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IOT BASED LED DOT MATRIX SCROLLING DISPLAY

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Abstract: This project demonstrates an IoT-based LED Dot Matrix Scrolling Display for environmental monitoring and customizable messaging. Using Arduino, NodeMCU, a DHT11 temperature and humidity sensor, and a gas sensor, the system collects real-time environmental data and displays it on an LED dot matrix display. Additionally, users can send custom messages from a mobile application to the display. This solution is ideal for public information systems, workplaces, or educational institutions, enhancing real-time data communication and environmental awareness.

1. INTRODUCTION

In today's digital world, information dissemination in real time is crucial. Traditional static displays are often insufficient for dynamic environments. This project integrates IoT with an LED dot matrix display to create a flexible, real-time information broadcasting system. The system monitors environmental conditions and displays sensor data alongside user-defined custom messages, making it an effective tool for both awareness and communication.

LED Display Systems are specifically designed to be used at the colleges, universities, share market etc. for displaying day-to-day updates, important notices and other information continuously. Being IOT-based system, it offers flexibility to display flash news or announcements faster than the programmable system. IOT-based display system can also bemused at places like shops, bus stations, nursing homes ,factories shop floors railway stations, gardens etc. without affecting the surrounding environment. The led display system mainly consists of a Wi-Fi module as receiver and a display toolkit which can be programmed from an authorized mobile phone. It receives the data, from android Mobile through an application (App) and displays the desired information after necessary code conversion. It serves as an electronic notice display board which displays the important notices

instantly avoiding unwanted delays. Being wireless, the IOT based led display it's easy to expand and allows the user to increase the number of display panels anytime and at any desired location depending on the requirement of the user. These days the use of LED Matrix Scrolling Displays has become very popular in area

Like malls, movie theatres, public transports, traffic and highways signboards, etc. But major issue with these displays is to carry a personal computer, laptops or specialized keyboards for transmitting messages to these LED display boards. Carrying computational assembly or keypads every time, when the user needs to change the message on the LED display boards can be quite hectic.

This system takes ideas from other systems which have already been implemented earlier. It merges two different project ideas into single unit. It is an extension of already existing LED scrolling display board. But here we are using speech to text technology using mobile app through Wi-Fi module. For making this LED display more portable, an android phone can be used instead of carrying a computer or keyboard every time user needs to change the messages to be displayed on the LED matrix display. A speech signal is obtained through spoken words in the mobile phone and sent to LED moving display boards by using Wi-Fi. A Wi-Fi module is connected to the LED display hardware and is used to receive the speech to text converted message and send it tote controller circuit of the LED display. Then the controller circuitry which drives the led matrix stores the received data in externally interfaced RAM and tallies the same with the lookup table stored in controller program displays the text onLED displays accordingly. By using Wi-Fi it is possible to change the message on the LED display board through speech, from any desired location in the country. This idea used in this project minimizes the total cost that is required in the traditional LED display boards and makes easier to send datato these LED display boards. The project uses a Wi-Fi at the display side to receive the speech signal. IC 8051 is the controller which drives the LED display board. Along with this, Switch mode power supplies are used for controlling.

Now-a-days LED Message Scrolling Displays are becoming very popular .These displays are used in shopping malls,theatres , public transportation, traffic signs, highways signs,etc., The big problem with these displays is to carry computer or special keyboard for generating and sending

messages to LED moving display boards dynamically. Carrying a host computer or special keyboard every time to generate message for LED display boards is big headache and also increase cost if it go for wireless based message sending. To make the LED scrolling display more portable, a GSMmobile phone is used instead of carrying keyboard or a host computer for generating or sending messages to LED display board. A text message is typed in the GSM mobile phone and sent it by using SMS service of the mobile phone to LED moving display boards. A Adriano board is connected to the LED display hardware is used to receive the message and send it to the controller circuit of the LED display. Then the controller circuit of the LED display filters the message content in message and changes the display text in LED display dynamically. By using this Adriano sketch it is possible to change the text in the LED display board from anywhere in the country. The idea implemented in this project reduces the total cost that is required in the traditional LED display boards not only it makes easier to send message to theLED display boards. The project uses a Arduino UNO board at the display side with Atmel 328p micro controller to send text to drive the LED display board. Along with these a power supply unit and supporting hardware for microcontroller is used.

The dot matrix LED displays can be made with individualism, or a pluggable unit can be bought. By making use of the premade pluggable unit, production costs can be lowered. Further, this type of display can show graphics and normal text. This enables the display to be used for more than just sporting events. It can be used as a billboard and information board in shopping malls. These units can be stacked or cascaded in such a manner that a larger display can be constructed. This is usually done in multiples of eight, making use of an eight bit microcontroller, as this enables easier driving. A 40-pixel by 56-pixel size is thus the smallest size of LED panel that can be constructed when making use of a 5-pixel by 7-pixel LED dot matrix unit as shown in figure. Each of these LED dot matrix display units can display character or symbol, hence a total of 40 characters could be displayed at any given time. These characters will, however, be too small to be seen at long distances away from a LED dotmatrix billboard. Hence pixel binning will have to be used. This is the process in which adjacent LEDs are grouped together to make larger pixels. By doing this the resolution of

the LED dot matrix billboard will be lowered, but the size of each character will be larger and appear brighter.

