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IOT-BASED SMART KITCHEN AUTOMATION & MONITORING WITH ESP8266

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ABSTRACT

The Internet of Things (IoT) has dramatically transformed the way we interact with everyday objects, allowing for automation, remote control, and enhanced monitoring. The goal of this project is to develop a Smart Kitchen Automation and Monitoring System using the ESP8266 microcontroller. This system is designed to control and monitor various kitchen appliances, such as refrigerators, ovens, and lighting, through a smartphone application or web interface.

By integrating sensors such as temperature, humidity, and motion sensors with the ESP8266, this system can automate tasks like turning on/off appliances based on real-time data. Additionally, it provides notifications to users about the status of the appliances, energy consumption, and safety alerts, contributing to an energy-efficient and safer kitchen environment.

Through this IoT-based approach, the system can manage inventory, track food storage, and offer a more convenient and smarter way of operating kitchen appliances remotely. The project integrates a cloud platform for data storage and remote access, enabling users to control their kitchen even when they are away from home.In this project, we will build an IoT Based Smart Kitchen with Automation & Monitoring System using NodeMCU ESP8266. The kitchen is one of the important places in a house. The safety factor is the main aspect that must be taken into account during the activity in the kitchen. The existence of gas leakage, uncontrolled fire, excessive temperatures & a moist environment must be quickly identified and addressed. Apart from this, it is necessary to monitor & control Kitchen Appliances like lights, fridge, oven, etc. remotely

The main motto of this project is to make a prototype of an IoT Based Smart Kitchen using the Internet of Things. The system uses multiple sensors, relays & NodeMCU ESP8266 Board. We can monitor all the sensor data on Blynk Applications. We can also send the command from Blynk App to control Kitchen Appliances.

INTRODUCTION

The IoT-Based Smart Kitchen Automation & Monitoring system using ESP8266 is designed to enhance convenience, safety, and efficiency in modern kitchens. This system integrates smart sensors, actuators, and cloud-based monitoring to automate essential kitchen functions such as gas leak detection, temperature monitoring, and appliance control. By leveraging the power of the NodeMCU ESP8266, the system enables real-time data collection and remote operation via a mobile application.

The primary objective of this project is to create an intelligent kitchen environment that minimizes manual intervention while ensuring safety and energy efficiency. Sensors such as gas

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detectors, temperature sensors, and motion sensors continuously monitor kitchen conditions, while automated appliances operate based on predefined thresholds. Users can receive real-time notifications, control kitchen devices remotely, and ensure a safer and smarter cooking experience. This innovative approach makes kitchen management more efficient, secure, and user-friendly.

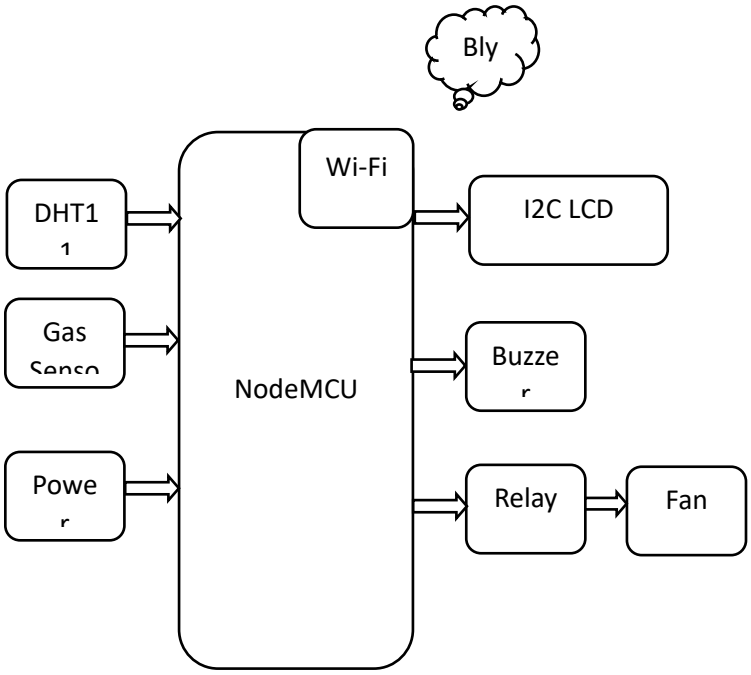

Figure.1 Block Diagram

LITERATURE SURVEY

Several studies have been conducted on the integration of IoT technology into kitchen automation. Some prominent projects involve smart refrigerators that monitor food stock levels, smart ovens that allow remote temperature control, and smart lighting systems. Research has shown that using IoT in kitchens can help reduce energy consumption, ensure better food storage, and improve the overall convenience of cooking. Popular platforms for IoT projects, such as Blynk and ThingSpeak, are commonly used for creating smart kitchen solutions. Various sensors like temperature sensors, motion detectors, and RFID-based systems have been successfully integrated to create smarter and more connected kitchen systems.

