IOT Based Smart Kitchen Monitoring and Automation

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Abstract — In this project, we will build an IoT Based Smart Kitchen with Automation and Monitoring System using NodeMCU ESP8266. The kitchen is one of the important places in a house. In recent days, kitchen-based accidents have increased in both commercial kitchens and domestic kitchens. People regularly go to the kitchen to cook food. But it will become a dangerous situation if there is leakage in the gas cylinder. Our aim is to reduce the risks in the kitchen using the Internet of Things. The safety factor is the main aspect that must be considered during the activity in the kitchen. The existence of gas leakage, uncontrolled fire, excessive temperatures, undetected human activity and a moist environment must be quickly identified and addressed. In order to implement this research both hardware and software will be utilized. From the hardware side gas sensor (MQ135), temperature and humidity sensor (DHT11), PIR sensor, Relay, Buzzer, LED Display, Arduino UNO, Node MCU ESP8266 microcontroller has been used. Apart from this, it is necessary to monitor and control Kitchen Appliances like lights, fridge, oven, etc remotely. Our system provides results in the form of a web application. The main motto of this project is to make a model of an IoT Based Smart Kitchen using the Internet of Things.

Keywords: ESP8266, MQ 135, DHT 11, Automation

I. INTRODUCTION

Nowadays, the Internet of Things (IoT) has fundamentally changed the way people live. IoT is a concept that enables objects around us to communicate with each other. A major goal of the Internet of Things is to automate everything around us to make life easier. IoT plays a critical role in automating electronic media work. The kitchen is one of the places where human action takes place. Safety has been an important thing for designing houses, buildings and Industries. LPG cylinder used as a Fuel in Cooking purpose in home and several areas. At the same time, gas cylinders are becoming increasingly popular but they are also extremely dangerous, causing fire accidents. Many families consider the kitchen to be an important part of their homes. The safety aspect is the most important aspect to consider during kitchen activities. In this project we are going to build an ESP8266-based smart kitchen with automation and a monitoring system using ESP-DASH. A gas leak, uncontrolled fire, extreme temperature, and inhospitable environment should be identified and addressed immediately. Additionally, lights, refrigerators, ovens, etc., must be monitored and controlled remotely.

II. LITERATURE SURVEY

This project is very useful to prevent accidents due to gas leakage. Each flame and gas detection application has its own unique safety hazards. If we implement this on Broadway, it is very successful. The main advantage of this simple gas leak detector is its simplicity and its ability to warn its stakeholders about the leakage of the Gas.

In this system, the main implementation of IoT based smart kitchen with Automation & Monitoring system is done using Node MCU and using both hardware and software. From the hardware side gas sensor, temperature sensor, humidity sensor, Servo motor, Arduino UNO, load cell Node MCU has been used. From the software side integrated Node MCU and mobile application has been used. The system provides results in the form of SMS and enables monitoring of gas leakages in the kitchen and during night conditions if gas leakage happens all of a sudden, the person may switch on the light which may lead to blast to avoid that, the main power supply will be automatically off. Monitoring the kitchen appliances like Cylinder and notify the user.

This project aims to improve the safety of kitchens by detecting the leakage of LPG, oxygen level and temperature. The user will be displayed these warnings on the LCD screen attached to the system. The system is wireless and uses GSM for communication, Arduino UNO 8is used to create the software used for the system. An MQ2 gas sensor is used in the system which will detect the gas leakage in the kitchen. The warning message will be displayed as well as sent to the user using the GSM module used. A NodeMCU ESP8266 module is at the heart of this system.

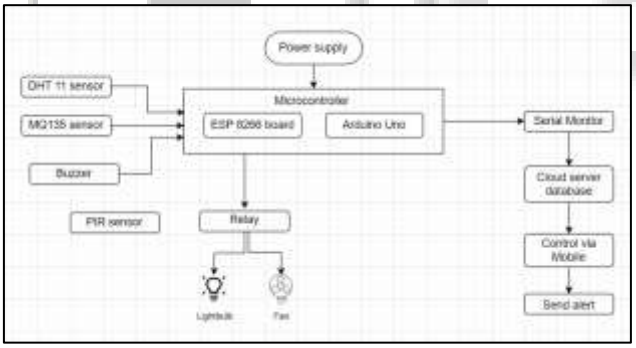
The software freely controls the operation of each intelligent equipment, to realize the automatic safety monitoring and environmental monitoring of the kitchen, realize the intelligent operation of gas equipment, automatic optimal control of energy consumption, ensure the health and comfort of the kitchen environment, and provide users with intelligent and convenient life services.

