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IOT Based Smart Home Automation System Using Sensor Node

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Abstract

Ensuring safety and operational efficiency in Home environments is crucial due to the hazardous nature of the work. This project proposes the development of an IOT Based Smart Home Automation System Using Sensor Node using NodeMCU, LCD with I2C, DHT11 sensor, Relay, CPU fan, bulb, servo motor, and IoT server. The system monitors environmental parameters and potential hazards in real-time and transmits the data to an IoT server for remote monitoring. This system aims to enhance safety by providing timely alerts and automated responses to hazardous conditions.

I. Introduction

In today's rapidly advancing technological landscape, the concept of smart homes is becoming increasingly popular. The Internet of Things (IoT) has revolutionized the way we interact with our living spaces, offering enhanced convenience, security, and energy efficiency. Home automation systems enable homeowners to control various devices and appliances remotely, creating an integrated and intelligent living environment. The IoT-based home automation system utilizing the ESP8266 controller is designed to provide a seamless and user-friendly solution for managing home appliances. The ESP8266, a powerful microcontroller with built-in Wi-Fi and Bluetooth capabilities, serves as the central hub for connecting and controlling a wide range of devices. By leveraging the capabilities of the ESP-32, this system allows users to monitor and control their home environment from anywhere in the world using a smartphone or other internet-enabled devices.

The primary objective of this project is to enhance the quality of life by automating routine tasks and providing remote access to home appliances. This includes controlling lighting, heating, cooling, security systems, and various other appliances. The integration of IoT technology ensures that these tasks are performed efficiently and can be customized to suit individual preferences.

One of the key benefits of the proposed system is its ability to optimize energy consumption. By providing real-time monitoring and control of energy usage, homeowners can make informed decisions to reduce waste and lower utility bills. Additionally, the system enhances home security by enabling remote surveillance and alert notifications, ensuring the safety of the household.

II. Literature Survey

Majid Al Kuwari, Abdulrahman Ramadan, et. al., 2018. In order to help maintain comfortable living conditions within a home, home monitoring and automation are utilized. The standards of human's comfort in homes can be categorized into several types. Among these categories, the most significant ones are the thermal comfort, which is related to temperature and humidity, followed by the visual comfort, related to colors and light, and hygienic comfort, associated with air quality. A system can be set to monitor these parameters to help maintain them within an acceptable range. Additionally, making the house smart is to allow for intelligent automatic executing of several commands after analysing the collected data. Automation can be accomplished by using the Internet of Things (IoT). This gives the inhabitant accesses to certain data in the house and the ability to control some parameters remotely. This paper presents the complete design of an IoT based sensing and monitoring system for smart home automation. The proposed design uses the EmonCMS platform for collecting and visualizing monitored data and remote controlling of home appliances and devices. The selected platform is very flexible and user-friendly. The sensing of different variables inside the house is conducted using the NodeMCU-ESP8266 microcontroller board, which allows real time data sensing, processing and uploading/downloading to/from the EmonCMS cloud server.

“Internet of Things based Low-Cost Real-Time Home Automation and Smart Security System”, Kishore. P. T. Veeramanikandasamy, K. Sabbath and S. Veerakumar, 2017. Many people today prefer smart devices which can be controlled remotely by the Internet rather than the manual control to improve the standard of living. The home appliances are expected to fully automatic and Internets of Things (IoT) is projected to provide dramatic improvements in smart home appliances. The internet technology is growing day by day and the internet connection is accessible everywhere in the world. The IoT is going to rule the world within a few years. This paper presents an Internet of Things based real-time home automation and security system using Arduino UNO and ESP8266 Wi-Fi module which makes the system

III. IMPLEMENTATION

Existing System:

Traditional home automation systems often require complex wiring and are expensive to install and maintain. They typically rely on proprietary technologies, limiting their flexibility and compatibility with other devices. These systems are also less accessible to average consumers due to their high cost and complexity. Manual control of home appliances can be inconvenient and inefficient, leading to higher energy consumption and reduced convenience.

