Controlling P10 LED for Displaying Real Time Information of Time, Temperature & Humidity and Air Quality

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Abstract. The objectives of this thesis are to create a huge display for displaying various information inspired by automatic weather station. Date and time, temperature, humidity, and carbon monoxide data will be read using sensors often used in commercial applications and displayed so that people can see it even from a distance. People frequently disregard this information as unnecessary because they believe it is not required in everyday activities. With ESP32 as the controller connect to LED P10 as the display, generate a static text that inform any data that read by sensors is a straightforward process.

Keywords: display, sensor, ESP32, LED, P10

1. INTRODUCTION

Nowadays, information is relayed faster, enabling the expanding information media to be more creative and interesting. People try to create a creative presentation to present information so the audience who receives it can be impressed. People who are studying advertising often utilize multiple examples to express their viewpoints to audiences. Electronic displays, also known as Liquid Crystal Display (LCD) are one of the media that people use. Right now, there are plenty of people around us who frequently use LCDs. Everything from televisions to cellphones to laptops to the billboards we see in stores and on the street rely on LCD technology. There are various types of LCD, Light Emitting Diode (LED) is the most encountered. LED is a semiconductor that can convert electrical energy into light. LEDs are widely used in electronic devices because of their small size, practical installation method and low electricity consumption. People use this existence of information boards and banners using LED for any kind of information to create a particular impression to those of us who are observing. One specific detail that caught my attention is that there are hardly any headlines about basic information of weather and air quality in Indonesia. We are aware that traffic feels more crowded after the pandemic, but we are unsure of how serious this situation is. The world's biggest environmental issue is still pollution. Air pollution is the leading issue among all known pollutants. Complaints about its impact on human health and the environment already voiced countless times. Air quality start declined during the industrial revolution due to the widespread use of coal in factories. Nowadays, it is worse because the exploding population and extensive belonging & usage of transportation has become a part of both industrial and daily life not just domestically but internationally. This thesis is taking weather station as an inspiration to build a display consists of some parameters that commonly shown in weather station.

2. LITERATURE REVIEW

Weather stations can be distinguished by two different type of data acquisition, online and offline. Online data acquisition system is based on Internet of Things technology such as smart weather station. It is simply an online data acquisition system that collects information remotely based on environmental factors and stores it in the Cloud or database on the website. The non-smart weather stations do not use Internet of Things technology. Non-smart weather stations store measurement results only through wired connections and is referred to as offline data acquisition.[1]

3. METHODOLOGY

The goal is to output all sensor data into LED P10 by reading all parameters. To access date and time through NTP server, the computer requires an internet connection; the ESP32 connects to WiFi. Then connecting all sensors to ESP32, all data parameters will be stored inside ESP32 memory to be processed. Convert all text data and count all text into dot x and y coordination, then display static text on LED P10. The first row of LEDs will display the date and time. The temperature, humidity, and carbon monoxide measurements will be followed by the second row of LEDs.

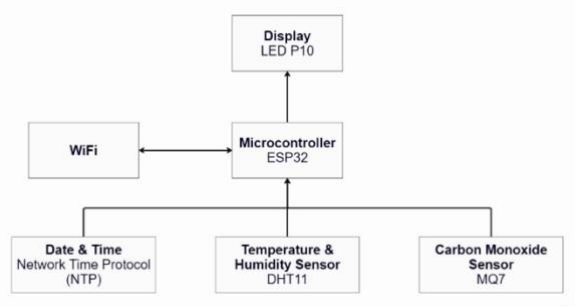

Figure 1. System Architecture

The first step before carrying out the plan is to test each component. The first stage will be to test the ESP32 and LED P10. It is essential to have the correct library for any device and programs to run successfully because every device has its own library. The ESP32 and LED P10 libraries must be installed; otherwise, the Arduino IDE will not detect both devices.

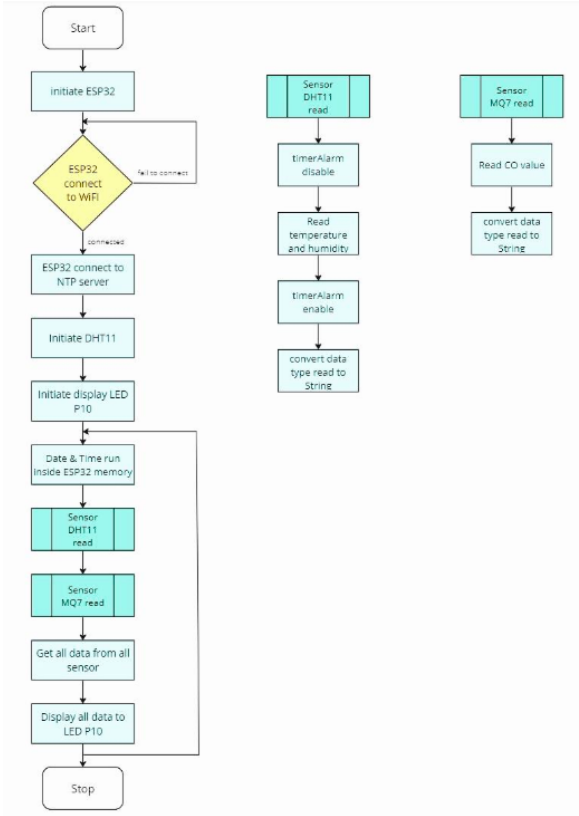

Figure 2. Flowchart Program Diagram

From figure 3.19, tells that first step is to connect the ESP32 to the internet. If the ESP32 is not connected to the internet, a loop will continue continuously until the ESP32 is connected to the internet. Access the NTP server after connecting the ESP32 to the internet to obtain the date and time. The date and time data will then be kept in ESP32 memory and will always run within it. Inside the Arduino IDE project, create a function to call each sensor; DHT11 and MQ7. So that when LED P10 wants to display something, the Arduino IDE can simply call the function and set the x and y coordinates where the LED node will light up. Changing the data type of each sensor to a string is also required within each function, else the LED will not recognize the input. And there goes the loop, taking data and displaying it every second.

4. RESULT

Unfortunately, this project cannot be projected to be able accomplish the expected results. Intended to create the size of office windows. However, the author was unable to finish the project within the time span given; just the prototype was completed. There are few examples and explanations of the ESP32 and LED P10. The author struggled and became stuck because the LED would not display any data that the sensors had read and there was no

example of converting data type commands from the dmd32 library. It took a long time to find the answer and to track down each command line that the library provided. After following each line and attempting every possible strategy to transform each data type into a string and a certain command line, the solution was discovered. The command "timerAlarm" may override other sensors to read in some way. So, program the command to be disabled, sensor read, and "timerAlarm" enabled again.

5. CONCLUSION

With several examples to apply LED P10 with Arduino Uno as the microcontroller, this thesis is demonstrating how the ESP32 can be also used with LED P10 and several sensors to read some parameters and display all desired output. The result was to create large display that inspired from weather station using ESP32 as the microcontroller. The LEDs will be placed outside office windows so it can be viewed by people from the street. The display can be running according to expectations. ESP32 can collect the data parameters from sensors and show to LED P10. But unfortunately, the project did not finish within the time it given. The author only finishes at prototype stage without any large display progress.

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