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Gas Leakage with Auto ventilation and Smart Management system Using IOT

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ABSTRACT- In the evolving smart home architectures, the issue of gas spillage and fire is still remaining as a significant hindrance for designing a comprehensive, safe and sustainable kitchen model. On the other hand, security has also been significant challenge in this digital era. In urban areas, most of the kitchens are very small and it doesn't contain proper ventilation system. In such case, Spillage of gas increases the risk of fire accident, suffocation or a blast. To eradicate this challenge, smart management system viz. gas leakage detection and fire detection system should be developed. In this paper, Arduino UNO microcontroller was utilized to build a smart gas detection system with many usable sensors (MQ2, IR Fire Sensor) and actuators (air fan, buzzer). When gas spillage is recognized, the client will be intimated through SMS and at the same time they will receive notification via blynk application. The proposed system can detect fire, gas leakage and it also has the ability to take further steps and decrease gas concentration via auto air ventilation and extinguish fire with water. The proposed method will help to improve the safety and reduce the death toll and reduce the damages that occur to the surrounding environmentt.

Keywords: Arduino; alarmnotifications; gas leakage detection; fire detection; home security.

I. INTRODUCTION

Gas leaks and fires in homes result in a variety of losses and property damage. For example, flammable gas leaks, which are highly combustible, increase the risk of fire and can potentially cause impact . Sensor-based projects are becoming increasingly popular these days. When contract holders are away from home, this technology is utilised to deliver live updates regarding irritating situations. Every year, a large number of individuals are killed in fires caused by gas leaks. The most important thing is to discern between gas spills and fire . To stay safe from fire, every private home should have an alarm system. The suggested "IoT (Internet of Things)-based smart gas management system" addresses five major issues: gas spillage location, fire detection and auto ventilation, disrupting System (SMS, Notification via adaptable application), and water syphoning framework. This system uses a gas sensor, a fire sensor, and a bell, as well as a water valve, an air fan, and a GSM module for communication, all of which are controlled by an Arduino microcontroller. Clients can be notified in the event of a house fire or a gas leak. It may engage in appropriate behaviour in response to unfavourable conditions in order to prevent the loss of human life and property.

II.RELATED WORK:

Gas spillage location, fire detection and auto ventilation, disrupting System (SMS, Notification via adaptable application), and water syphoning framework. This system uses a gas sensor, a fire The suggested "IoT (Internet of Things)-based smart gas management system" addresses five major sensor, and a bell, as well as a water valve, an air fan, and a GSM module for communication, all of which are controlled by an Arduino microcontroller. Clients can be notified in the event of a house fire or a gas leak. It may engage in appropriate behaviour in response to unfavourable conditions in order to prevent the loss of human life and property. In comparison to prior studies, our system performs more precise tasks.

III.METHODOLOGY STEPS:

Gas sensor (MQ2 Sensor) and fire sensor are interfaced to the Arduino microcontroller in the suggested framework. These sensors serve as a supplement to the framework. The

LCD display can show the response of each of these sensors. The AT orders used by the GSM module are used to send SMS.This item is a fantastic development board for Internet of Things (IoT) applications (Blynk). The suggested system also includes an automatic air ventilation and water flow system.The suggested framework contains the software, hardware, and framework activity for the system. All components of the segment are discussed in detail in the subsequent subsection to help you understand the work.

System's Software:

Arduino programming language was employed in the development of this project for the entire system's functionalities . This project made use of the Arduino IDE 1.8.13 adaption.Blynk: Blynk is an Arduino-controlling phase that uses IOS and Android apps. It's a high-level dashboard where you can drag widgets to create a sensible interface for the suggested task.SIM900 GSM/GPRS library: SIM900 GSM/GPRS library functionalities are utilised in the wireless communication shield.NodeMCU: This library was used to connect to a wireless network in order to communicate with an IoT application.

