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P10 LED DISPLAY USING ARDUINO UNO

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Abstract -This project demonstrates a P10 LED display controlled using an Arduino Uno and an HC-05 Bluetooth module. The system allows wireless text input via a mobile device, which is then displayed on the LED panel. It utilizes serial communication between the HC-05 and Arduino to process and display dynamic messages efficiently. The project is useful for digital signage board, real-time notifications, and customizable message displays.

1. INTRODUCTION

In today's digital world, real-time information display systems are widely used in public places such as shopping malls, bus stations, schools, medical stores, hospitals and offices. Traditional wired LED displays require a direct connection to a computer for updating messages, which can be inconvenient and time- consuming. To overcome this limitation, a wireless P10 LED display system using Arduino Uno and the HC-05 Bluetooth module is developed. This system allows users to update text messages remotely via a smartphone or computer.

2. Working Mehtodology

The 32x16 LED Display using Arduino Uno works by wirelessly receiving messages via the Bluetooth HC-05 module and displaying them on a P10 LED display. The Arduino Uno acts as the controller, managing data input and sending signals to the display. The Bluetooth HC-05 module allows for wireless communication from a mobile phone or PC, enabling users to send messages remotely. We begin by opening a Bluetooth terminal app on our smartphone, where we enter the message we want to display on the P10 LED module. Once we send the message, the HC-05 Bluetooth module receives the data wirelessly via the Serial Port Profile (SPP) protocol. The HC-05 then converts this data into a serial format and transmits it to the Arduino Uno using its UART (Universal Asynchronous Receiver-Transmitter) interface. As the Arduino Uno receives the data, it first processes it to check for errors, ensuring that the message is properly formatted. This includes handling special characters, adjusting message length, and verifying the integrity of the data received. Once validated, the Arduino converts the message into a binary format compatible with the
P10 LED display. The Arduino communicates with the P10 module using the SPI (Serial Peripheral Interface) protocol, which is known for its high-speed andsynchronized communication, ensuring smooth text rendering on the LED matrix.

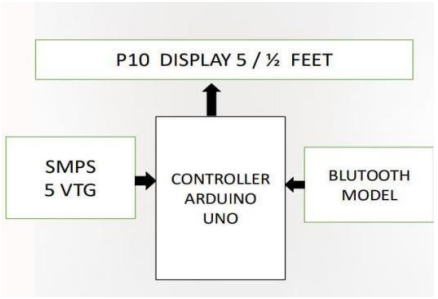

Fig.1 Basic block diagram of P10 led display using Arduino uno

To power the system, a Switched Mode Power Supply (SMPS) is used. The SMPS provides 5V to the Arduino Uno for processing and control, while the P10 LED module operates on 5V, ensuring stable performance for continuous display operation. The power distribution is crucial for maintaining a flicker- free and stable display output. Once the P10 module receives the processed data from the Arduino, it begins mapping the characters onto its LED matrix. Each character is formed by activating specific LEDs within the matrix, and depending on the programming, the display can show static text, scrolling messages. The SPI communication allows for fast updates, meaning new messages sent from the mobile app can be displayed on the LED module in real time. The system functions as a wireless, real-time text display, eliminating the need for physical connections to update messages. This makes it highly useful for digital notice boards, advertising displays, and event information systems. The combination of Bluetooth communication, microcontroller processing, and high-speed LED display control results in a flexible and efficient system for remote message broadcasting.