Proposed System:

The proposed IoT-based system integrates a DHT11 sensor to monitor temperature and humidity, with a relay to control a CPU fan, bulb, and servo motor for immediate hazard response. The NodeMCU processes the sensor data and displays it on an LCD with I2C. The data is also transmitted to an IoT server for remote monitoring and analysis. This system offers real-time monitoring, remote access, and automated responses, significantly enhancing safety and operational efficiency in homes. The system's IoT capabilities enable remote monitoring and control through a smartphone or web application. Users can check the temperature and humidity levels in their home and control the appliances remotely,

regardless of their location. This ensures a comfortable and energy- efficient home environment. The relay module acts as a switch, controlling the power supply to the appliances based on the commands from the ESP8266, controller. By integrating these components, the system provides a cost-effective, flexible, and user- friendly solution for home automation. It eliminates the need for complex wiring and reduces the dependency on proprietary technologies, making smart home technology more accessible to average consumers. The system's ability to monitor environmental conditions and control appliances based on real-time data enhances energy efficiency and convenience.

IV. Block diagram:

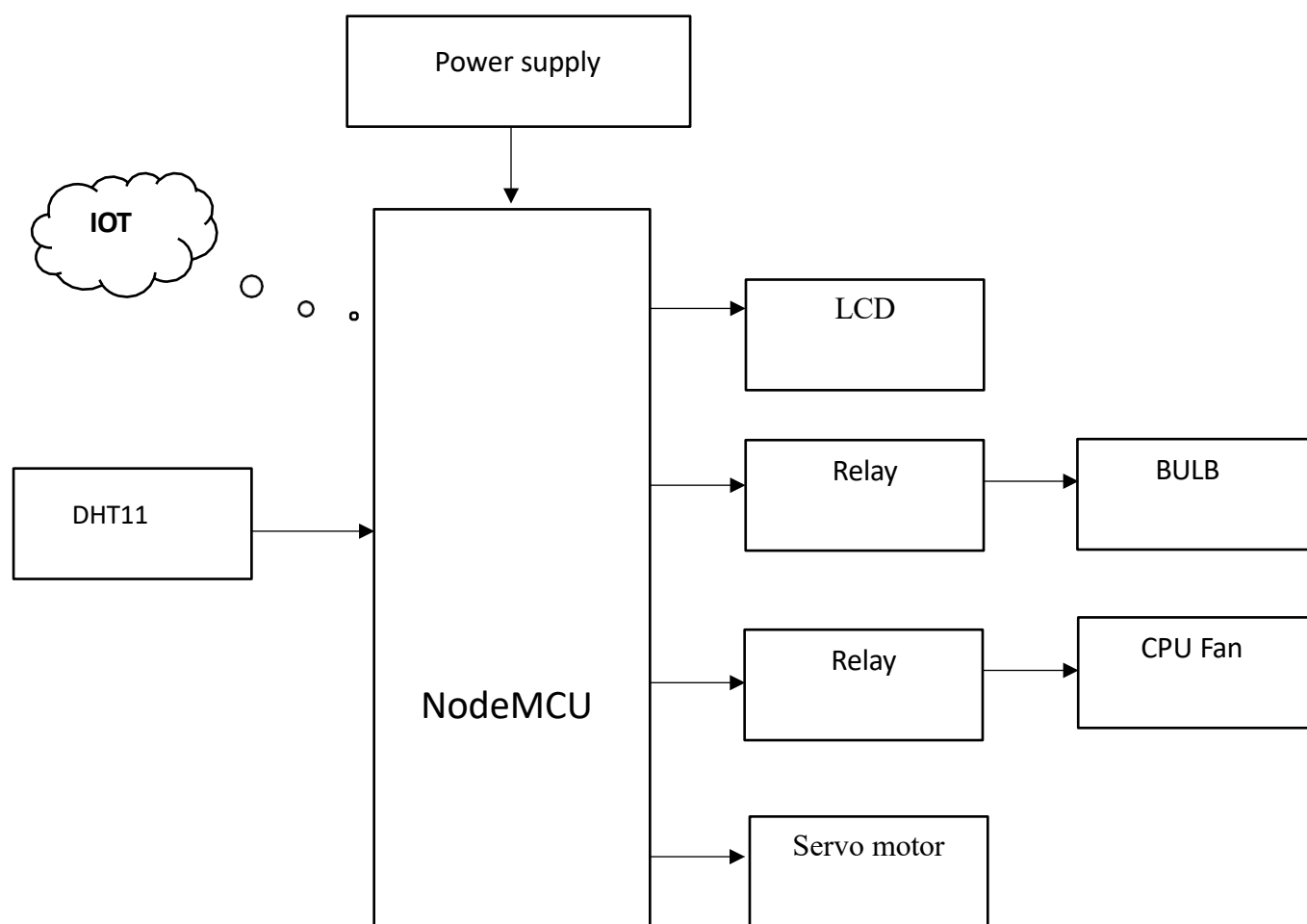
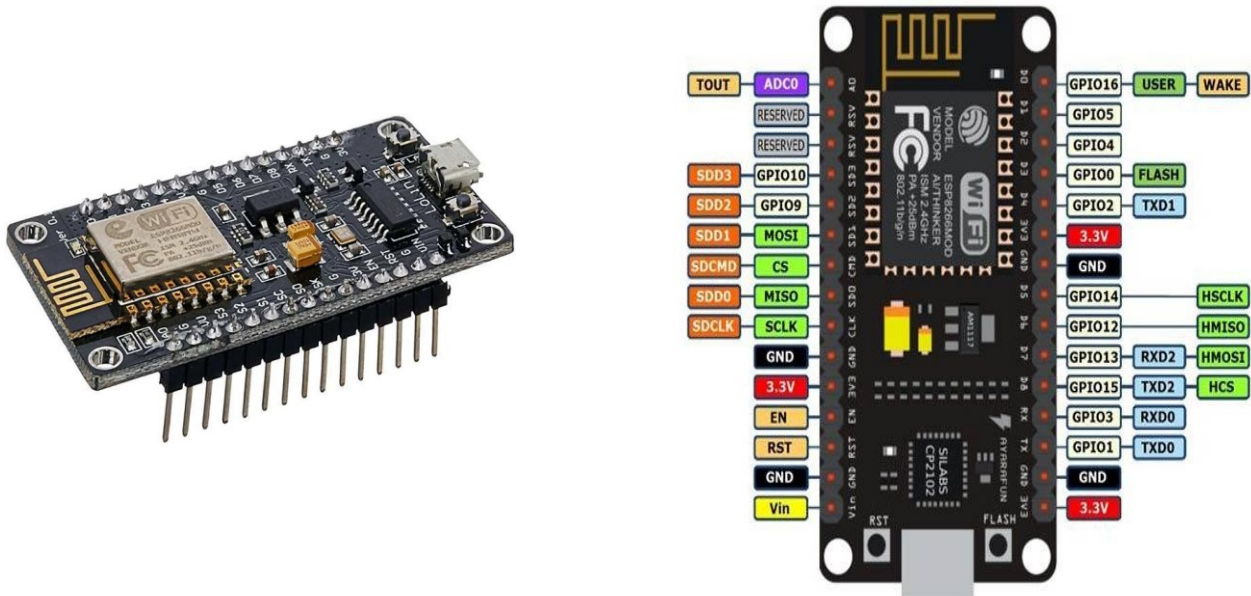