Electronic notice board is a common device that is used to display information. The information or messages are displayed using dot matrix. The wireless system for dot matrix display is a method using Radiofrequency as transmission medium. The system consists of two modules; transmitter and receiver. The transmitter module is used by a user to place message through an input module such as keypad or keyboard or smart phone.

2. LITERATURE SURVEY

Notice boards are playing a very important role in our day to day life. By replacing conventional analog type notice board with digital notice board we can make information dissemination much easier in a paperless community. Notice board could be a primary factor in any establishment or public places like bus stations, railway stations, colleges, mallet. Sticking out numerous notices day today could be a tough method. A separate person is needed to take care of this notice display. The objective of our project is to design a dot-matrix moving message display using microcontroller and IOTwhere the characters shift from left to write continuously. In this project we have used ATMega8 microcontroller. ATMega8is a family of 8-bit microcontrollers. It has maximum rated processor frequency of16MHz. The ATMega8 lends itself extremely well to prototyping due to its simple requirement of a 4.5V-5.5V power source. It has a shift out frequency of around 100MHz and storage register of 3-stage output and finally we have used16x32 dot-matrix display. At first a code was developed. And we got our desired result there. This project is regarding advanced wireless notice board. In IOTbased Web Controlled Notice Board, Internet is employed to wirelessly send the message from Browser to the LED display. The main objective of the project is to develop a wireless notice board that displays messages sent from the user's mobile application.

With the technological advancements there have been advancements in ways of a displaying marketing and advertising of information. LED matrix display boards are used for displaying advertisements and notices. These Display boards have become a primary thing in educational institutes, shop floors (workstations) & various public places for displaying information regarding public transport timings, platforms, various advertisements regarding products, or

important notices. People are now adapted to the idea of the world at its fingertips. The older version of display boards made use of wired technology for communication. Here wireless technology Wi-Fi is used for communication. Information is entered through the keyboard of transmitter or as speech signal and send through Wi-Fi & nodemcu or wife module at receiver end will receive it and send it to matrix display due to which the desired information will be displayed on LED matrix display.

Because of developments in technology, there have also been developments in terms of the ways that information canbe shown for the sake of marketing and advertising. These developments have been made possible by those technological developments. These enhancements are a direct result of the technical developments that have taken place in recent years. LED matrix display boards are frequently used for the purpose of showing a variety of adverts and messages of varying lengths and formats. These Display boards have evolved into a regular fixture in several public spaces, including educational institutions, shop floors (workstations), and other public settings. Other public settings also frequently make use of these boards. They are utilized to display information such as the timetables for pub transit platforms and times, in addition to displaying a variety of advertisements for items and important notices. Important notices and advertising are two examples of the additional forms of information that can be displayed on.

People are now accustomed to the concept that they can access any information in the world with only a few clicks of their mouse. This concept has revolutionized the way people acquire information. In earlier iterations of display boards, the technique of communication was accomplished using wired technology because wireless technology was not yet on the market at the time. In this situation, the act of communicating is accomplished by utilizing a form of wireless technology known as Wi-Fi.

This work presents the design and construction of an electronic scrolling digital display system, using Light Emitting Diodes (LEDs). The arrangement of LEDs is inform of dotmatrix array on which information is displayed. This work is useful for dissemination of information across various department and faculty within the institution. The system consists of the Power supply unit, control unit (which entails the Microcontroller, counter unit and driver

unit) and the Display unit (which is the output unit inform of LEDs). The power supply unit uses alternating current (AC) from the mains which will be optimized to 12 V using a step-down transformer, rectified with bridge rectifier, filtered with an actual capacitor and regulated to 5 V using an ICs regulator. The Microcontroller used was the ATMEGA328P microcontroller, which is a family of 8-bit microcontrollers and has a maximum rated processor frequency of 16 MHz It has a simple voltage requirement of a 4.5-5.5volts from the power source. Also, a 74HC595 Shift register was used in the design for shifting the characters from left to right. The output unit enables the information to be displayed using the light emitting diodes (LEDs) on a 16x32 Dot matrix display.

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3. EXISTING SYSTEM

The main aim of this research will be to design a Short Message Service (SMS) driven automatic display notice board which can replace the currently used programmable electronic display. It is proposed to design a receiver (GSM MODEM) display board which can be programmed from an authorized mobile phone. The message that is desired to be displayed is sent through an SMS from an authorized transmitter (mobile phone). The microcontroller receives the SMS from the authorized transmitter, validates the sending Mobile Identification Number (MIN) and displays the desired information on an LED array which serves as the display board. Started off as an instantaneous News display unit, we have improved upon it and tried to

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take advantage of the computing capabilities of microcontroller and a larger obvious display board instead of a small Liquid Crystal Display (LCD).

