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L-Leakage Detection and Prevention of its Threats Using IoT in Smart Home Automation Systems

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***Abstract*: These days' gas spillage and gas identification is a significant issue in our day by day lives. Additionally, gas wastage is a significant issue that should be countered. LPG gas is exceptionally combustible and can dispense harm to life and property. To maintain a strategic distance from such circumstances, an extensive measure of exertion has been given to the improvement of dependable systems for recognizing gas spillage. As thinking about the presence of a break isn't in every case enough to dispatch a remedial action, some of the break location procedures were intended to permit the chance of finding the hole. Our point is to decrease the dangers in Kitchen utilizing Internet of Things. The primary point is to propose the structure and development of a wi-fi based Gas Leakage Alert System. Gas sensor are utilized to distinguish gas spillages in a kitchen with the assistance of the controller Arduino Mega (ATmega2560), with the assistance of an infrared sensor the issue of gas wastage is additionally observed. A caution goes off at whatever point the sensor doesn't distinguish any vessel over the burner past a specific timespan.**

***Keywords*: Arduino Mega, GPS, GSM, IoT module.**

1. Introduction

The LPG gas is highly ignitable and can inflict damage to life and property. Our main aim is to construct the wireless fidelity based gas outflow alert system. Gas detector area units won't notice gas leakages in an exceedingly room with the assistance of the controller Arduino Mega (ATmega2560), when the gas leakage detected the evacuation starts. At the moment any fire exists in the surrounding the servo motor generates the fire extinguisher and this action clear the chance of an accident situation.

The entire system function can be displayed in the LCD display and can be controlled by the IoT. These data can be stored in the cloud. With the help of an IR sensor detector the problem of gas wastage is additionally monitored. An alarm explodes whenever the detector doesn't notice any vessel over the burner on the far side for a selected period of time.

2. Literature survey

[1], [4] describes the property of gas sensor to detect LPG and natural gas sense at the low level. The system automatically closes the knob after it detect the gas leakage is represented in [2], [9]. [5] describes the detection based on the ambient temperature and humidity condition. [8] indicates the generation of sound alert using buzzer. [8], [9] refers the wi-fi module will send SMS using the cloud to the user. [9] refers the exhaust fan will fan out all enclosed gas from the environment. The relay will cut off the main power supply within 2 to 4 seconds.

3. Proposed work

In this system, Arduino Uno (ATmega328P) microcontroller are used, which acts as brain of the system, because the entire system program instruction stored in it. Gas, temperature and humidity sensor are used to monitor the leakage status of gas. The detection of gas result of power off the all power supply of system along with immediate evacuation take place by using DC fan. Here, IR sensor is used to detect the vessel at gas top.

The fire sensor used to detect the fire so that the servo motor Implement the fire extinguisher, following action clear the chance accident situation. Once the fire detected means the location get by GPS is sent to the fire station through GSM, All the operation as well as the entire system function status can be displayed in LCD and monitored and control by IOT.

A. Gas leakage detection

The main function of this module is to detect the gas leakage in the kitchen. It consists of the Arduino Mega microcontroller, gas sensor, DC fan, LED, Buzzer. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, and turn it into an output - activating a motor, turning on an LED, publishing something on the cloud. Arduino act as the heart of the entire system. It consists of an ATMEL 8 bit AVR microcontroller with varying amount of flash memory, pins and features. The gas detection is done by using a gas sensor that is sensitive to LPG, natural gas and other gases such as CO and H2. It is made up of Tin dioxide(Sno2). The gas sensor detects the small change in the concentration of the gas. The Power supply can be noticed with the help of LED. The Light Emitting Diode is forward biased

PN junction Diode. It makes the complete atom more stable and it gives a little burst of energy in the photon of light, when the whole action takes place the buzzer starts the function and intimate the gas is detected in the room. The kitchen exhaust fan can be a vitally important part of our kitchen. The kitchen exhaust fans are extremely effective when it comes to the extraction of air and any possible pollution or other substance that may be present. Some exhaust fans employ sensors that allow them to automatically activate when they send the gas that streams in the room.