Systems's Hardware:

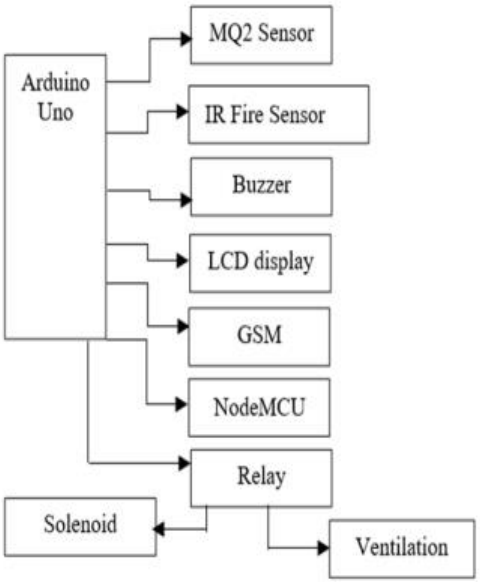

Figure 1:Components

The details information of these components are given below:

i) MQ2 Sensor:

Figure 2:MQ-2 Sensor

As a smoke sensor, MQ-2 has been used. This equipment can detect both gas and smoke, but because we employed a different gas sensor to detect gas leaks, its sole purpose in our job is to detect smoke. It outputs a digital value, although it can be used as a digital or analogue sensor. It has a +5V working voltage and a pre-heat time of roughly 20 seconds. It would sound an alert if there were a lot of smoke around.The amount of smoke can be determined by adjusting the sensitivity. The MQ-2 sensor is a four-pin sensor that connects to an Arduino UNO microcontroller. The MQ-2 sensor is connected to the Arduino Uno. Figure 2 depicts the situation.

ii) Fire/Flame Sensor:

Figure 3:IR Infrared Flame Sensor Module

The infrared (IR) fire sensor is a device that detects fire in the area where it is installed. After a zone has been engulfed in flames, the temperature of the surrounding area will rise to critical levels, with carbon-dioxide and carbon monoxide levels in the atmosphere clustering together. It can detect light sources that are between 760nm and 1100nm in wavelength. This is a better option than the DHT22 sensor or others for detecting fire. The used Arduino Uno is linked to a fire sensor.

iii) Arduino Uno:

Figure 4: Arduino UNO Board

The Arduino Uno is a free and open-source microcontroller that runs on the ATmega328P microprocessor.14 advanced I/O pins and 6 simple I/O pins are available on the board.Arduino was utilised to create the proposed system since it can connect to a variety of sources such as sensors, actuators, and modules. Because the Arduino IDE is used to programme it.

iv) Buzzer Module:

Figure 5: Buzzer Module

Figure 6 shows a buzzer, which is an auditory signalling device. An oscillator and a piezo disc make up a buzzer. The piezo component vibrates as needed to deliver the sound, while the oscillator propagates a repetition around 2-4 kHz. The buzzer has been used as a notification alert in our system.As illustrated in Figure 5, the Buzzer Module is linked to the Arduino UNO.

v) 2-Channel Relay Module:

Figure 6:Relay Module

A two-channel relay module allows the microcontroller to control high-current and high-voltage devices directly.There are four pins on the 2-channel relay module. The 2-channel relay module has been used for some important applications in this system. As seen in Figure 6, it is connected to an Arduino Uno.

a) To clear the smoke and spilt gas with an auto ventilation fan.

Figure 7:Ventilation Fan

In figure 7 shows a gadget of ventilation fan, which used to pull out the smoke and gas from kitchen to open-air of the kitchen.

b) To work a solenoid valve to distinguish fire through water flow utilizing a water tank.

Figure 8: Solenoid Valve

Figure 8 shows a solenoid valve that is operated by a switch and is an electromagnetic valve.The water tank is connected to this valve. When the right force is applied to the valve, it will open and stream water to extinguish the fire.

vi) LCD Display:

Figure 9:LCD Display

The utilization of LCD display is to show the output (response of various sensors) of the project [1]. Being shown in figure 9.

vii) NodeMCU:

This item is a fantastic development board for Internet of Things (IoT) applications. It has an ESP8266 chip integrated in. It's a free and open source operating system. It has a 3.3V working voltage. The input voltage ranges from 7 to 12 volts. Its ability to participate in IoT

initiatives is aided by its mall-like scale. It's utilised in a variety of network projects, IoT prototyping, and low-power battery-operated applications, as well as projects that require several I/O interfaces with Wi-Fi or Bluetooth functionality. We used it for the most recent reason. By connecting Wi-Fi to the database, we were able to upload the value. Simply put, we have our data online as a result of it. Figure 10 is a representation of the board.

