

Wireless Notice Board Using ESP-32

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Wireless Notice Boards are growing rapidly around the world nowadays. Wireless is a term used to define telecommunication and data transmission without wires. This technology is used to make the notice board portable and easy to handle. The project will be a great substitute to the traditional notices which were written on paper and attached to the notice boards. In this paper, the development of ESP-32-based wireless notice board is presented. This can be a more efficient method to display any message in any kind of application. The message that is to be conveyed to people can be displayed using a self-developed app, on the notice board in an instant and more effective way. The wireless notice board is used in various applications or places such as railway stations, government offices and some other public places. The project is made using ESP-32 module, 16x96 LED display, 5V DC supply, FRC connectors, connecting wires and LED display panels.

Keywords: Wireless technology; notice board; ESP-32; Arduino IDE.

1 Introduction

The process of communication means to the transfer of data from one place to another place and from one person to another person or a group of people. In the whole process, a sender, a receiver and a message that is to be transferred is needed.

The communication is of two types:

- Wired communication
- Wireless communication

Wired communication is basically the transfer of data from one device to another using wires or cables such as Ethernet cables, optical fibre cables, television cables, internet cables, etc.

Wireless communication provides the ability to communicate between two or more devices over large distances without using any kind of long wires or cables. Wireless communication is basically used where it is hard to employ long cables and wires. The wireless technology has been in the area of broadcast communication like TVs, Radios, etc. Over the past few years, wireless technology has shown an amazing development in every region.

A notice board is a board which is usually attached to a wall in order to display notices giving information about something. As a mean of communication, notice board can be generally used in schools, colleges, universities, hospitals etc.[1]

The notice boards that are commonly seen, are fixed at a particular place and to carry a message it needs involvement of a few people to do work like printing it in paper, distributing those papers and attaching them into the board. The manual notice board takes more space to hang the notice as compare to the wireless notice board. In case of emergency manual notice board is time consuming and requires more efforts to change the information.

To decrease the complexity, wireless notice board is used which can immediately display a message and information sent by a user through the mobile app. The main objective of this project is to save the papers and to make this project simple and easy for the user to update the notice from anywhere from the mobile app.

Wireless notice boards tackle the overall problem of deforestation by conveying messages at large without the use of paper.[2] Such innovative measures will go a long way in adapting the damage to the environment.

In this paper, wireless display technology is used to make the notice board portable and this task is done by using 5V DC supply. The ESP-32 module is programmed to receive the message from the mobile app and display the message on the LED panels. The message which is displayed on LED panels is read from the GOOGLE Firebase which acts as the intermediate between the ESP-32 and mobile app.

2 Literature Review

In September 2021, Mulugeta Tegegn Gameda and Ayane Lebeta Goshu et.al^[3] worked on smart wireless notice board comprised of two sections i.e., transmitting and Receiving sections. The transmitting section is composed of mobile phone which is having GSM and Bluetooth module. The receiver section consist of GSM Module, HC-05 bluetooth module and Arduino microcontroller.

According to the paper published by Nami Susan Kurian, R K Hemanth Kumar and et.al^[4], (Aug 2021), they have used Raspberry Pi, NodeMCU and LED Display board. The display is controlled by the Android application. The admin can send the data in form of text or voice. By using the text to speech software, the text is scrolled over the LED Screen. Internet is used to avoid coverage issues.

In Sept 2020, Md. Bakhtiar Abid and Mamunur Rashid Rumon et.al^[1] used Node MCU for the interfacing between transmitter and receiving unit. NodeMCU is a WI-FI Module, so the project is based on WI-FI technology. When interfacing is done between transmitter and receiving sides, user can type the message in the app and the message will be displayed on the notice board instantly.

In year 2018, Krithika Srikanthan along with Arvind Chakrapani et.al ^[2] worked on Wireless Notice Board which was developed by using GSM Modem. The GSM modem interfaced with level shifter IC to Microcontroller. The Notice board is an LCD display interfaced to a microcontroller, powered by a regulated power supply from main supply of 230 V AC supply.

3. Methodology

The purpose of this project is to display any text or message on notice board using wireless technology. Wireless notice boards are designed using different types of technologies and various sources.

This project is based on Wi-fi/Bluetooth technology. The hardware requirements for this project are LED Panels, ESP-32 module, FRC cables and 5V DC power supply.

- **LED panels** are an array of Light Emitting Diodes that are used to display numeric and alphabetical information. LED Panels are available in different colors like blue, green and red.
- **ESP32 Module** is a series of low cost, low power system on a chip microcontroller. ESP-32 is a dual-core processor that runs at 160MHz to 240MHz^[5]. In this module both type of communications are possible either it is Wi-Fi or Bluetooth technology.
- **5V DC Power Supply** is a usual power supply prevalent nowadays. A 5V DC output achieved from 50V AC or 240V AC input using a combination of transformer, diodes and transistors ^[6].

The software requirements for this project are MIT App Inventor, Google Firebase and Arduino IDE.

- **MIT App Inventor** is maintained by the Massachusetts Institute of Technology (MIT) ^[7]. It is an open source web app originally provided by Google. It is used to create software applications for the Android operating system.
- **Google Firebase** is a platform developed by Google for creating mobile and web applications.
- **Arduino IDE** is an open-source software i.e. used to create codes and upload it to any controller.

