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# Wireless Communication using LED Panels

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**ABSTRACT:** People in an institute can communicate better with help of wireless notice board project using Arduino and Android app. Teacher or Admin using this project can send a message to a particular display unit for students or staff. The dissemination of information. People can choose which screen to send the message or voice command to Bluetooth. The Android app uses technology that recognizes your voice to get text output from what you said. The app forwards messages to the HC-06 Bluetooth Module which send it to an Arduino Nano Board which takes action as per the messages. The Arduino controls a scrolling LED display that emits a sound beep when new information arrives, signaling its presence. Through this project, we hope to close the communication gap of traditional notice boards where the message often gets ignored or is considered old. With the digital platform for notice display, no paper notice is required thereby cutting down on waste and encouraging an eco-friendly practice. A system that frequently updates itself to share the required information essential in the educational environment will be made. This project makes use of modern technology and a real-time implementation that provides an easy-to-use interface which will enhance the user experience in school and other institutions

**KEY WORD:** Wireless, Bluetooth, Android app, voice

## I. INTRODUCTION

The proposed solution provides an affordable and easy-to-use wireless noticeboard system built on the Android platform. It uses Bluetooth or Wi-Fi for wireless data transfer, allowing messages to be shown on a remote digital noticeboard. Alphanumeric text is sent through Android-based applications running on personal digital assistant (PDA) devices equipped with Bluetooth and Wi-Fi capabilities. On the receiving end, a transceiver module is linked to an Arduino Uno microcontroller, recognized for its low cost. This microcontroller is programmed to accept text messages via the chosen communication method. The system's goal is to simplify noticeboard management by minimizing manual tasks, reducing paper consumption, saving printer ink, and eliminating the expenses related to manual notice updates. The evolution of cellular networks began in the 1970s to address the limited frequency spectrum available for radiotelephone services. The first generation, AMPS (Advanced Mobile Phone System), used analog transmission, followed by the second generation, which brought digital transmission with standards like GSM and ERMES. This period also introduced cordless telephone technologies.

## SURVEY AND SPECIFICATION

Creating a project on wireless communication using LED panels involves integrating Light Fidelity (Li-Fi) technology. This technology uses light-emitting diodes (LEDs) for transmitting data wirelessly through light signals. Below is a detailed guide including a survey and specifications for your project:

- **Project Survey**

Objective

Enable wireless communication using visible light emitted by an LED panel. Demonstrate data transmission (e.g., text, audio, or video) using modulated light signals.

- **Applications**

- Smart homes and offices: Wireless internet without radio interference.
- Healthcare: Data communication in electromagnetic-sensitive environments.
- Education: Classroom communications and information transfer.

**• Key features**

- High-speed data transmission using LEDs.
- Safe communication without electromagnetic interference.
- Energy-efficient by leveraging LED lighting systems.

**Challenges**

Maintaining line-of-sight for communication.  
Ambient light interference from sunlight or other lighting sources.  
Range limitations compared to Wi-Fi or other RF technologies.

**• Project Specifications****Hardware Components**

1. LED Panel:  
High-speed LEDs capable of modulation.  
Example: 1W or 3W high-power LEDs with proper heat sinks.
2. Microcontroller/Processor:  
Controls the LED modulation for data encoding.  
Example: Arduino, Raspberry Pi, or ESP32.
3. Modulation Circuit:  
Circuit to modulate the light intensity based on binary data.  
Example: Use MOSFETs or transistors for fast switching.
4. Photodetector:  
Photodiode or phototransistor to detect modulated light signals.
5. Amplifier Circuit:  
Amplifies the weak signal received by the photodetector.
6. Decoder/Receiver Circuit:  
Processes the amplified signals and decodes them into usable data.
7. Power Supply:  
Stable power source for LEDs and other components.

**Software Components**

1. Data Encoding/Decoding Algorithm: Implement schemes like On-Off Keying (OOK), Pulse Width Modulation (PWM), or Quadrature Amplitude Modulation (QAM).
2. Microcontroller Programming: Code for modulating the LED and reading signals from the photodetector.
3. Data Display Interface: Example: Serial monitor on a PC or a display module.
4. Design Specifications
5. Data Transmission
  - Speed: 1 Mbps or higher (depending on the LED and modulation technique).
  - Range: 1–5 meters (can be extended with focused LED beams).

