

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ABSTRACT

The Smart Digital Notice Board is an innovative IoT-based system designed to modernize traditional information display methods in institutions, organizations, and public spaces. This project integrates an Arduino Uno microcontroller with a Bluetooth module (HC-05), a Real Time Clock (RTC), and a P10 LED display panel to create a fully automated and remotely controlled digital notice board. The system enables authorized users to send messages wirelessly via a smartphone application, eliminating the need for manual updating of physical notice boards. With the inclusion of the RTC module, the board can display the current time and date alongside custom messages, making it a versatile and time-aware communication device. The entire system is powered by a Regulated Power Supply (RPS) ensuring stable and consistent operation, and the embedded software programmed into the Arduino governs data flow, display logic, and message management with high efficiency and reliability.

Keywords: Smart Notice Board, IoT, Arduino Uno, HC-05 Bluetooth, P10 LED Display, RTC Module, Wireless Communication, Embedded Systems, Digital Signage, Microcontroller.

1. INTRODUCTION

In the current era of rapid digitalization, the way organizations communicate and disseminate information has undergone a significant transformation. Traditional notice boards, which rely on paper printouts, pins, and manual efforts, are increasingly being replaced by smart, automated systems that leverage the power of Internet of Things (IoT) technology. Institutions such as schools, colleges, hospitals, railway stations, and corporate offices require efficient and real-time information display systems that can be updated instantly without any physical intervention. The Smart Digital Notice Board presented in this project addresses precisely this need by offering a wireless, automated, and microcontroller-based solution that allows administrators to transmit text messages remotely and display them on a high-visibility LED panel.

The concept of a digital notice board has evolved over the years from simple scrolling text displays to fully networked digital signage systems. However, many existing solutions are either prohibitively expensive, technically complex, or require continuous internet connectivity to function. The proposed system overcomes these limitations by using a cost-effective Bluetooth-based communication protocol that does not require internet access, making it ideal for deployment in areas with limited or no network infrastructure. The Arduino Uno, a widely used open-source microcontroller platform, serves as the brain of the system. It processes incoming Bluetooth data, manages the RTC for accurate time synchronization, and drives the P10 LED display module to render alphanumeric messages clearly and efficiently.

The P10 LED display panel is a high-brightness dot-matrix display that is capable of rendering text with excellent visibility even in bright ambient lighting conditions. It is commonly used in outdoor signage and information boards due to its robustness, power efficiency, and high contrast ratio. Paired with the HC-05 Bluetooth module, the system enables seamless wireless communication between the notice board and a user's smartphone. An Android application can be used to compose and transmit messages, which are then

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received by the Arduino and displayed on the LED panel in real time. This eliminates the need for any wired connections or manual text entry at the display unit itself, significantly reducing the time and effort required to update information.

The Real Time Clock (RTC) module incorporated into the system ensures that the notice board is always time-aware, providing accurate date and time information that can be displayed alongside or alternately with user-defined messages. This feature is particularly valuable in environments where time-sensitive information needs to be communicated, such as exam schedules, meeting timings, or announcement deadlines. The RTC operates independently of the main microcontroller, maintaining accurate timekeeping even in the event of a system reset or power interruption, thanks to its onboard battery backup. The Regulated Power Supply (RPS) provides a steady and noise-free power source to all components, ensuring long-term operational reliability and preventing damage due to voltage fluctuations.

This project represents a convergence of embedded systems, wireless communication, and IoT principles, offering a practical and scalable solution to one of the most common organizational challenges efficient and timely information dissemination. The system is designed with ease of use in mind, requiring minimal technical knowledge from the end user while delivering a feature-rich and responsive display solution. The subsequent sections of this report detail the problem statement, objectives, existing systems, proposed system, block diagram explanation, and the conclusion drawn from the development and testing of this innovative project.

2. Related Work

The evolution of wireless notice board systems has significantly improved information dissemination by reducing manual effort and enabling real-time communication. Early systems primarily focused on GSM-based communication, while recent approaches integrate mobile applications, Wi-Fi, and microcontroller-based automation for enhanced efficiency.

