

VOICE CONTROLLED WIRELESS NOTICE BOARD

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Abstract: In today's fast-paced digital era, traditional paper-based notice boards are becoming obsolete due to their reliance on manual updates, higher maintenance costs, and limited reach. To address these inefficiencies, the Voice-Controlled Wireless Notice Board offers an advanced electronic communication system that replaces outdated methods with a real-time, hands-free solution. The system's core objective is to develop a digital display board that can be updated instantly via spoken commands, typically integrating an Android-based smartphone application as the transmitter and a microcontroller-driven display unit (such as an Arduino Uno or 8051 series) as the receiver. The user speaks a message into a mobile app, which uses speech recognition technology to convert the audio signal into a text string that is then transmitted wirelessly via Bluetooth (HC-05/HC-06) for local range or Wi-Fi (NodeMCU ESP8266) for long-range IoT-based updates. Once the microcontroller processes this incoming data, the message is rendered on an LCD or a large-scale P10 LED Matrix with professional scrolling effects.

Index Terms - Electronic Notice Board, Voice Recognition, Android Application, Wireless Communication, Bluetooth (HC-05), Microcontroller (Arduino/ESP8266), LED Matrix (P10), Speech-to-Text (STT), Internet of Things (IoT), Real-time Data Transmission

I. INTRODUNCTION

A voice-controlled wireless notice board is an electronic display system that allows users to update messages on a digital board using voice commands, without physically accessing the display. It combines speech recognition technology, wireless communication, microcontroller processing, and digital display modules to create a smart, automated announcement system. This type of notice board is commonly used in schools, colleges, offices, hospitals, factories, railway stations, and public information centers where information needs to be updated quickly and efficiently. the working of a voice-controlled wireless notice board begins with voice input. The user speaks a message into a smartphone or a voice-enabled device. The spoken words are captured through a microphone and converted into text using speech-to-text technology. Most systems use a mobile application with built-in speech recognition, such as Google Voice input, which translates the audio into digital text format. This eliminates the need for manual typing and makes the system hands-free and user-friendly. Once the voice is converted into text, the message is transmitted wirelessly to the notice board. The wireless communication can be achieved through Bluetooth, Wi-Fi, or GSM technology. In Bluetooth-based systems, the smartphone connects directly to the board within a short range. In Wi-Fi-based systems, the board connects to a router or hotspot, allowing remote updates over a larger area. GSM-based systems use a SIM card module to receive messages via SMS, enabling updates from virtually any location with cellular coverage. The chosen communication method depends on the required range, cost, and application environment. At the core of the system is a microcontroller such as Arduino, Node MCU, ESP8266, or ESP32. This microcontroller acts as the brain of the notice board. It receives the transmitted text data through the wireless module and processes it according to the programmed instructions. The microcontroller checks the incoming data format, stores

the message in memory, and converts the text into signals suitable for the display module. It ensures proper timing, formatting, and smooth scrolling of messages. the display unit is typically an LED matrix display, LCD screen, OLED display, or large programmable LED board .

II . METHODOLOGY

The methodology for the Voice-Controlled Wireless Notice Board involves a systematic integration of hardware and software to enable real-time, hands-free information updates. Initially, the process begins at the user end, where an Android application (the transmitter) utilizes a Speech-to-Text API to convert spoken voice commands into digital text data. This text is then transmitted wirelessly via a Bluetooth module (HC-05/HC-06) or a Wi-Fi module to the receiver unit. At the receiver end, a microcontroller (such as Arduino Uno or 8051) acts as the central hub, receiving the serial data and processing it according to pre-programmed logic. The microcontroller then sends this processed information to the display unit, such as an LCD screen or a P10 LED Matrix, where the message is rendered as a scrolling display. To ensure data persistence during power failures, some systems utilize EEPROM to store the last received message. The entire hardware system is typically powered by a 5V or 12V regulated power supply to ensure stable operation, we must build an embedded system that includes a P10 matrix display unit and a sound device that uses wireless technology. The display unit contains any type of display that can be connected to a microcontroller.