PROPOSED SYSTEM

The proposed system integrates various sensors and actuators to create a smart kitchen environment. The NodeMCU-ESP8266 microcontroller serves as the brain of the system, connecting to the internet via Wi-Fi and enabling remote monitoring and control.

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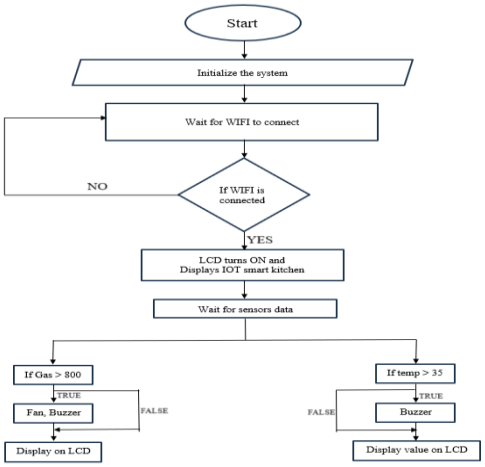

Figure.2 Flow Chart

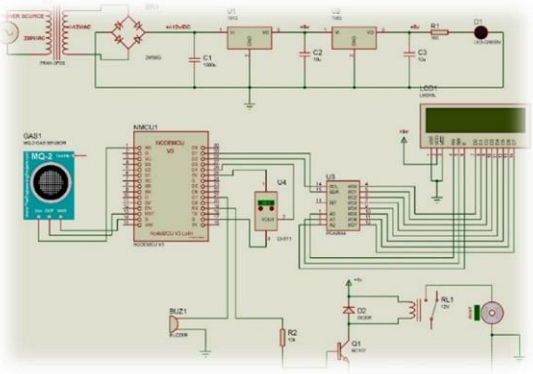

Figure.3 Schematic diagram

The IoT-Based Smart Kitchen Automation & Monitoring System is designed to enhance safety, efficiency, and convenience in modern kitchens using NodeMCU (ESP8266) as the core processing unit. The system integrates various sensors and actuators to monitor environmental conditions and automate essential kitchen functions. The DHT11 sensor is used to measure temperature and humidity, ensuring optimal kitchen conditions. A gas sensor continuously detects any gas leaks, triggering an alert system if hazardous levels are reached.

To provide real-time monitoring and control, an I2C LCD displays sensor readings, while a buzzer alerts users in case of emergencies. A relay module is used to control appliances such as exhaust fans, which automatically activate upon detecting high gas levels or excessive heat. The system is powered by a regulated power supply and can be monitored remotely through an IoT platform, allowing users to receive notifications and control devices via a mobile application. This smart automation system ensures kitchen safety, reduces energy consumption, and enhances user convenience.