Figure 10:Node MCU

viii) SIM900A GSM Module:

Figure 11: SIM900A GSM Module

Figure 11 depicts the SIM900A GSM Module, which is a shield device for wireless communication. In this work, a GSM module is connected to an Arduino UNO, which is capable of connecting to the Internet via a portable information organisation. It can communicate with regulators using AT orders. It can have a SIM inserted in it, allowing it to do things like make phone calls and send SMS . The module has been used to send SMS in this framework.

C. Conceptual Diagram:

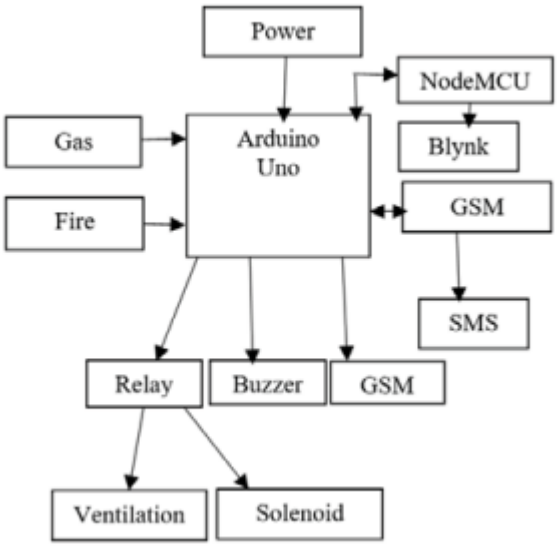

Figure 11: Conceptual Diagram For The Proposed System

D. System Flow Chart:

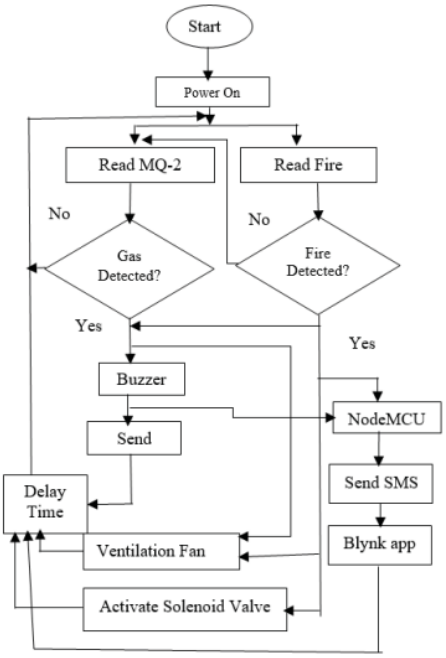

Figure 13: Flow Chart For The Proposed System

IV. RESULT AND DISCUSSION:

Figure 14 shows a test setup of the suggested framework.

The findings of all sensors are shown on an LCD monitor. SMS and notifications will be delivered via GSM Module and Blynk application if a gas leak or fire is detected. The buzzer starts beeping at the same time.

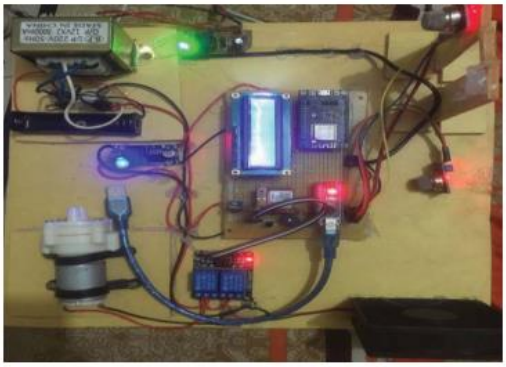

Figure 14: Experimental Setup For Proposed System

Blynk application for both platform iOS and android. This is an open source platform.

Figure 15. Notification Alert on Detection of Gas Leakage and Fire

V. CONCLUSION AND FUTURE WORK:

A gas leakage detection and smart management system based on Arduino has been proposed in this study. The goal of this plan is to assist persons who are unconscious, as well as to lessen the risk of fire mortality and infrastructure damage. The suggested system includes gas detection and fire detection capabilities. If the system detects a gas fire, it will send an SMS to the homeowner and turn on the buzzer. The suggested system has two major features: auto ventilation and water flow via solenoid valve. The proposed technique is extremely beneficial in preventing the spread of fire. In this way, the main cause of harm is gas spillage, which can be mitigated by using IoT-based smart gas systems. Our system meets its requirements, however we'd like to add a few extra features.In the future, I'd like to make the assignment more convenient. We will incorporate a real-time camera sensor to provide infrastructure situations.

VI. ACKNOWLEDGMENT:

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