III. METHODS AND MATERIALS

A. Proposed System

Fig. 1: Proposed System Flow Diagram

B. Block diagram



IV. HARDWARE DETAILS

A. ESP 8266

ESP8266 is a system on a chip (SOC) Wi-Fi microchip for Internet of Things (IoT) applications produced by Espressif Systems.

Given its low cost, small size and adaptability with embedded devices, the ESP8266 is now used extensively across IoT devices.

The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 bgn. The module has a full TCP/IP stack and provides the ability for data processing, reads and controls of GPIOs.

B. DHT 11 sensor

DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data.

C. MQ135 sensor

MQ 135 sensor can be implemented to detect smoke, benzene, vapours, and other hazardous gasses. It can detect various harmful gasses. It can be used for air quality monitoring, noxious gas detection, home air pollution detection, industrial pollution detection, portable air pollution detection, etc.

D. PIR sensor

PIR Sensor is short for Passive Infrared Sensor that measures infrared light radiating from objects in its field of view, almost always used to detect whether a human has moved in or out of the sensor's range. They are small, inexpensive, low-power, easy to use and don't wear out.

E. Realy module

A Relay module is an electrically operated switch that can be turned on or off deciding to let current flow through or not. They are designed to be controlled with low voltages like 3.3V like the ESP32, ESP8266, etc, or 5V like your Arduino.

F. Buzzer

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, confirmation of user input such as a mouse click or keystroke etc.

G. OLED display

The OLED (Organic Light-Emitting Diode) display is an alternative for LCD display. The OLED is super-light, almost paper-thin, flexible, and produces a brighter and crisper picture.

H. Jumper wires

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit.

I. Breadboard

A breadboard is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, then to reuse the components in another circuit.

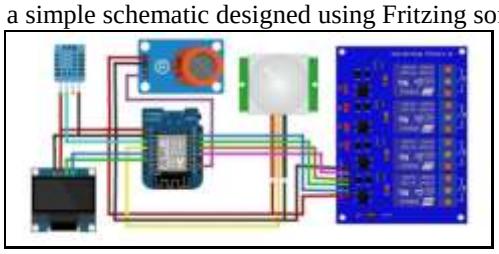
V. SYSTEM DESIGN AND CIRCUIT DIAGRAM

We will utilize the sensors like DHT11 Humidity Temperature Sensor, MQ-135 Gas Sensor, Passive Infrared Sensor to monitor the Indoor Air Quality Parameters. Similarly, a simple 5V buzzer can work as an alarming system. An automatic exhaust Fan is connected to a relay which activates automatically when the air quality level exceeds the threshold value.

Since we are using 4 channel relay, the remaining 3 relays can be connected to kitchen appliances like Mixer,

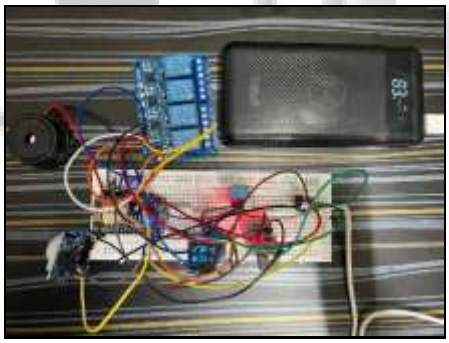
Refrigerator, Oven, Water Heater, Induction, etc. A simple 0.96″ I2C OLED can Display room temperature, humidity, and gas value live. The heart and brain of this project are the Wemos D1 Mini Board or NodeMCU ESP8266MOD Board. You can use any of the ESP8266 based boards. The ESP8266 chip connects to the WiFi Network and establishes a connection with Dash cloud server.

Here is a simple schematic designed using Fritzing software.



