

SMART ALERT LED DISPLAY SYSTEM USING IOT

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Abstract— Nowadays display boards are becoming very popular and are commonly used at educational institutions, hospitals, shopping malls etc. It has major advantage of drawing people's attention by prompting messages to reflect many times. In future, the competition of advertising market will be the competition of customer value, management and professional quality which declares the thriving vitality of LED advertising display. This paper deals with the design and implementation of intimating message to people using smart alert LED display boards. This system is used for the purpose of displaying alert messages or general information without any delay using IOT which is more efficient and reliable than the traditional way of pasting messages on notice boards. Our proposed system overcomes the shortcomings of the GSM based system in which input can be given only through a specific device which is connected to the hardware board by feeding messages to the LED display just by sending an SMS using mobile application or using web page which can be accessed globally through dynamic IP. The hardware board contains NodeMCU microcontroller which has inbuilt ESP8266 WiFi microchip and 8*8 character LED display is attached to the microcontroller for displaying.

Index terms—LED Display, NodeMCU, Web Application, Mobile Application.

1) INTRODUCTION

Technological advancements plays a major role in the current moving world without which even existence of people has become difficult. Advertisement is the one of the common promotion tool that uses various strategies and deals with the benefits of a product or service to mainly influence and target audience's attitude and/or behavior. The most advancing and competitive environment has made the advertising field more experimental and hence advertisers choose this as an option and have adopted different measures

to attract the attention of people. Only those ads which are unique and catchy in some or the other way from the bouquet of others can able to catch people's attention.

To break this monotony and make advertising catchy, marketers are dishing out with wide variety of ideas among which LED display boards stands apart. Light Emitting Diodes (LED) dot matrix display is becoming popular in this digital world. Due to its clear bright light, way of displaying such as rolling left, right or fancy appearances, it has gained popularity around the world.

The basic idea of this project is to receive message from authorized user and send it to the smart LED boards for displaying globally. The message to be displayed on the smart LED board can be given in more than one ways, either using mobile application or using a web application which can be accessed globally using dynamic IP. The IP for accessing the web application and the mobile application should be maintained by the authorized user. Both alert messages and general information can be displayed. NodeMCU microcontroller in which ESP8266 WIFI microchip is inbuilt is used. It is comparatively efficient than the PIC microcontrollers used in the existing systems.

2) EXISTING SYSTEM

The drawbacks found in the existing system are explained, "GSM based smart message display board", International Journal of Advancements in Research & Technology in which message cannot be sent globally and only remote accessing is possible for which a computer or a special keyboard is to be carried, "LED display using GSM", International Journal of Electronics and Communication Engineering in which the previous message will be displayed until a new message is received and has a

limitation of displaying only 48 characters, “Design and implementation of an Alphanumeric microcontroller based GSM scrolling display system”, International Journal of Engineering Research and General Science which has the drawback of using PIC 16F8771 microcontroller in which task switching and generation of reentrant code is difficult, “lab VIEW based wireless notice board”, International Journal of Engineering and Applied Sciences in which each and every time the authenticated user has to login with the password for sending the message to be displayed.

3) PROPOSED SYSTEM

The main objective of this proposed system is to display messages on the smart LED board globally. The message can be fed to the display board using two ways, either using a mobile application or using a web page. The web page is created using the client side languages, HTML, CSS and JavaScript. The system is programmed to display messages either normally or with an alert sound. It overcomes the shortcomings of the existing system by displaying the message globally using the dynamic IP which should be maintained privately by the authenticated user. The user can open any browser from anywhere and simply give the IP address which opens the designed web page, in which the message to be displayed should be entered. The existing system has demerit of displaying only 48 characters which is overcome in the proposed system in which the input string to be displayed can have maximum of 200 characters.