Khera *et al.* [1] proposed a low-cost Android-based wireless notice board system using Bluetooth and Wi-Fi communication. Their system enables message transmission from Android devices to a remote display unit controlled by an Arduino Uno microcontroller. The approach eliminates manual paper-based notice systems, reducing time and operational costs while improving communication efficiency.

Balakrishna *et al.* [2] developed an advanced wireless notice board using GSM technology integrated with a mobile application. The system allows secure message transmission via SMS and provides user authentication features, preventing unauthorized access. Additionally, the proposed system supports dynamic user management, making it more flexible compared to traditional GSM-based notice boards.

Simha *et al.* [3] emphasized the importance of automation in reducing human errors associated with traditional notice board systems. Their work highlighted limitations such as incorrect message delivery, information tampering, and inefficiencies in manual processes. The study strongly supports the transition toward automated wireless communication systems for reliable information dissemination.

Morsalin and Rahman [4] introduced a GSM-based wireless digital notice board system with multi-user support. The system enables multiple authorized users to send messages via SMS, which are then displayed on an LCD. The design incorporates password protection, ensuring secure communication, and supports simultaneous display of multiple messages, enhancing usability.

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Arulmurugan *et al.* [5] proposed a Wi-Fi-based wireless notice board system capable of transmitting messages over a range of approximately 100 meters. Their system improves data transmission speed compared to GSM-based solutions and supports multiple network interfaces, making it compatible with modern wireless technologies. The approach also reduces dependency on paper-based communication and manual labor.

Several supporting works have contributed to the development of wireless communication technologies used in notice board systems. Dalwadi *et al.* [2] and Nivetha *et al.* [3] explored SMS-based wireless notice boards, emphasizing real-time message delivery and monitoring capabilities. Gaikwad [5] demonstrated GSM-based communication systems integrated with embedded processors, highlighting their applicability in real-time monitoring systems. Additionally, technical resources such as GSM AT command manuals [6] and Raspberry Pi-based automation guides [7, 9] provide practical insights into system implementation and optimization.

3. PROPOSED SYSTEM

In this proposed project, arduino is used to control the process, Bluetooth (HC-05) module to sent voice or text from the authenticated mobile handset and P10 module to display the received voice message shows the block diagram of wireless notice board using AI based voice technology. The wireless Bluetooth technology used in the proposed project to display messages on the notice board is efficient, reliable, and faster with minimal errors. It is cost effective system, requires very little maintenance, and is easy to handle and use. It fills the role of conventional and old notice boards that require to send voice messages. This time consuming and tedious work has been replaced by wireless digital display board. From small institutions to big organizations, the digital notice board is gaining popularity.

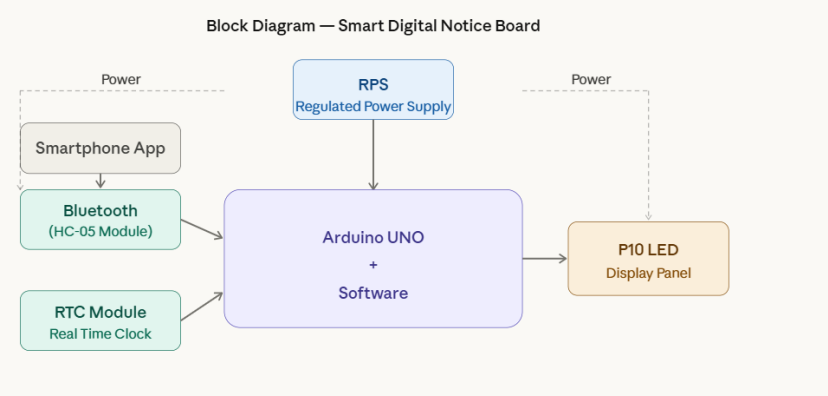

Fig 1: Block diagram of proposed method

A Bluetooth-based wireless notice board with voice assistance is an innovative communication system that allows users to display messages remotely on a digital board using Bluetooth technology. The system typically consists of a microcontroller, a Bluetooth module (like HC-05 and an LCD or LED display. A mobile application or a dedicated device can be used to send text messages via Bluetooth, which the microcontroller processes and then displays on the board. To enhance usability, voice assistance is integrated, enabling users to give voice commands for updating or retrieving messages. This is achieved using speech recognition modules or AI-based assistants that convert spoken words into text, which is then transmitted to the notice board. The system is particularly useful in educational institutions, offices, and

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public spaces where instant updates and announcements are required without the need for physical intervention. It offers a cost-effective, user-friendly, and efficient way to manage notice boards wirelessly.