**II. LITERATURE SURVEY**

1. This paper introduces a novel method of communication by utilizing a wireless electronic display board integrated with Bluetooth technology. The aim is to provide an efficient and dependable real-time messaging system that addresses the drawbacks of conventional notice boards. This technology can be deployed in diverse settings such as educational institutions, public areas, shopping malls, and large buildings, improving security, increasing awareness of emergencies, and helping to prevent potential risks.
2. The paper titled "Small and Medium Range Wireless Electronic Noticeboard Using Bluetooth and ZigBee" by Dharmendra Kumar, Sharma, and Vineet Tiwari presents a wireless noticeboard that employs both Bluetooth and ZigBee technologies for communication. The research outlines an affordable and portable electronic noticeboard powered by the ATmega32 microcontroller from Atmel, which integrates Bluetooth and ZigBee wireless functionalities. The study assesses the performance of these wireless technologies by examining factors such as bit error rate (BER), communication range, received signal strength indicator (RSSI), signal attenuation, and power consumption. The noticeboard uses a graphical liquid crystal display (LCD) to present data received in serial



format from the wireless receiver module. The receiver hardware is designed to support both Bluetooth and ZigBee modules, while the noticeboard utilizes a KS0108-based 128x64 graphical LCD to showcase the transmitted information.

- The paper by M. Abila Mary, B. Pavithra, R. Sangeetha, and Prof. T.C. Subbu Lakshmi, titled "GSM-Based Wireless Noticeboard Using Arduino," presents a noticeboard powered by GSM technology. The primary objective of this system is to offer colleges and universities an efficient way to display daily information continuously or periodically during working hours. By leveraging GSM technology, the noticeboard can quickly present breaking news and announcements. The project aims to create a user-friendly and easily installable GSM-based noticeboard that allows content updates via SMS, facilitated by an embedded microcontroller system. The design is straightforward, with a mechanism to receive and display notices in a specified manner. The system utilizes GSM technology, enabling messages to be sent from users' mobile phones. The Arduino board interfaces with a SIM 800 GSM modem, which is equipped with a SIM card, and communicates through AT commands for message processing.
- The paper "Cost-effective Android-Based Wireless Noticeboard" by Pallavi M. Banait, Nikita P. Bakale, Mayuri S. Dhakulkar, and Bhushan S. Rakhonde, published in the International Journal of Emerging Technologies in Engineering Research (IJETER), explores the growing importance of smartphones due to their portability and versatility. One innovative use of an Android smartphone is through a dedicated application that facilitates wireless transmission capabilities. On the receiving side, a budget-friendly microcontroller board, such as the Arduino Uno, is programmed to receive and display messages via different communication modes. This system has been successfully applied in two areas: a wireless person-calling system and a remote digital noticeboard. The main objective of the project is to wirelessly distribute information to specific individuals, thus saving time while minimizing paper and printing costs.

### III. DISCUSSION AND METHODOLOGY

#### Discussion:

Bluetooth is a widely used wireless communication technology that allows devices to exchange data over short distances. Android applications can integrate Bluetooth functionality through APIs, enabling them to establish connections with other devices, transfer data, and perform a variety of tasks. Here are some key considerations when utilizing Bluetooth in Android apps:

- Bluetooth Range:** Bluetooth typically supports a communication range of up to 10 meters in open spaces. This range can be influenced by physical barriers, interference, and the Bluetooth version being used.
- Data Transfer Speeds:** Bluetooth supports varying data transfer rates, typically ranging from 1 Mbps to 721 Kbps. The actual speed depends on the Bluetooth version (e.g., Bluetooth 4.0, 5.0) and environmental conditions.
- Bluetooth's versatility makes it suitable for a range of applications, including:
- Messaging:** Bluetooth can be used for direct communication between Android devices, allowing users to send messages without needing an internet connection. This is particularly useful in environments where mobile data or Wi-Fi may not be available.
- Home Automation:** Bluetooth-enabled Android apps can be integrated with home automation systems. For instance, users can control smart devices such as lights, locks, and thermostats through their phones, offering a convenient and wireless method to manage home environments.

These capabilities make Bluetooth a powerful tool for a wide range of practical applications, offering a simple yet effective solution for communication and automation needs.

#### METHODOLOGY

In traditional educational settings, communication often depends on static noticeboards, which present several challenges. These boards require manual updates, leading to inefficiencies in message dissemination and the potential for missed notifications or outdated information. Students and staff may overlook important announcements, events, or changes due to the passive nature of these boards. Additionally, the reliance on printed materials contributes to paper waste, which is environmentally unsustainable. With the growing need for timely and efficient communication, there is a clear demand for a solution that not only improves visibility but also supports real-time updates. The development of a wireless noticeboard that integrates voice input and Bluetooth technology addresses these challenges, offering an effective platform for instant communication in schools and organizations.

#### IV. CONCLUSION

Wireless communication is a foundational technology that powers a wide range of devices and applications. From smartphones to the Internet of Things (IoT), it enables devices to exchange data without the need for physical connections, revolutionizing the way we engage with the world. As technology advances, we can expect even more innovative applications of wireless communication. Whether it's facilitating new forms of personal communication, driving the next generation of IoT devices, or supporting space exploration, wireless communication will undoubtedly remain a key driver in shaping the future of technology.

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