4) WORKING PROCEDURE

The message to be displayed on the smart LED board is given in the web page using the concept of IOT. The web page is designed with HTML for content and structuring, CSS for formatting and styling and JavaScript for behavior. The input string to be displayed is entered in the text box and click the display button. The entered string will be displayed on the web page below the text box using the JavaScript. The text given by the user is stored in firebase which is a google cloud. It is a most commonly used open source Internet of Things (IOT) application and the API which is generated is used to store and retrieve data using the HTTP protocol over the Internet or via a Local Area Network. By this cloud, the parsing string is generated as an API key. The key which is generated from the firebase cloud is given as input to the micro controller NodeMCU which has an inbuilt ESP8266 WI-FI module. Embedded C programming is used in the microcontroller. It takes the given string as input and

parses character by character. String with more than 200 characters will not be accepted. A default message is scrolled when no new message is given. With all the above mentioned processing done, the content is sent to the smart LED board for displaying.

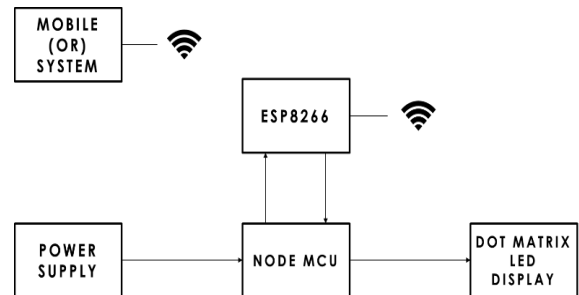


Figure (1): Architecture Diagram

5) SOFTWARE REQUIREMENTS

A) Web Application

The webpage which is created using client side languages such as HTML for content and structuring, CSS for formatting and styling and Java Script for dynamic behavior is used to feed input to the smart LED board. The webpage is created responsive and made convenient to the authenticated user using the concept of IOT.

B) Android application

This Android Application is designed for the convenient of the mobile user. The authorized user must have the application installed in their mobile phone or tablet using which the smart LED board can be accessed for displaying messages.

C) NetBeans (Embedded C)

NetBeans is an integrated development environment (IDE) for Java. It allows applications to be developed from a set of modular software components called modules. It runs on Microsoft Windows, Mac OS, Linus and Solaris. It has extension for other languages like PHP, C, C++ and HTML5.

6) HARDWARE REQUIREMENTS

A) Dot matrix LED Display (8*8)

The most commonly used device for displaying information is a Dot matrix LED Display. It has a rectangular configuration arrangement of dot matrix lights. The processor sends instructions to a controller which does the required processing inside and turns on or off lights in the matrix so that the required display is produced.

B) NodeMCU

NodeMCU is an open source IOT platform which includes firmware that runs on the ESP8266 WIFI module. It is a single board microcontroller which has memory of 128Kbytes and storage of 4Mbytes. The ESP8266 is capable of either hosting an application or offloading all WIFI networking functions.

C) Power supply unit

230V AC power supply for all the electronics involve in this project. A transformer is used to step-up or step-down the supply voltage as per need of the solid-state electronic devices.

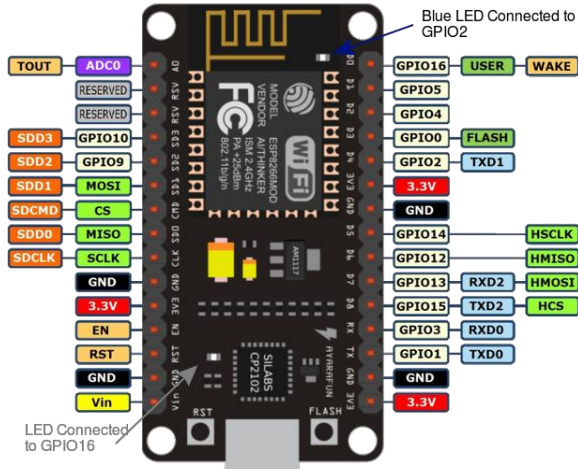


Figure (2) :NodeMCUPinout

7) PIN SPECIFICATIONS

In order to produce the required output, the mapping of pins should be appropriate and in accordance with the input given. The correct pin mapping for ESP8266 is the following:

- D0 = GPIO16;
- D1 = GPIO5;

- D2 = GPIO4;
- D3 = GPIO0;
- D4 = GPIO2;
- D5 = GPIO14;
- D6 = GPIO12;
- D7 = GPIO13;
- D8 = GPIO15;
- D9 = GPIO3;
- D10 = GPIO1;
- LED_BUILTIN = GPIO16 (auxiliary constant for the board LED, not a board pin);

8) FEASIBILITY

Feasibility test is used to determine the viability of the idea, such as ensuring a project is legally and technically feasible as well as economically justifiable. It tells us whether the project is worth the investment. It also evaluates the project’s potential for success.

A) Technical Feasibility

This assessment mainly focusses on the technical resources available to the organization. It helps the organization to determine whether the technical resources meets the capacity and whether the technical team is capable of converting the ideas into working systems. It also involves the evaluation of the hardware, software and other technology requirements of the proposed system. By conducting the technical feasibility test, we ensure that our system can be implemented with all the requirements satisfied.

B) Operational Feasibility

This assessment involves undertaking a study to analyze and determine whether and how well the organization’s needs can be met by completing the project. It also analyzes how a project plan satisfies the requirements identified in the requirements analysis phase of the system development. Our proposed system is made more efficient and convenient to the authorized user for accessing hence satisfying the operational feasibility.

C) Economic Feasibility

This assessment typically involves the cost, benefits analysis of the project, helping the organizations to determine the viability and the financial resources allocated. It also serves as an independent project assessment and enhances project credibility, helping the decision makers determine the positive economic benefits to the organization. This project is developed

using HTML, CSS and JavaScript and can also be installed easily thus satisfying economic feasibility.

9) RESULT ANALYSIS

This project mainly deals with the working of LED boards which is widely used for the purpose of advertising. It has various advantages when compared to the other display devices in terms of efficiency, energy saving, color, power consumption and life span. Also the continuous spectrum of light produced by LED reduces the emission peak.

Table (1): Specifications of Led

Life Span	25,000 HRS
Watts Per "60 Watt"	7 Watts
Bulb Lumens	850 Lumens
Cost per bulb	\$11.98
Bulbs needed for 25,000 hrs	1 bulb
Total cost for 25,000 hrs	\$32.95

Table (2): Comparison of Light Bulbs

Characteristic	Incandescent	Halogen	LED	Smart LED
Energy saving	25%	25%	85%	94%
Life span	1000	2000-3000	30,00-50,000	30,00-50,000
Dimmable	Yes	Yes	Yes	No
Toxic materials	No	No	No	No
Instant On	Yes	Yes	Yes	Yes

10) SCREENSHOTS



Figure (2): Web Application

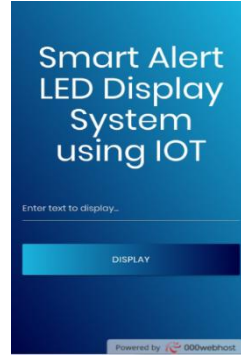


Figure (3): Progressive Web Application



Figure (4): Message Displayed

11) FUTURE ENHANCEMENTS

This proposed work is used for displaying messages on the smart LED board globally using the concept of IOT. In future, the smart LED boards can be attached with sensors which detects the environment and displays message only if people movement is found. Further the concept of Artificial Intelligence (AI) can also be included.

12) CONCLUSION

This system will be useful to send alert message or general information globally thus making the LED notice boards more easy and smarter to access and operate. This proposed system also replaces the traditional way of pasting notices in which latency is concerned and also saves our environment from ink, papers and organic materials. This idea can be efficiently implemented in schools, colleges, hospitals or any other public places.

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