Fig3.1: block diagram for proposed system

V. Node MCU:

Technically speaking NodeMCU is a firmware for ESP8266 developed using C Programming Language, Espressif NON-OS SDK and Lua scripting language. Traditionally, we write code for our Microcontrollers like Arduino, STM32, 8051 etc., either in C or C++ and compile it with a set of tools and generate a binary file. This binary file is then uploaded into the flash memory of the microcontroller and it gets executed. Things are quite different with NodeMCU. You can consider the NodeMCU firmware as an interpreter for Lua Scripts. So, if your ESP8266 is loaded with NodeMCU Firmware, you can simply write your application in Lua and send it to the ESP8266. NodeMCU Firmware will interpret the byte code and executes the commands. There is no compilation, no binary file etc. Just write a script and run it the team which developed NodeMCU Firmware also developed a breakout board for ESP-12E module called the NodeMCU Devkit. So, many of us are actually using the board called NodeMCU and programming it with Arduino IDE and not the Lua Scripts.

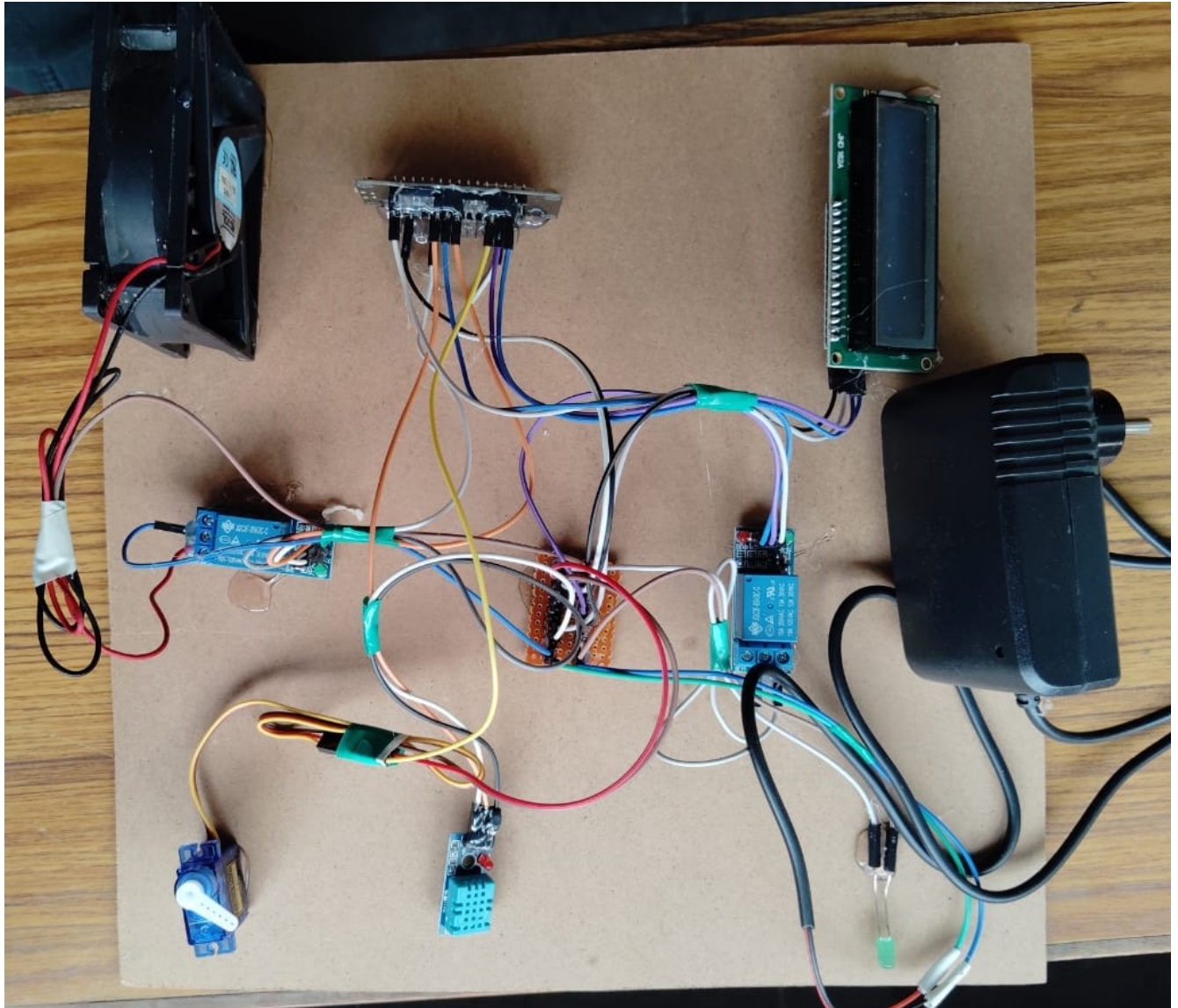
ESP8266 Wi-Fi module



ESP8266 Wi-Fi module

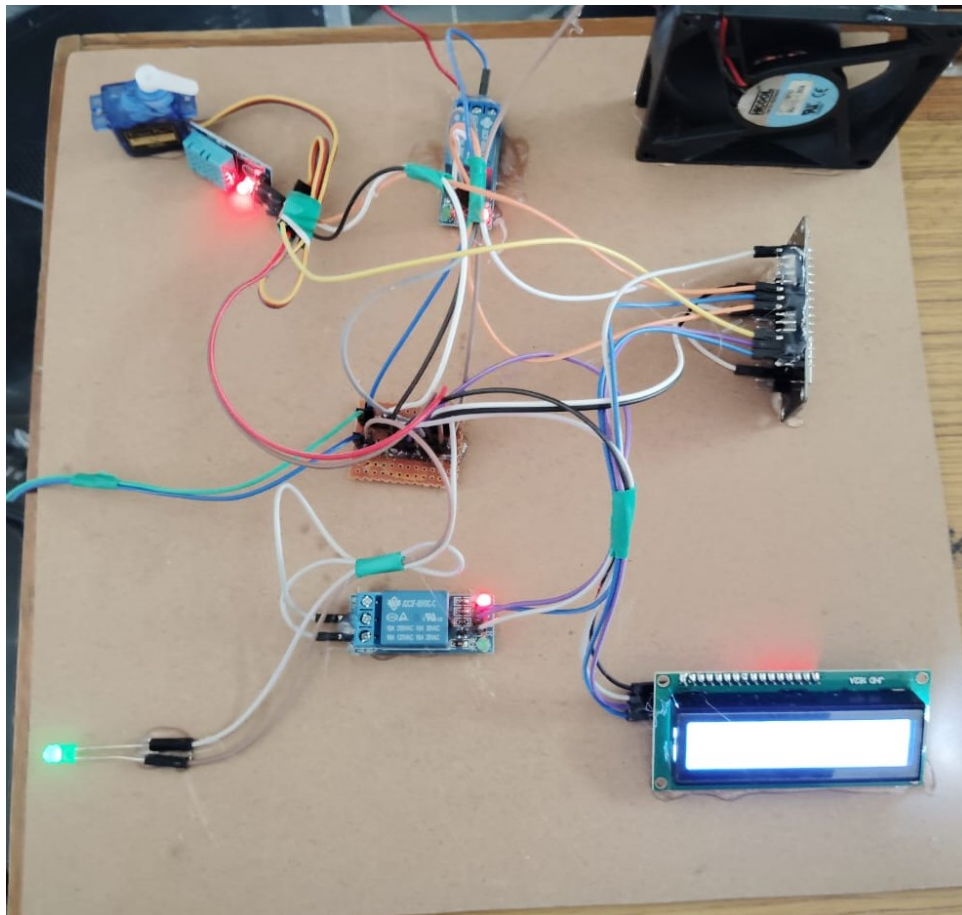
Internal circuit:

Internal Circuit: 5V Relay Module

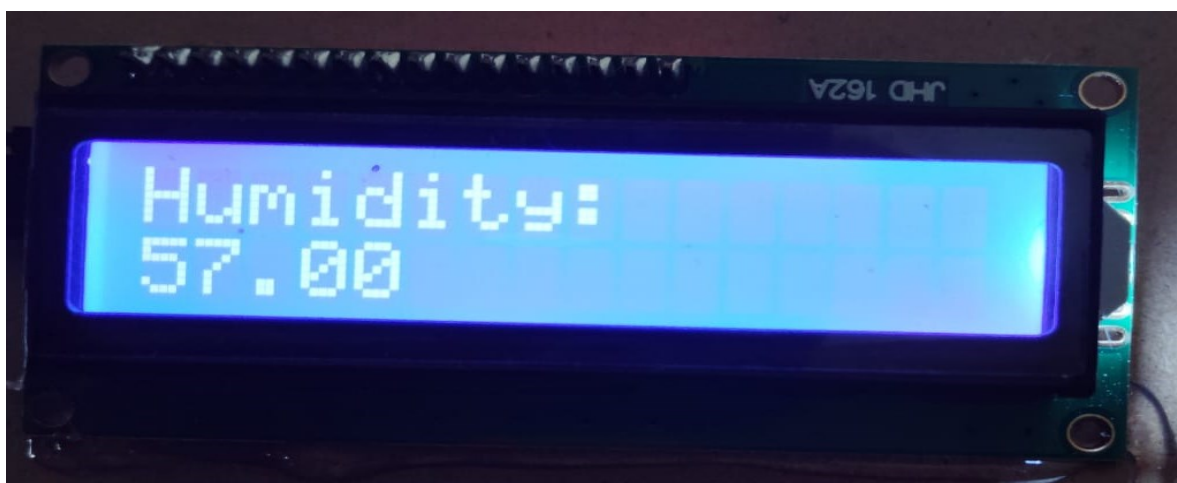


Result:

Hardware kit in off condition



Hardware Kit in ON Condition

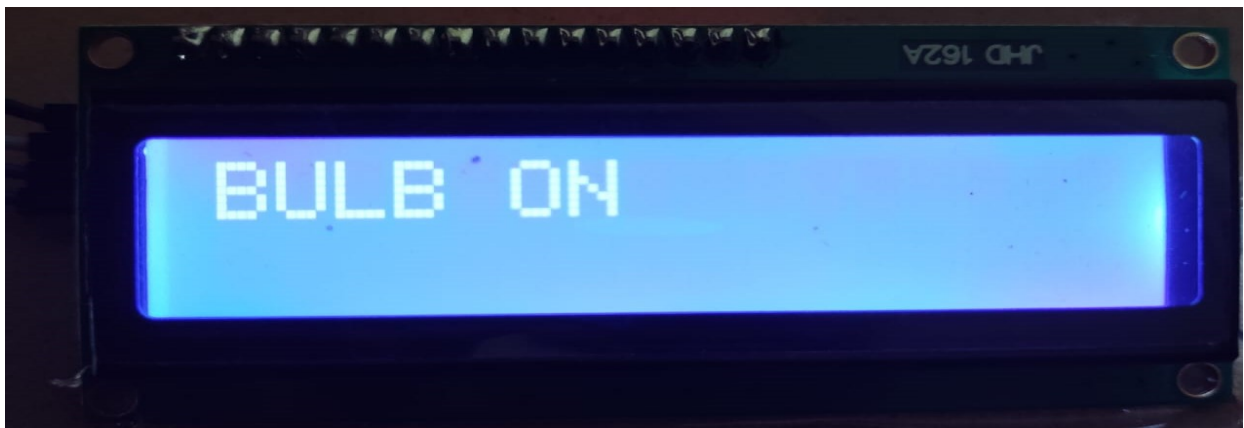
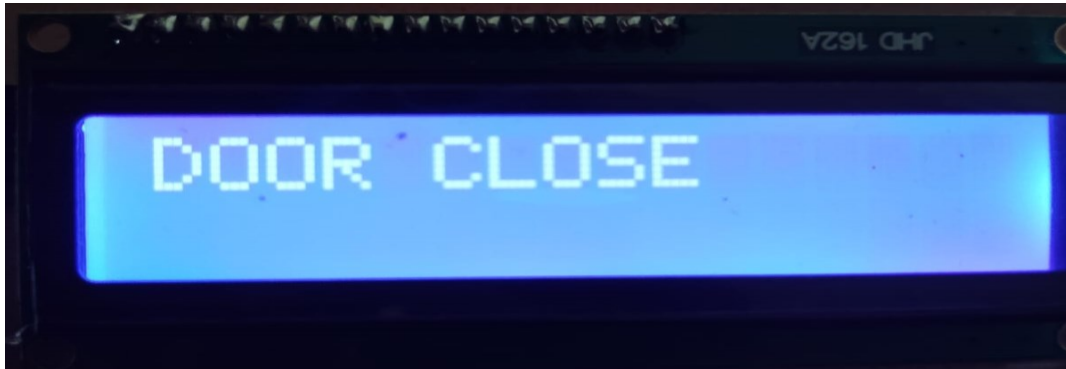


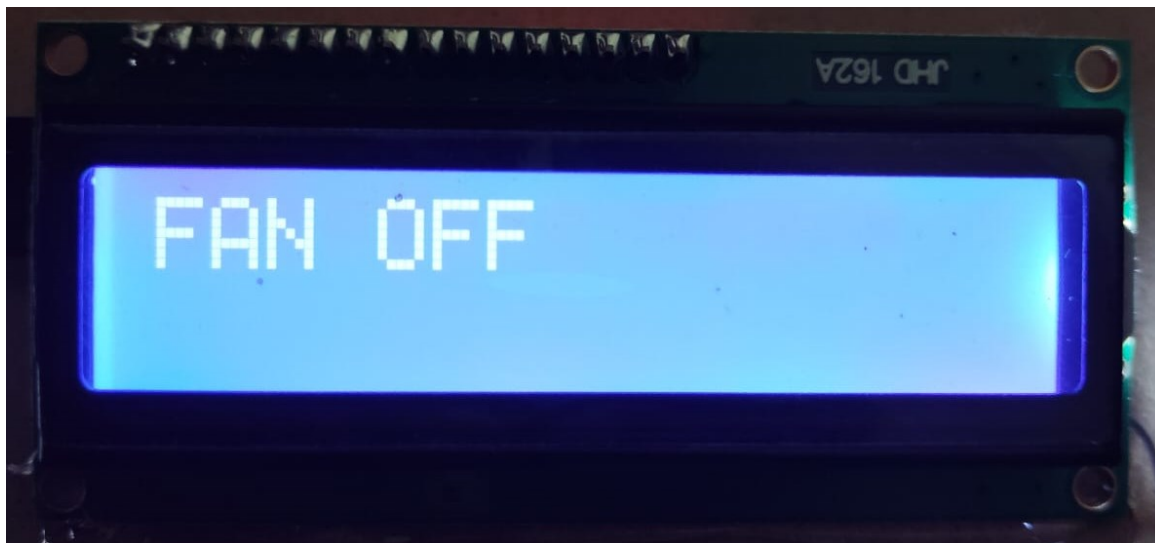
Displaying Humidity Levels



Displaying Temperature







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