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Wi-Fi Enabled Electronic Scrolling LED Display

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Abstract - The basic idea of this project is to highlight the adaptability of digital LED display boards for various applications such advertising, class schedules, warning boards, queue management, and more. Due to advancements in technology, there have also been advancements in the manner in which information can be presented for the purposes of marketing and advertising. These improvements are a direct outcome of the technical advances that have occurred in recent years. LED matrix display boards are often utilized for the intention of displaying a range of adverts and messages of different lengths and formats. These Display boards have become a common feature in various public spaces, such as educational institutions, shop floors (workstations), and other public settings. Other public settings also often use these boards. They are used to show information like the schedules for public transit stops and times, as well as showing a range of advertisements for products and important announcements. Important announcements and advertising are some of the other types of information that can be shown on them. In previous display board versions, the method of communication was achieved through wired technology since wireless technology was not yet available on the market then. In this case, the process of communicating is achieved by using a type of wireless technology called wi-fi.

Key Words: Display boards, LED Matrix Display, Wireless technology, wi-fi.

1. INTRODUCTION

In the era of smart technology and wireless communication, traditional display boards are evolving into intelligent, remotely controlled systems. The proposed system utilizes a Wi-Fi module to establish an internet connection, enabling real-time content updates without requiring physical access to the display. This eliminates the need for manual programming and enhances flexibility, making it ideal for commercial advertising, public announcements, traffic management, and smart city applications.

An LED Display or Notice board is a surface that may be utilized for any number of purposes, including but not limited to the transmission of significant news, the advertisement of goods that are desired or need to be sold, the announcement of events, and the provision of information. It is possible to create an LED scrolling display that is able to present information on a timely and efficient basis. This will allow you to communicate and update your messages as often as is necessary. You are able to view the content at a distance and bring these displays up to date in very little amount of time. With the aid of the internet, you can provide remote control over these systems. The principal use of this project is to create an idea for a system that would show different types of college events like announcements of future tests, details about interviews, details about seminars and webinars, and other types of college activities. This system can be used in various important locations, like shopping centers, cinema halls, public transport, road and traffic signboards, and other spheres wherein the delivery of information which is current at most is required. In particular, this system is capable of being used in these and other fields.

The idea implemented in this project reduces the total cost that is required in the traditional LED display boards not only it makes easier to send message to the LED display boards. Along with these a power supply unit and supporting hardware for microcontroller is used.

2. LITERATURE SURVEY

1. Evolution of LED Display Boards:

Early static LED boards required manual content updates. Transition to programmable LED displays using wired connections. Introduction of wireless communication (Wi-Fi, Bluetooth, GSM, IoT-based systems) for real-time content updates.

2. Wireless Communication Technologies in LED Displays:

Wi-Fi-based Displays: Fast, cost-effective, ideal for short to medium-range applications.

GSM-based Displays: Uses SMS for remote updates but has latency issues.

Bluetooth-based Displays: Limited range but energy efficient.

IoT and Cloud-based Displays: Enable real-time data synchronization over the internet

3. Challenges in Existing Systems:

Power consumption issues in continuous display systems. Data security risks due to WiFi-based connectivity. Scalability problems for large networks of display boards.

WiFi-based LED displays are the most efficient solution for real-time content updates. W3 WiFi controllers simplify LED display control by eliminating the need for microcontrollers and complex programming. Security, power efficiency, and scalability remain key challenges that need further research. Future advancements may include AI-driven content updates and cloud-based IoT integration for better automation.

The literature review highlights that W3 WiFi controllers offer a simplified, web-based approach to controlling LED scrolling displays without requiring traditional microcontrollers. Existing research shows that WiFi technology provides a faster, more efficient alternative to GSM or Bluetooth-based solutions. However, security, power optimization, and multi-device scalability remain key areas for future research and development.

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3. METHODOLOGY

Creating a Wireless LED Notice Board involves multiple steps, including designing the hardware, developing the software, and integrating wireless communication. In this study, we carefully selected P10 LED display modules and Wi-Fi controllers, prioritizing reliability and cost-effectiveness. The integration of these hardware components is crucial to ensure seamless connectivity and performance The system uses Bluetooth or Wi-Fi connectivity to provide seamless communication between smartphones and LED displays, allowing users to broadcast messages effectively and efficiently. With customizable options, it can meet a variety of needs, from displaying job postings to sharing school events. Here is a detailed methodology for the project.