The main components used includes AT89C52 microcontrollers, GSM MODEM, 7×96 characters LED display arranged in matrix configuration, max232 serial interface, electrically erasable programmable read-only memory (EEPROM), mobile phones, and voltage level conversion unit. Figure 1 shows the block diagram of the research work. The text to be displayed

is sent from the mobile phone to the GSM MODEM. The GSM MODEM responds by requesting

a confirmation SMS. The GSM MODEM has a different voltage level from that of the control unit. The voltage level conversion unit serves to synchronize the voltage levels. The data collected by the GSM MODEM is stored in the external memory which is fetch bit by

bit by the control unit and fed serially to the display driver (shift registers) and then finally displayed on the array of LEDs.

4. PROPOSED SYSTEM

In ciruit connection part we have mainly used three components they are nodemcu, 8x8 dot matrix display, android mobile and some jumpers for connections. After making connections open Arduino IDE software it is the software used to dump the code into nodemcu but it not as simple not we can easily dump the code in nodemcu.. Firstly in IDE software go to libraries section then search for max7219pannel.h library next download libraries from the installer it has three stages link of max7219pannel.h libraries should be copy and paste in three level section then max library will be downloaded now first library has downloaded this max7219pannel.h library will be used to display the characters on dot matrix display.

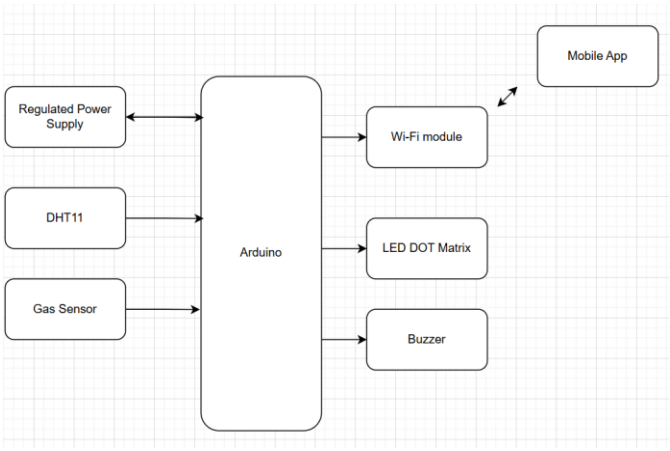

Fig 1 Block Diagram

Working Flow

Sensor Data Acquisition:

The DHT11 sensor reads temperature and humidity levels.

The gas sensor monitors air quality.

Sensor data is sent to the Arduino Uno for processing.

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Data Transmission to Cloud:

The processed data is transmitted to an IoT cloud platform via NodeMCU.

Users can view the data on a mobile app in real-time.

LED Display Control:

The Arduino updates the LED dot matrix display with scrolling messages.

Display alternates between environmental sensor data and user-defined custom messages.

Custom Messaging:

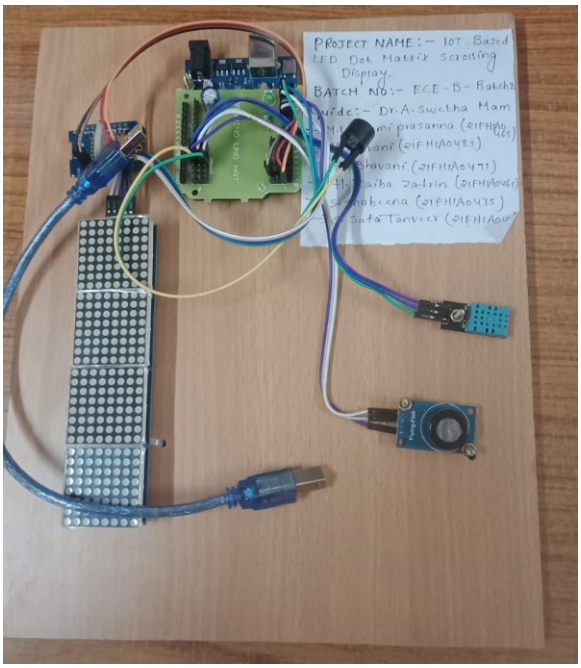
Users send messages from the mobile app to the NodeMCU, which forwards them to the Arduino.

The custom messages are displayed on the LED dot matrix display.

Alerts and Notifications:

If gas levels exceed a safe threshold, the system displays a warning message and triggers a buzzer for safety.

5. RESULT



6. CONCLUSION

The IoT-Based LED Dot Matrix Scrolling Display provides an innovative way to communicate real-time information effectively. By integrating sensor data, IoT cloud platforms, and custom messaging, this system ensures timely updates and enhances awareness. Its versatile design makes it suitable for a variety of applications, contributing to smarter and more connected environments.

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