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RESULTS

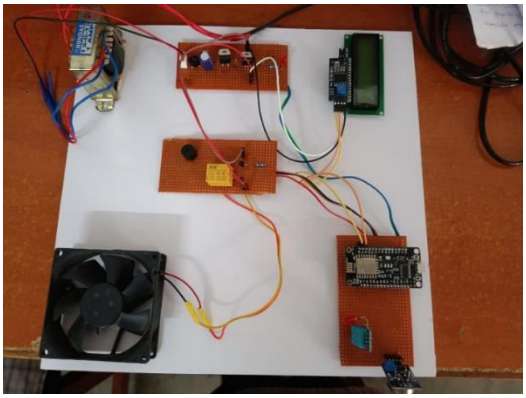

Figure.4 Hardware Working kit

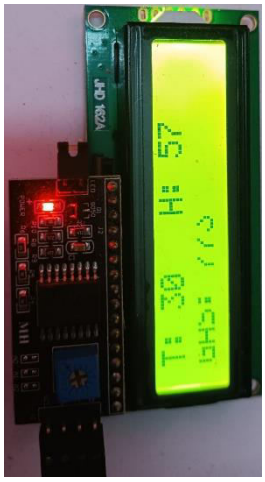

Figure.5 Display of parameters

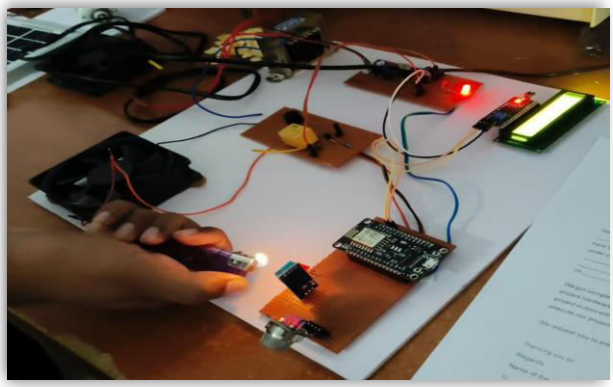

Figure.6 Fire Detection

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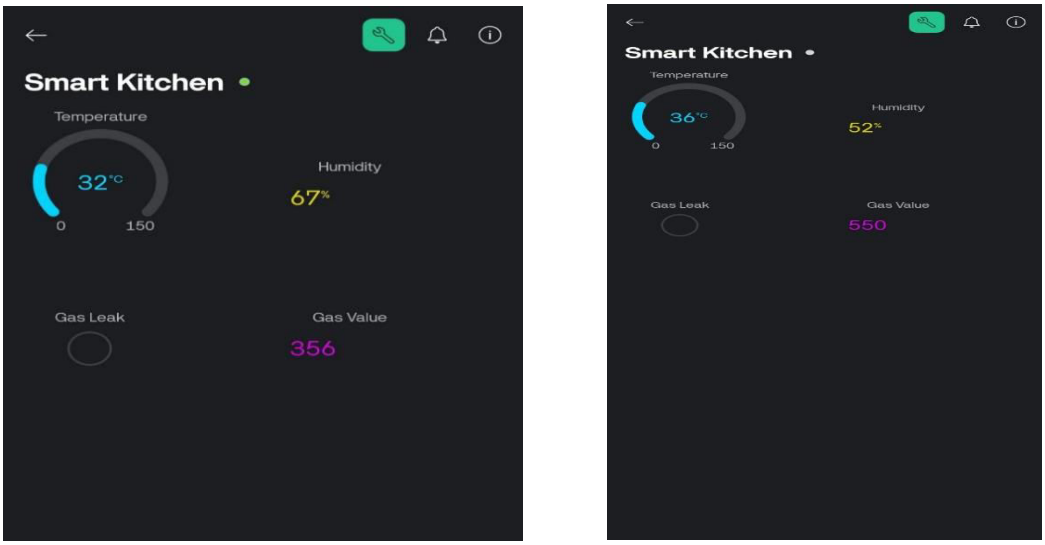

Figure.7 Result in Blynk App

The system successfully enables the remote control and monitoring of kitchen appliances. The real-time data from sensors is accurately displayed on the cloud platform and the mobile interface. Notifications are received promptly when appliances are turned on or off, or when the desired temperature is reached. The system also efficiently controls appliance power to save energy.

ADVANTAGES

- **Enhanced Safety –** Detects gas leaks and excessive heat, triggering alerts to prevent accidents.
- **Remote Monitoring –** Users can monitor kitchen conditions and control appliances from anywhere via IoT.
- **Energy Efficiency –** Automatically controls exhaust fans and appliances, reducing unnecessary power consumption.
- **User Convenience –** Provides real-time data on temperature, humidity, and gas levels, improving kitchen management.
- **Automated Control –** Eliminates manual intervention by activating appliances based on environmental conditions.

APPLICATIONS

- **Smart Homes –** Automates kitchen appliances, ensuring a safe and efficient cooking environment.
- **Restaurants & Hotels –** Monitors kitchen conditions and prevents hazards like gas leaks and overheating.
- **Industrial Kitchens –** Ensures safety in large-scale cooking environments by automating ventilation and alerts.

- **Healthcare & Elderly Care –** Helps in monitoring kitchen safety for elderly or disabled individuals.
- **IoT-Based Research & Development –** Used as a prototype for further advancements in smart home automation.

CONCLUSION

In this project, we successfully implemented an IoT-based Smart Kitchen Automation and Monitoring System using the ESP8266. The system provides remote control, real-time monitoring, and notifications for various kitchen appliances. It ensures energy efficiency and convenience, improving the overall kitchen experience.

The IoT-based Smart Kitchen Automation and Monitoring System using ESP8266 has successfully demonstrated how everyday kitchen appliances can be controlled and monitored remotely. This system enhances convenience, energy efficiency, and safety in the kitchen by providing real-time monitoring, control via a mobile app, and cloud-based storage. It is scalable, affordable, and adaptable, making it a great solution for anyone looking to integrate smart technology into their kitchen.

FUTURE SCOPE

Expand the system to include more appliances and sensors. Implement voice control for hands-free operation. Integrate advanced machine learning algorithms to predict cooking times and automate appliance usage.

In future, the open circuit fault can be detected by using a capacitor in ac circuit which measures the change in impedance and calculate the distance of fault.

- Future Enhancements
- Integration with voice assistants (e.g., Alexa, Google Assistant).
- More advanced inventory management using RFID or barcode scanning.
- Integration with smart refrigerators to automate restocking alerts.

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