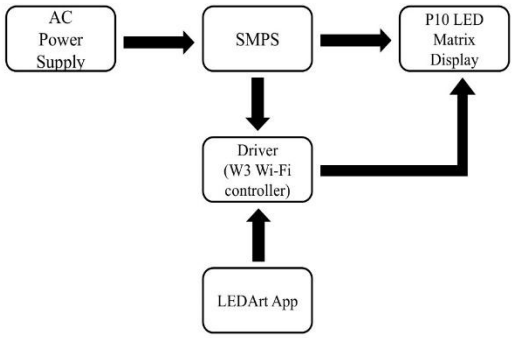

Figure 1: Proposed block diagram of Wi-Fi enabled Electronics Scrolling LED Display

WIFI CONTROLLER:

W3 WiFi controller is a compact and versatile device designed for wireless communication and control of LED displays shown in Figure 2. It features robust WiFi connectivity, allowing seamless integration with various LED display modules such as the P10 LED display. With its user-friendly interface and flexible configuration options, the W3 WiFi controller enables convenient management of displayed content remotely. Its compact size and low power consumption make it suitable for a wide range of applications, including LED notice boards, digital signage, and IoT projects. The controller supports real-time data transmission, ensuring timely updates and synchronization with external devices such as smartphones. Its reliable performance and compatibility with popular development platforms make it a preferred choice for projects requiring wireless LED display control.

① Power connector, Connect 5V power supply.
② Test button, click to switch screen test status.
③ Indicator: The power on indicator is on and the Wi-Fi working indicator is blinking.
④ Sensor interface: Connect brightness sensor.
⑤ HUB12 (Black color) & HUB08 (Yellow color): Connect the display.

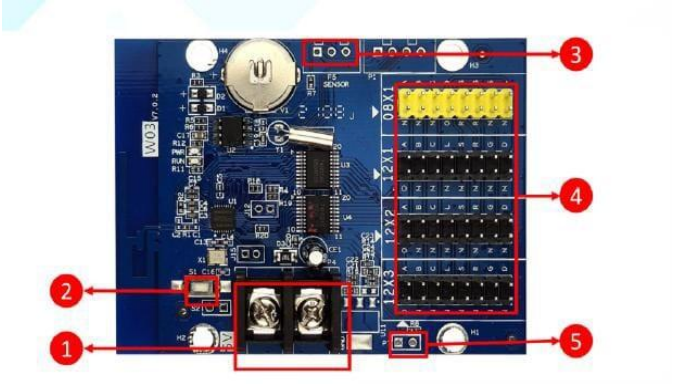

Figure 2: W3 WIFI Controller

P10 LED MATRIX DISPLAY:

The P10 LED display is a versatile and commonly used LED panel with a 10mm pixel pitch, ideal for both indoor and outdoor applications shown in Figure 3. Its modular design allows for easy assembly and scalability, enabling users to create displays of various sizes. With vibrant colors, high brightness, and wide viewing angles, the P10 display ensures clear visibility in diverse environments. Its compatibility with standard control protocols facilitates seamless integration with control devices like the W3 Wi-Fi controller, enabling remote management and content updates. The P10 LED display is widely employed in projects such as advertising boards, information displays.

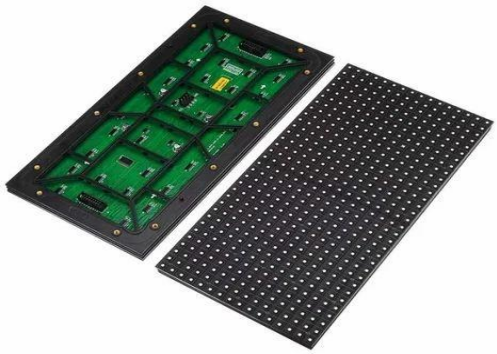

Figure 3: P10 LED Matrix Display

SMPS (Switched Mode Power Supply):

The Switched Mode Power Supply (SMPS) employed in the project is a crucial component responsible for converting AC power from the mains to the appropriate DC voltage required to operate the LED display and associated electronics shown in Figure its high efficiency and compact design, the SMPS ensures reliable power delivery while minimizing energy wastage. It features protection mechanisms such as overvoltage, over current, and short circuit protection, safeguarding the connected components from damage. The SMPS provides stable and regulated output voltages, essential for the optimal performance of sensitive electronics like LED displays and controllers. Its light weight and cost-effective design make it suitable for integration into various electronic

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devices and projects, including the wireless LED notice board with smart phone integration.