B. Fire detection and evacuation

The fire sensor is designed to detect the fire. The fire sensor consists of sounding an alarm, deactivating a fuel line (such as propane or natural gas) and activating a fire suppression system. When the fire burns it emits a small amount of Infrared light that will be received by the photodiode on the sensor module. Arduino Mega checks the logic level on the output pin of the sensor and perform further task such as activating the buzzer and LED sending an alert message. The fire sensor circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity. When the fire detected the fire extinguisher starts its function. A fire extinguisher is an active fire protection device used to control small fire often in an emergency situation. A fire extinguisher consists of hand held cylindrical pressure vessel containing an agent that can be discharge to extinguish a fire. In stored pressure units, expellant is stored in the same chamber as the fire sighting agent itself. Depending on the agent used, different propellants are used. With dry chemical extinguisher, nitrogen is typically is used; Water and Foam extinguisher typically used in air; When the fire detected the buzzer starts its action to intimate the message to the user.

C. Infrared sensor detection

An Infrared sensor is an electronic device that emits in order to aspects of its surrounding. An Infrared sensor can measure the heat of the object as well as detects the motion. A passive an infrared sensor is an electronic sensor that measures infrared light radiating from object in it field of view. The PIR sensor is commonly used in security alarm and automatic lighting applications. A Servo motor is an electrical device which can push or rotate an object with great precision. It rotates the objects from some specific angles or distance. It is just made up of simple motor. which run through a servo mechanism.

A servo consists of a motor(DC(or)AC), a potentiometer, gear assembling and a controlling circuits connected to the output shaft. The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor. It is a closed loop system where it uses a positive feedback system to control motion and positive position of the shaft. Here the device is controlled by the feedback signal generated by comparing output signal and reference input signal. The servomotor is used in Robotics, RC helicopters, planes and automatic door open.

D. Communication module

Global System for Mobile Communication is a mobile communication modem. GSM is an open cellular technology used for transmitting mobile voice and data services. GSM digitizer compresses the data, then sends it down a channel with two other stream of user data, each in its own time slots. GSM was developed using digital technology. It has an ability to carry 64kbps to 120mbps of data rates. GSM operates in the bands 850MHZ and 1900MHZ.DHT 11 is low cost digital sensor for sensing temperature and humidity.

This sensor can be easily interfaced with a microcontroller such as Arduino, Raspberry pi, etc., to measure humidity and temperature instantaneously. By using the exclusive digital signal acquisition technique, humidity and temperature sensing technology it ensures high reliability and long term stability. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration.

An IoT module is a small electronic device embedded in objects, machines and things that connects to the wireless networks to send and receive datas. In the industry of IoT, wireless technology plays a significant role. Any device can be connected to the internet through any wireless technologies like wi-fi, bluetooth. ESP8266EX is often integrated with external sensor and other applications specific devices through its GPIos; codes for such applications can be provided as examples in the SDK.ESP8266 itself is a self-combined wi-fi network solution offering as a bridge from existing micro controller to wi-fi and is also capable of running self-contained applications.

LCD screen is an electronic display module and find a wide range of application. A 16*2 LCD display is very basic module and it is commonly used in various devices and circuits. The data is the ASCII value of the character to be displayed on the LCD. The LCD technology works by blocking light. GPS, is the satellite navigation system used to determine the group position of the object. The GPS receiver gets the signal from the satellite. The satellite transmits the exact time; the signal is send. Many GPS receivers can relay position data to a PC using NIM protocol.

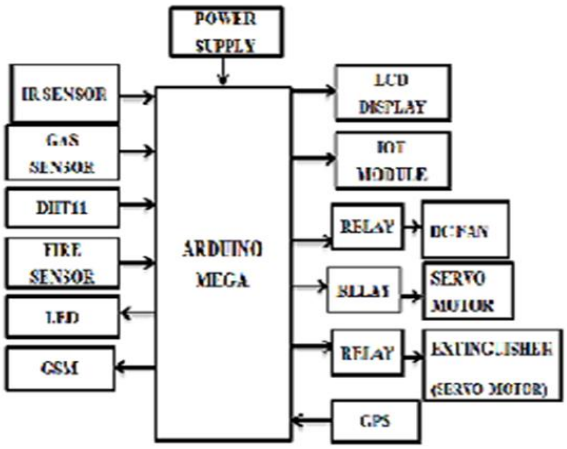

Fig. 1. Block diagram

4. Conclusion

This paper presents an overview on L-leakage detection and prevention of its threats using IoT in smart home automation systems.

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