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An Implementation of Iot Based Electrical Device Surveillance and Control using Sensor System

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Abstract: ***IoT (Internet of Things) is expanding its market share and opening up new avenues for innovation with each improvement in Internet speed & Bandwidth. According to data compiled by the Prevention Council while the Environmental Protection Association, the average mortality toll from fire is 10.5% and from petrol is 11%. This research endeavour addresses the issue of electrical appliance safety. IoT-based control system with gas, fire and temperature sensors; lcd(16x2) displays system status and sensor data. In this setup, loads are managed mechanically based on sensor readings. The Internet of Things (IoT) can store and track this information. The system provides safety against toxic gas and fire hazards. Wi-Fi networks with IEEE 802.11 wireless standards are ideal for homes and offices with little space. The primary goal of this project is to ensure the safety of the building in which this design is implemented; for example, if a fire is detected by a fire sensor, a motor pump will be triggered to disperse water as part of a sprinkler system, and if a gas sensor detects harmful gases, an exhaust dc fan will rotate to vent the area. The temperature sensor will monitor the interior temperature and activate the exhaust fan if the temperature rises beyond the set limit. All of the sensor data and the status of each linked function will be shown on an LCD, and a buzzer will sound a warning. Proteus, a professional design suite, version 8.6, may be used to simulate this proposed safety solution, and Arduino IDE, version 1.8.19, can be used to write the necessary code. A working prototype is built and put through its paces as an experiment.***

Keywords: Arduino, Power Supply, Fire Sensor, DC Fan, Buzzer.

1. INTRODUCTION

In order to keep tabs on and regulate household appliances, researchers have developed a sensor-based Internet of Things (IoT) based electrical equipment monitoring and control system. The annual mortality toll from fires and gas leaks continues to rise steadily. The goal

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of this project is to improve upon the status quo for controlling and monitoring electrical devices by incorporating IoT technologies.

In order to keep an eye out for any dangers or abnormalities, this project makes use of sensors including fire detectors, MQ-4 gas detectors, and DHT11 thermometers. The Arduino Uno may be designed to run the control functions automatically depending on sensor data. The information gathered by those devices is sent securely to an online platform that may be viewed through a computer or mobile device. When abnormal readings or potentially hazardous situations are found, the platform examines the device's data and provides a notification.

The Arduino Uno is a board with a microcontroller that may be used to connect to and control external sensors and devices through software. The Arduino Uno serves as the project's central controller, reading sensor data and directing gadgets according to user inputs.

Using a Wi-Fi module like the ESP-01, the user may link an Arduino Uno to the internet and have access to the IoT platform. The ESP-01 may be set up for serial communication with the Arduino Uno.

The presence of fire may be detected with the help of the Fire/Flame sensor. Using a light source and a light sensor, it detects the presence of particles in the air using the concept of photoelectric detection, phototransistor. The existence of fire may be detected by connecting the fire sensor to an Arduino Uno.

The submersible pump may be managed with the L293D motor driver. One typical IC used to regulate the tempo and direction of the tiny submersible motor pump is the L293D motor driver. The Arduino Uno may be linked to the motor driver.