Figure 4: SMPS (Switched Mode Power Supply)

Working:

This proposed system allows people to directly check the important information on the display. Here, we used the wireless Wi-Fi technology for communication The system consists of multiple P10 LED modules, arranged in a grid formation. Each module contains a matrix of LEDs, which are controlled through digital signals. These modules are interconnected using data cables, ensuring seamless data flow and synchronization. The W03 control card acts as the central processing unit, managing data transmission to the LED modules. It receives display signals from an external source (such as a computer or microcontroller) via a communication interface. It transmits control signals to the P10 modules through flat ribbon cables, ensuring proper pixel activation. 230V AC power supply is given to the 12V SMPS device which converts AC into DC. SMPS gives power to the Driver and LED matrix display. Each P10 module is powered individually while maintaining a common ground connection to prevent voltage mismatches. The power distribution ensures uniform brightness across all LED modules. Download and install LedArt software on your android. Firstly, check the Wi-Fi is connected to the driver W03. Then, connect W03 to the LedArt app for text updating purpose. LedArt app is the software which is used for connecting Driver to the Wi-Fi. The system constantly transmits this data to the W03 controller, which now processes this data and keeps on transmitting it to the online web server over a Wi-Fi connection. The transmitted data is sent to the LED display and then it will print data on LED matrix display.

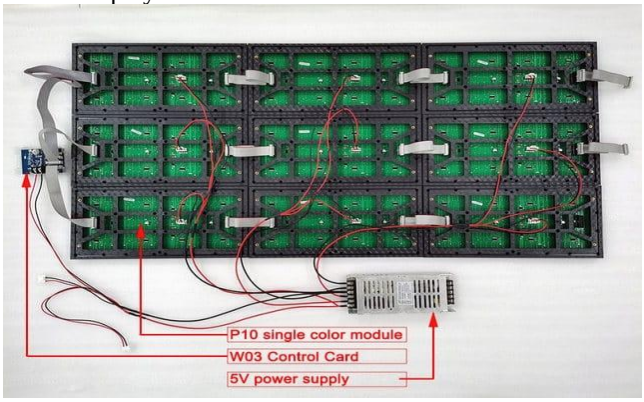

Figure 5: Electronic scrolling LED Display (Back side)

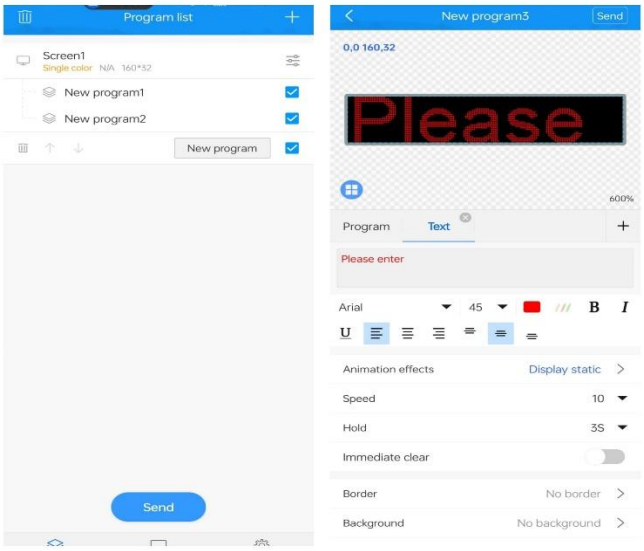

Figure 6: GUI (Graphic User Interface) of proposed model

4. RESULTS

The Wi-Fi enabled electronic scrolling LED display yielded impressive results, demonstrating seamless synchronization between the LED display and smart phones. The system effectively transmitted various messages, notifications, and announcements from the smart phone app to the LED board in real-time. Users experienced smooth interaction, enabling them to easily update and customize messages through the intuitive smart phone interface. The project showcased robust wireless connectivity, ensuring reliable communication between devices. Additionally, the user-friendly design of the app facilitated effortless management of the LED board content, enhancing convenience and usability.

Figure 6: Final Result of Proposed System

5. CONCLUSION

The P10 LED Display System using a W03 Control Card is successfully implemented, providing a cost-effective, efficient, and customizable solution for digital signage and advertising. The project involved assembling P10 single-color LED modules, configuring the W03 control card, and integrating a 5V power supply to ensure stable operation. Through the LED programming software (LedArt) we successfully designed and uploaded dynamic content, including scrolling text, static messages, and visual effects. The system was tested for brightness, responsiveness, and stability, ensuring smooth operation. This project demonstrated key concepts in hardware interfacing, embedded systems, and display technology. Additionally, it provided insights into power management, data transmission, and software-driven LED control.

This study contributes to the advancement of digital signage technology, offering insights into modular LED display configurations and embedded control systems. The findings and methodologies outlined can serve as a foundation for future research in smart display solutions and interactive visual communication systems.

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