To set up a Bluetooth-based wireless notice board with voice assistance using an Arduino, a Bluetooth module (HC-05**)**, and a P10 LED display module, proper pin connections and wiring are crucial. The HC-05 Bluetooth module is connected to the Arduino using the TX and RX pins**.** The TX (Transmit) pin of HC-05 is connected to the RX (Receive) pin of the Arduino, and the RX pin of HC-05 is connected to the TX pin of the Arduino, with a voltage divider circuit (using resistors) to step down the voltage from 5V to 3.3V to prevent damage to the HC-05. The VCC and GND of HC-05 are connected to the 5V and GND of the Arduino, respectively. The **P10** LED display module is connected to the Arduino using data (D), clock (CLK), store (STB/CS), and OE (Output Enable) pins. Typically, the D pin is connected to Arduino digital pin 8, the CLK pin **to** pin 9, the STB pin **to** pin 10, and the OE pin to GND (if constant display is required). The power supply for the P10 module is provided separately, as it requires 5V to 12V with sufficient current. Once the hardware connections are complete, a mobile app with Bluetooth communication is used to send text messages or voice commands, which the Arduino receives via Bluetooth, processes, and displays on the P10 LED board.

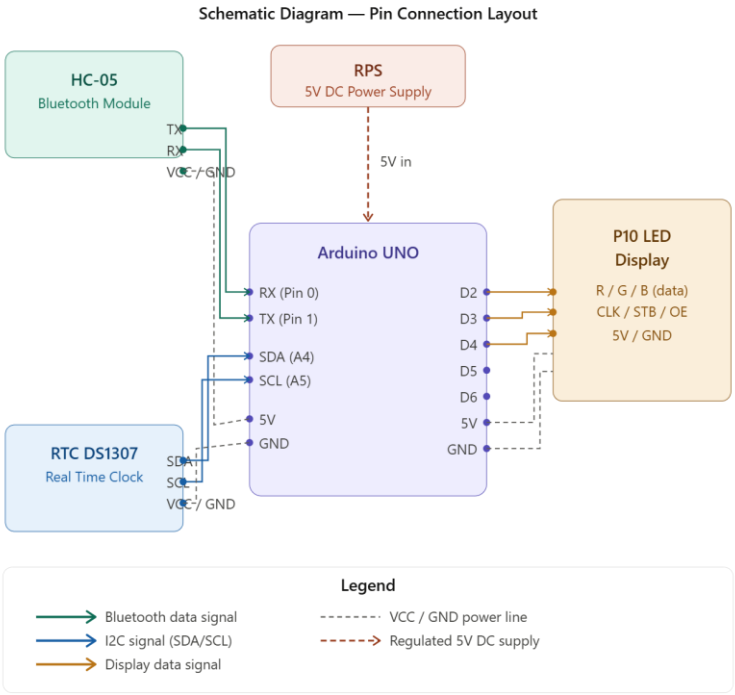

Fig. 2: Schematic Diagram

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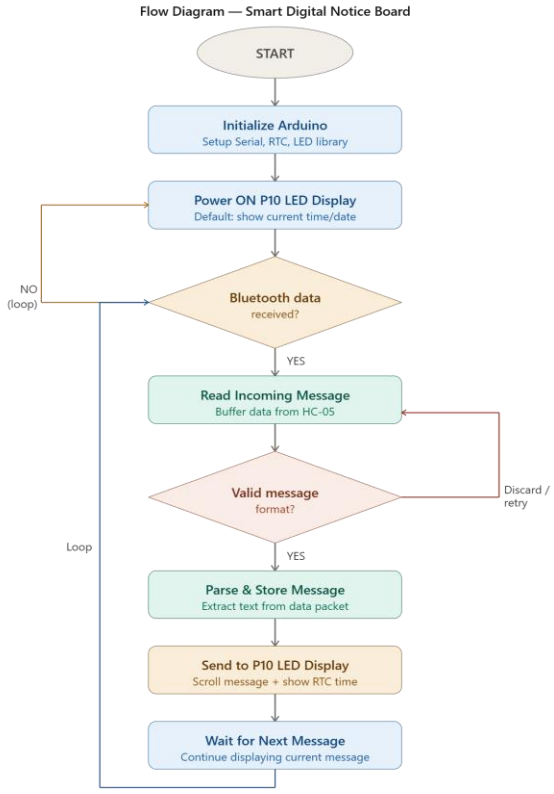

Fig. 3: Flow Chart

4. RESULT

This image shows the P10 LED display panel actively presenting the current time in a bright red digital format. The clear visibility of the numbers demonstrates the effectiveness of the LED matrix in displaying real-time information. It highlights the integration of the Real Time Clock (RTC) module with the system. The display is bright and readable even in low-light conditions, making it suitable for public environments. This confirms the system's ability to function as a digital clock along with a notice board.

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Fig 4: LED Display Showing Time

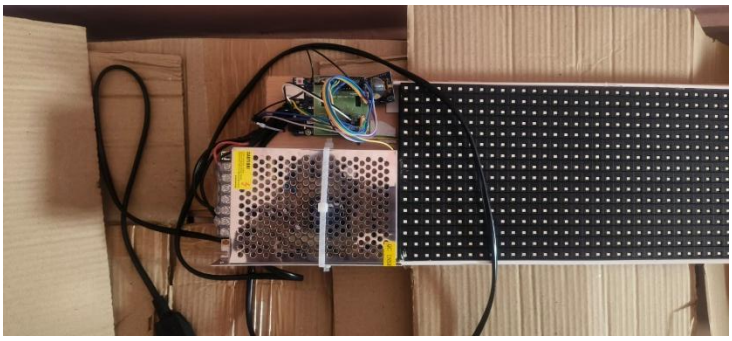

Fig 5: Hardware Setup of Smart Notice Board.