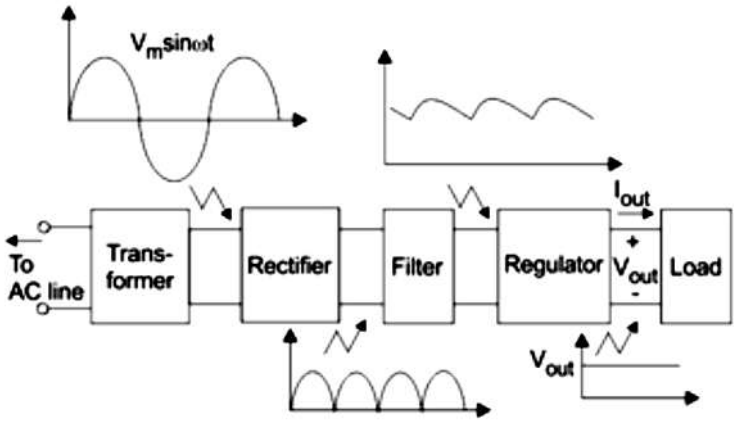
System Components

A. Power Supply:

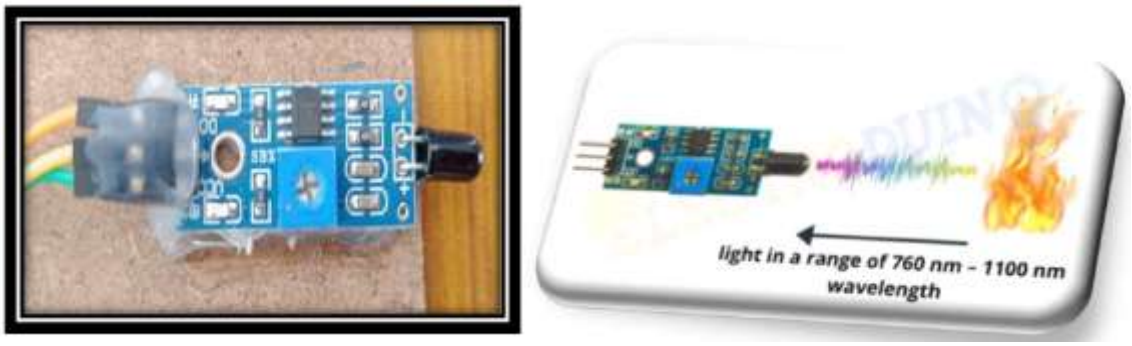
The purpose of these power supplies is to reduce the voltage of the AC mains energy so that it may be used by electronic circuits as well as other devices. Each component of a power supply serves a specific purpose and may be analysed independently. The regulated electrical supply takes in alternating current and outputs a stable direct current. See an example of a typical regulating DC power supply's block diagram in the image below.

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B. Fire/Flame Sensor Module:



A flame sensor's reaction is typically employed as a fire alarm since it is extremely sensitive to common lighting conditions. This module is capable of identifying a flame or other light source between 760 and 1100 nanometers in wavelength. The IO port of a microcomputer can be directly linked to a small plate export interface or a single-chip device. To prevent the sensor from being damaged by the flame's heat, there is a safe space that must be maintained between the two. If the flame is larger than 80 cm, try it at a further distance. The flame spectrum is highly sensitive because of the 60-degree detection angle.

C. MQ4 Alcohol Gas Sensor Module:



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Methane, propane, butane, alcohol, and natural gas may all be detected with the use of the MQ4 gas sensor, which is a sort of gas detection sensor. It's a compact module with rapid reaction and great sensitivity for detecting gases in the atmosphere. The MQ4 gas sensor is based on the properties of the semiconductor tin dioxide (SnO2), which has a strong affinity for hydrocarbon gases. The MQ4 sensor detects the presence of gas by measuring the change in conductivity of the Tin Dioxide (SnO2) semiconductor when exposed to the gas.

D. Dht11 (Digital Humidity and Temperature) Sensor Module:



The DHT11 sensor module has been utilised in this project. The DHT11 moisture sensor module is a combination module for detecting temperature and humidity while providing a regulated digital output signal. This component contains a temperature and humidity complex. The DHT11 is a digital sensor that measures both temperature and humidity and can be purchased for relatively little money. In one convenient box, you'll find both a capacitive humidity gauge and a temperature-measuring thermistor.

E. ESP 8266:

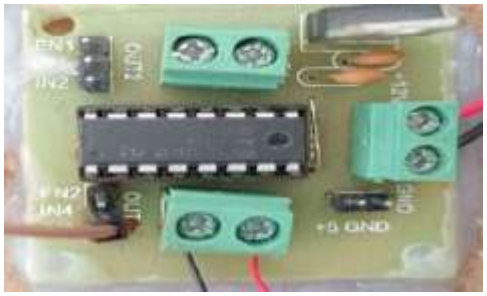


Dramatic Solutions in Shanghai, China produces the ESP8266, a low-cost Wi-Fi microprocessor with a full TCP/IP stack with microcontroller functionality. In August of 2014, the ESP-01 unit by Ai-Thinker, a third-party vendor, brought the chip to the notice of US manufacturers. With this little module, microcontrollers may establish TCP/IP connections across a wireless network with the use of standard Hayes-style instructions. At initially, however, very little information was available in English about the chip & the orders it could understand. Many hackers were drawn to the module, chip, and software, as well as the translation of the Chinese records, because to its low cost with the fact so it had very few outside parts on it, indicating that it may someday be extremely affordable in bulk.

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F. L293d Motor Driver Ic:



Quad high-current half-H drivers, like the L293 and L293D, are available. The L293 can deliver 1 A of driving current in each direction at voltages between 4.5 V and 36 V. The L293D can supply driving current of up to 600 mA in either direction, at voltages ranging from 4.5 V to 36 V. Both components are optimised for positive-supply applications that require driving inductive loads like relays, solenoids, dc and bipolar stepping motors, and other high-current/high-voltage loads. Each of the inputs is a standard TTL type. A Darlington transistor sink and a pseudo-Darlington transistor source make up a full totem-pole driving circuit at each output.

G. Arduino:



The Arduino Uno is the most widely used board in the Arduino family. When people talk about an Arduino, they usually mean this board. The Uno is a wonderful option for those just getting started with Arduino. There have been several iterations of the Arduino Uno, and we've included information about the most recent one (Rev3 or R3) below. The Arduino Uno is an ATmega328-based microcontroller board. It is equipped with a reset button, a USB port, a power connector, an ICSP header, and 14 digital I/O pins (6 of which may be utilised as PWM outputs).