Use the following schematic as a reference and assemble the circuit on a breadboard. Connect the OLED Display SDA & SCL pins to Wemos D2 & D1 Pin. Similarly, connect the DHT11, MQ-135 & PIR Sensor output pin to the D4, A0 & D3 pin of Wemos. For the alarm system, you can connect the 5V active Buzzer to the D0 Pin of Wemos. For controlling the Home Appliances, we can use a 4 channel Relay Module. So using the jumper wires, connect the 4 channel relay input pin to the D5, D6, D7 & D8 of Wemos.

After uploading the code, the NodeMCU ESP8266 Board broadcasts the Wi-Fi network "IoT Smart Kitchen". Connect your Mobile/laptop to this network using the password defined in the code. After a successful connection, open the following IP address (192.168.4.1) on your preferred web browser. The ESP Dashboard will load successfully. Now, you can monitor sensor data and control appliances through this beautiful web dashboard.



Mobile UI

Desktop UI

The webserver will get new data asynchronously every 1500 milliseconds from NodeMCU. The Temperature, Humidity & Air Quality Index Data are displayed graphically. It will also show whether the Buzzer is ON or OFF as well as the presence of humans inside the room or not.

Relay 4 that connects to the exhaust fan automatically activates when the Gas level reaches the threshold value. I set the threshold value to 2000 PPM. You can set it to any desired value. You can send the command from the web dashboard to turn ON & OFF the Kitchen Appliances like Fridge, Oven & lights.

VI. Results

Based on the design and test of this system, the following conclusions can be taken:

- Based on the test, each of sensors contained in this system works well.
- All collected data can be displayed on the web and apps. In the delivery of such information, is strongly influenced by the quality of Wi-Fi networks used.
- In simulated fires and gas leaks, the fan can function properly. A warning system can work.

VII. Conclusion

In this research paper, Our Smart Kitchen Automation and Monitoring System using IOT with multiregional sensors has been designed, constructed and tested. The result obtained from the tests carried out shows that the system is capable of sending data and buzzing the alert buzzer connected to the system whenever there is heavy gas concentration at the inputs of the gas sensors. Hence this system can be used in homes and public buildings such as hotels and restaurants. Smart kitchen provides you all the automation features that includes safety features over gas leakage detection system. For this we are using a gas sensor, temperature sensor and exhaust fan. When the Air Quality Index surpasses the given normal threshold, Gas sensors are used to detect the leakage of a gas in the system and Temperature sensors are used to detect the current room temperature. After this, the buzzer connected to the system will alert and the exhaust fan connected to the system with the help of relay, will turn ON. Also, users will get the notification alert of gas leakage on the web application. It can prevent the accident and hazards. The only way to access the information is if the user is far from the home. It is a cost effective and time-consuming solution. We can use this in various applications like home automation, Hotel and Restaurants, and Hospital management.

REFERENCES

[1] David N, Chima A, Ugochukwu A, Obinna E. Design of a home automation system using arduino. International Journal of Scientific & Engineering Research. 2015 Jun;6(6):795-801.
[2] Gusmeroli S, Haller S, Harrison M, Kalaboukas K, Tomasella M, Vermesan O, Vogt H, Wouters K. Vision and challenges for realising the internet of things.
[3] Bello, O., & Zeadally, S. (2016). Intelligent device-todevice communication in the internet of things. IEEE
[4] Systems Journal, 10(3), 1172-1182.
[5] Kranz, M., Holleis, P., & Schmidt, A. (2010). Embedded interaction: Interacting with the internet of things. IEEE internet computing, 14(2), 46-53.
[6] Sourabh Jamadagni, Priyanka Sankpal, Shwetali Patil, Nikita Chougule and Shailesh Gurav," Gas Leakage and Fire Detection using Raspberry Pi", Proceedings of the Third International Conference on Computing Methodologies and Communication (ICCMC 2019) IEEE Xplore Part Number: CFP19K25-ART; ISBN: 978-1-5386-7808-4.
[7] Timothy Malche and PritiMaheshwary, "Internet of Things (IoT) for building Smart Home System" 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC).
[8] Ravi Kishore Kodali and Subbachary Yerroju, "IoT Based Smart Emergency Response System for Fire Hazards", International Conference on Applied and Theoretical Computing and Communication Technology-2017, ISBN: 978-1-5386-1144-9