This image presents the internal hardware setup of the Smart Digital Notice Board system. It includes the Arduino Uno, HC-05 Bluetooth module, RTC module, power supply unit, and the P10 LED panel connections. The wiring demonstrates how different components are integrated to form a complete IoT system. The regulated power supply ensures stable voltage for proper functioning of the LED panel. This setup forms the core control unit responsible for processing and displaying messages.

Fig 6: LED Display Showing Message.

This image shows the LED display panel presenting a custom text message. It demonstrates the system's capability to display user-defined content sent via a smartphone using Bluetooth communication. The bright LED matrix ensures high visibility of the message from a distance. This feature eliminates the need for manual updates on traditional notice boards. It highlights the practical application of the system in real-time communication.

5. CONCLUSION

The Smart Digital Notice Board using IoT Technology represents a significant advancement over conventional paper-based information display methods, successfully integrating wireless Bluetooth communication, real-time clock functionality, and high-brightness LED display technology into a compact, cost-effective, and user-friendly system. The project demonstrates that modern embedded systems and IoT principles can be applied to solve real-world institutional challenges without incurring high costs or

requiring complex internet infrastructure, making it accessible and practical for educational institutions, hospitals, offices, and public spaces alike. Through the seamless interaction of the Arduino Uno microcontroller, HC-05 Bluetooth module, RTC, and P10 LED display panel all powered by a stable regulated supply the system achieves its core objectives of remote operability, real-time information display, and autonomous timekeeping with reliable and consistent performance. Future enhancements could include Wi-Fi connectivity for longer-range control, integration with cloud platforms for centralized multi-board management, and the addition of voice command capability, further expanding the system's utility and adaptability in an increasingly connected worl.

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