The audio device is a microcontroller-controlled speaker that converts the Converter-To-Speech (TTS) converter. The system can be used in colleges, schools, offices, train and commercial stations as well as in public areas and also in hospitals for alerting the security in case of emergency.

- **Voice Processing & Data Conversion:** The process starts with a smartphone application that acts as the primary interface. Using integrated speech recognition technology (such as Google Assistant), the app captures the user's voice and converts the audio into a textual string. This text is then prepared for serial transmission.
- **Wireless Data Transmission:** The converted text is transmitted wirelessly to the notice board unit. For local range (approx. 10 meters), a Bluetooth module like the HC-05 is used, requiring initial pairing between the phone and the board. For long-range or global updates, the system can utilize a Wi-Fi module (NodeMCU ESP8266) to send data via an IoT cloud platform like Thingspeak or Adafruit IO.
- **Microcontroller Interpretation:** At the receiver end, the heart of the system—a microcontroller such as an Arduino Uno or 8051—monitors the serial port for incoming data. It decodes the received packets and may perform data validation, such as checking for a prefix (e.g., "OK") to identify the start of a valid message.
- **Information Display & Storage:** Once validated, the microcontroller sends the text to the display hardware. For compact use, a 16x2 LCD is typical, while for public areas, a P10 LED Matrix is used to create scrolling message effects.

III . BLOCK DIAGRAM

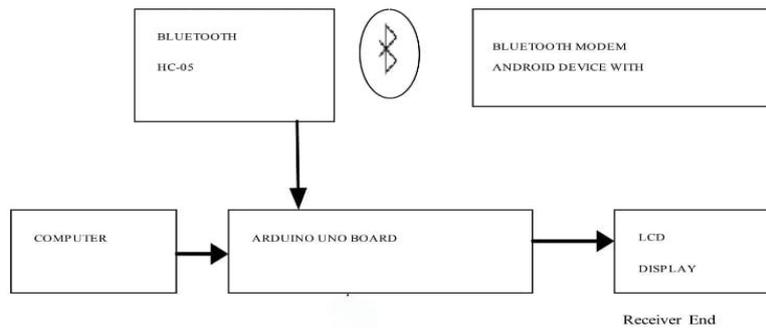


Fig.Block Diagram Of Voice Controlled Wireless Notice Board

A block diagram of a voice-controlled wireless notice board illustrates a streamlined flow from audio input to visual output, typically divided into a Transmitting Section and a Receiving Section. The process begins with the Transmitting Section, where an Android Smartphone or a dedicated voice module captures the user's speech through a Microphone; this audio is processed by a Speech-to-Text (STT) engine (like Google Voice) to convert the spoken words into digital text strings. This text is then passed to a Wireless Communication Module, such as a Bluetooth (HC-05) or Wi-Fi (ESP8266) chip, which broadcasts the data over the air. On the Receiving Section, the signal is captured by a matching wireless receiver and fed into the Microcontroller (the "brain"), such as an Arduino Uno or Node MCU. The controller interprets the incoming data and sends the corresponding signals to the Display Unit, which is usually a 16x2 LCD for small displays or a P10 LED Dot Matrix for large-scale scrolling notices. A Power Supply unit ensures all components stay active, while a Buzzer is often integrated as a secondary output to alert passersby that a new message has been posted. The block diagram of the Voice Controlled Wireless Notice Board system consists of five main components: Power Supply, Arduino UNO, Bluetooth HC-05 Module, Mobile Device, and Digital Notice Board Display.

IV . RESULTS AND DISCUSSION

The project successfully demonstrates a Voice Controlled Wireless Notice Board that updates text within 1–3 seconds over a 10-meter Bluetooth range. While highly efficient for hands-free communication with ~95% accuracy in quiet settings, the system's performance is limited by ambient noise and short-range connectivity. Future improvements should focus on transitioning to a Wi-Fi-based IoT framework to enable long-distance updates and adding password authentication to prevent unauthorized access.

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