Fig -2: P10 LED Display Using Arduino Uno

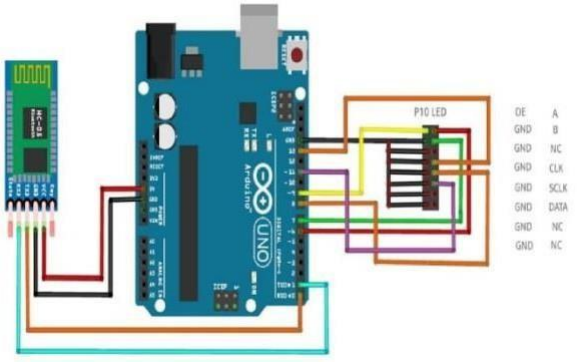

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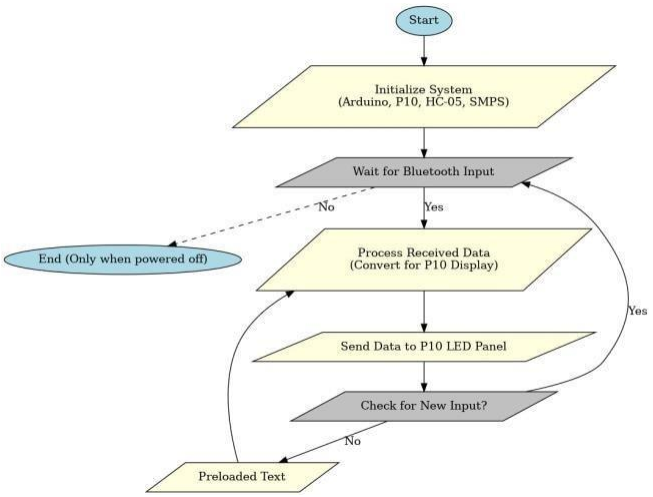
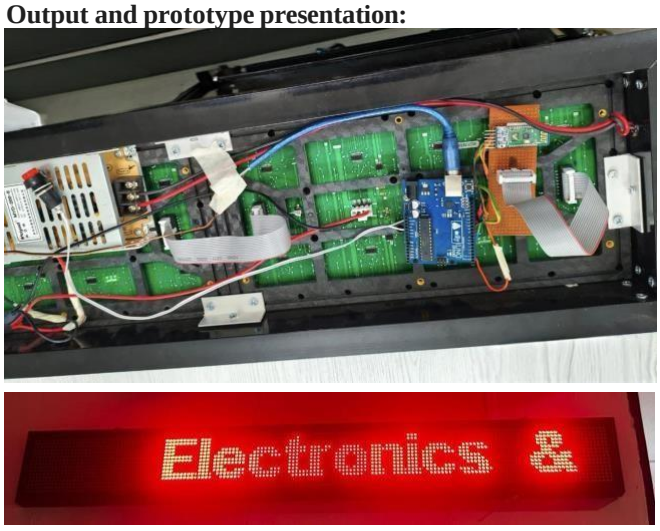
Fig. 3. Flowchart of P10 LED Display Using Arduino Uno



Output and prototype presentation:



Benefits :

1. Wireless Control: Users can update the display remotely via a smartphone using Bluetooth, eliminating the need for physical connections.
2. Real-Time Updates: Messages can be instantly changed and displayed, making it ideal for dynamic information boards.
3. Low Power Consumption: The P10 LED display is energy-efficient, making it suitable for continuous operation.
4. Cost-Effective: The system uses readily available and affordable components like the Arduino Uno and HC-05 module.

LIMITATION:

1. Limited Range: Bluetooth has a range of approximately 10–15 meters, restricting remote control over long distances.
2. No Internet Connectivity: Unlike Wi-Fi-based systems, it cannot be controlled from a remote location over the internet.
3. Message Length Restriction: The display size limits the number of characters that can be shown at a time, requiring scrolling for longer texts.
4. Power Dependency: Requires a constant power source, making it unsuitable for battery-operated applications without modifications

CONCLUSIONS

This project successfully displays messages on a P10 LED panel using Bluetooth communication with an Arduino and an HC-05 module. It efficiently processes user input and loads a preloaded message when no new input is received. The system is simple, cost-effective, and scalable, making it suitable for public information displays, advertising boards, and smart notice boards. Future improvements like IoT integration and cloud-based updates can enhance its usability even further.

FUTURE SCOPE :

1. Wi-Fi or IoT Integration: Upgrading from Bluetooth to Wi-Fi or IoT-based communication for remote message updates.
2. Cloud-Based Message Storage: Allowing messages to be stored and updated through a cloud server for easier access and management.
3. Voice-Controlled Input: Implementing voice recognition to enable hands-free message updates.
4. Multiple Panel Synchronization: Expanding the system to connect multiple P10 LED panels for a larger, coordinated display.

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