This system is designed according to the block diagram as given in the figure 1. The 5V DC power supply is needed to power up the circuit of this project.

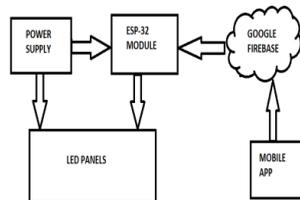


Fig. 1 : Block diagram of Wireless Notice Board using ESP-32

Firstly, the pins of LED panels are connected with the pins of ESP32 module according to the table given below:

Table 1: Connection of LED Panel and ESP-32 module

S.NO	PIN NO. OF LED PANEL	PIN NO. OF ESP32
1.	1 st pin	D22 pin
2.	2 nd pin	D19 pin
3.	3 rd pin	GND pin
4.	4 th pin	D21 pin
5.	5 th pin	GND pin
6.	6 th pin	NO CONNECTION pin
7.	7 th pin	GND pin
8.	8 th pin	D18 pin
9.	9 th pin	GND pin
10.	10 th pin	D2 pin
11.	11 th pin	GND pin
12.	12 th pin	D23 pin
13.	13 th pin	GND pin
14.	14 th pin	NO CONNECTION pin
15.	15 th pin	GND pin
16.	16 th pin	NO CONNECTION pin

In this project, three LED panels are used which are connected in serial manner with the help of FRC cables.

The code is created in Arduino IDE and upload it to the ESP32 microcontroller. The entire process of this notice board is run accordingly to this code. Many different libraries are used in the code. DMD32 library is dot matrix display, supports graphics operations like text etc.

The android application or app is made with the help of MIT App Inventor.

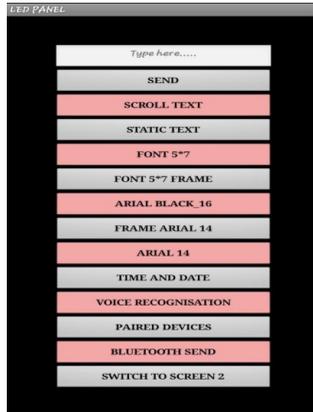


Fig. 2: Interface of LED PANEL application

In this app, firstly we add the type bar for typing any text or message that we want to display on notice board. A send button is located below the type bar. The information is send with the help of this button. There are different types of fonts in the app and each font has individual button.

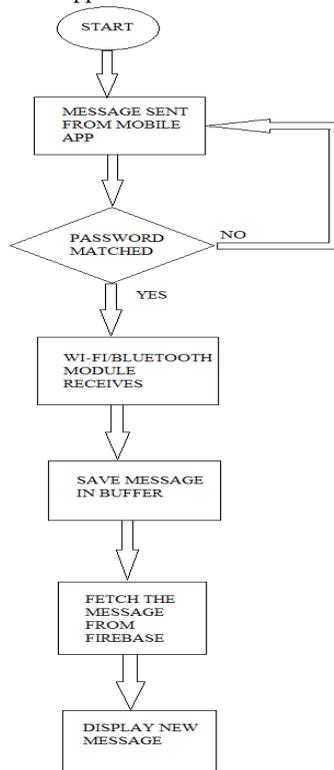


Fig. 3: Flow chart of Wireless Notice Board using ESP-32

Time and Date can also be printed on the board with help of Wi-fi. Voice Recognition and News characteristic are additionally delivered in this app.

Basically, the message is sent from an app which was made with the help of MIT app inventor. The app is linked with the Google Firebase^[8]. The firebase acts as an intermediate between ESP32 and mobile phone app.

ESP-32 reads the data from Google Firebase and displays it on LED panels. Here, serial communication is used for the entire process. Whenever the data gets changed on app, the data which will be displayed on matrix display will also be changed.

3 Results and Discussions

The project is working successfully after all the testing. The hardware requirements for this project are 16x96 LED Panels, ESP-32 module, FRC cables and 5V DC power supply. The software requirements for this project are MIT App Inventor, Google Firebase and Arduino IDE.



Fig. 4: Output of Final Project

Wireless notice boards are designed using different types of technology and various sources like GSM and Node MCU. It requires a SIM card to send the message on notice board. Extra charges are required on both sides for communication between transmitter unit and receiver unit.

Node MCU is a single-core processor that runs at 80MHz. So there is only Wi-Fi communication that is possible using Node MCU.

To overcome these problems, we have used ESP-32 technology. ESP-32 is a dual-core processor that runs at 160MHz to 240MHz. In this module both type of communications are possible either it is Wi-Fi or Bluetooth technology. If one of them is not in working condition, then we can use the second technology. By using this module, one can prevent the extra charges that were to be paid while working with GSM module.

4 Conclusion

The project will be a great substitute to the traditional notices which were written on a paper and were attached to the notice boards. In this paper, development of ESP-32 based wireless notice board is presented. A combination of WIFI and Bluetooth Technology is implemented to reduce the cost of overall Notice board. This can be a more efficient method to display any message in any kind of application. The message that is to be conveyed amongst people can be displayed using a self-developed app, on the notice board in an instant and more effective way.

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