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H. Submersible Pump:



In general, submersible pumps must be completely immersed in the liquid they are pumping. Submersible pumps are typically used for flood drainage, sewage pumping, emptying ponds, and even as pond filters since they are situated within the water reservoir that has to be pumped out. This article will focus on the inner workings of a specific type of submersible water pump called a micro submersible pump. Mini submersible pumps are quieter, smaller, more energy efficient, and less bulky alternatives to traditional submersible water pumps. Mini submersible water pumps have many practical uses throughout the house, including in the kitchen, bathroom, laundry room, greenhouse and elsewhere.

I. Exhaust Dc Fan:



A direct current (DC) fan is a type of fan used to vent hot air and other gases from a building. It functions by forcing air to go in one direction, where cool air is drawn in and heated air is forced out. Overheating may be avoided and cooling is provided by the exhaust DC fan. The fan runs on DC electricity and may be managed in a number of ways, such as by changing the voltage or the speed, or by utilising temperature or other sensors.

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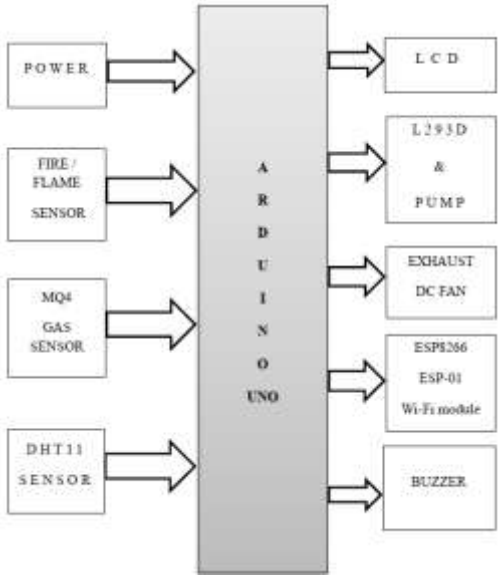
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J. Buzzer:



Mechanical, electromechanical, or electrical systems can all produce audible signals known as buzzers or beepers. Alarms, schedules, & verification of actions like mouse clicks and keystrokes are just some of the common applications for buzzers and beepers.

Proposed System:



An automatic safety system that can detect gas leaks and fire, regulate temperature, and inform the user with visual and audio signs is suggested for this project. Gas sensors, flame sensors, temperature sensors, L293d motor driver, water pump, exhaust fan, buzzer and an LCD display are just some of the parts that make up the system. Both gas and fire can be detected by the sensors. The sensors report back to the Arduino Uno board when they detect gas or burning. The user is then notified by a buzzer and an LCD display, both of which are activated by the Arduino Uno board. In addition, a DHT11 temperature sensor is incorporated into the system for continuous monitoring. The Arduino Uno board triggers the exhaust fan if the temperature rises over a predefined limit. When the temperature is under the setpoint, the fan does not turn on. A submersible water pump is also used by the system to extinguish any fires it detects. The L293D motor driver powers the submersible water pump, which is intended to douse flames in the event of an emergency. The exhaust DC fan is activated in the event of a gas leak to aid in dispersing the gas and bringing the concentration down to a safe level.

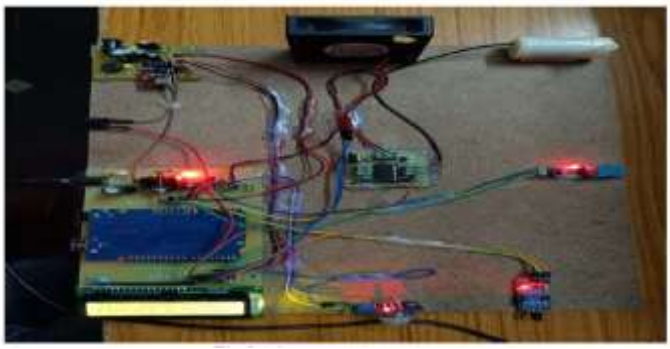
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2. RESULTS





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3. CONCLUSION

With the use of sensors, the Internet of Things-based electrical device surveillance and control project can give early warning and control mechanisms for possible fire and gas-related problems. To provide an intelligent and programmed solution to recognise and from controlling the dangerous circumstances caused by temperature, gas, and fire, the system is able to detect harmful gases, flame/fire, and also temperature changes, and it can automatically trigger safety devices such as a submersible pump, exhaust fan, and buzzer to minimise the risk of damage and injury. Improved security, conformity with safety rules, safety for assets and investments, enhanced indoor air quality, heightened comfort, decreased insurance rates, and so on are only some of the benefits of putting this plan into action.

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