

Industry Specific- Intelligent Fire Management System

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ABSTRACT:

Safety is significant in these days and ages and it is vital that acceptable wellbeing framework be executed in spots of Structural Health Monitoring of structures. This system is used in building and home dwellings for the fire detection and prevention purpose. And it should be implemented in all the establishments where the risk of fire accidents is very high. The sensor nodes are placed in important areas of the building, which we create a network and the monitored data is transmitted to control unit through wireless sensor network and if the temperature or pressure reach above the threshold value and building damage is detected automatically, alerts the surroundings and take necessary precautions to prevent the disaster. This safety system that can be used in any Constructing and constructed environments. The sensor nodes detects the maximum level that it can withhold, in the meantime it calculates where the damage is occurring and remaining time that the building can offer further resistance to damage.

INTRODUCTION:

Internet of things can be anything in the world that is actually connected to the internet so if a person at this moment is reading a book or some article from a mobile phone or laptop it will definitely be connected to the internet. IOT simply means gathering or collecting everything in our world to basically connect all things to the internet. The concept of IOT is all about the internet and how power extends it in the specific area beyond the mobile phones and computers to contain an entire group of things, environments and processes. All connected things are then being used to make a group of information or sending information or it can be for both processes. The internet of things is predicted to provide businesses and people with better visibility and has the power to control 99% of environments and available objects that are at this time out of reach of the internet. So therefore, IOT makes opportunities for people and businesses to be attached with the outside world even more than before, which will allow them to achieve more meaningful work at higher levels.

OBJECTIVE:

This is an IOT-based fire management system. It can be monitored from anywhere with its status update like gas level, temperature, and also to check if there is any presence of fire. Customer Satisfaction is the main objective which makes them feel comfortable and safe to work or stay in that place. No need to panic, all emergency steps will be taken automatically like sprinkler turn On, ventilation fan turn On and alert message will be sent automatically. It replaces the normal fire alarm system because it has live track data and the record maintenance of the surrounding atmosphere of that place. This helps for future reference. Easy to convey the fire accident message to the fire station so that loss of life is reduced. In future, any update in the software and hardware can be implemented for better performance and accuracy in the fire detection level.

PROBLEM FORMULATION:

Nowadays the fire management system is a fire alarm system which is pretty much used in several areas, but this fire alarm makes people panic at the time of emergency. So we need a smart fire management system to predict the chance of fire accidents occurring and also to inform the fire station and control room if any fire accident has occurred. Mainly to reduce the chance of fire accidents occurring. This fire management system has multiple sensors like temperature, gas, and flame sensors and also has a ventilation fan and water sprinkler. The data collected from the sensor is processed by using the microcontroller to enable the fan if flammable gas is present and the sprinkler will be enabled if any fire and large heat is detected by the flame and temperature sensors. This collected data from the sensors is sent to the cloud using the Wi-Fi connected to the microcontroller. From the cloud an alert message is sent to the fire station and the control room. Additionally, the live status of the area will be updated to the control room.

LIST OF COMPONENTS:

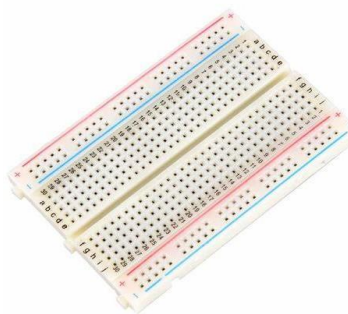
S.No.	Name of the component	Quantity
1	Arduino UNO	1
2	Breadboard	1
3	LED	-
4	Resistor	-
5	Piezo buzzer	1
6	Gas sensor	1
7	Temperature sensor	1
8	Flame sensor	1

ARDUINO UNO :



Arduino Uno R3 is a kind of micro-controller board based on ATmega328P. Includes everything needed to hold the microcontroller; Just connect it to a PC using a USB cable and power it with an AC-DC adapter or battery to get started. The term Uno means "one" in the "Italian" language and was chosen when the Arduino IDE 1.0 software was released. The Arduino Uno R3 is the third and most recent modification of the Arduino Uno. The Arduino board and IDE software are the reference versions of the Arduino and are being upgraded to newer versions. The Uno board is the leader in a USB Arduino board lineup and the reference model for the Arduino platform.

BREADBOARD:



A breadboard is a widely used tool for designing and testing circuits. You do not have to solder wires and components to make a circuit while using a breadboard. It is easier to assemble and reuse components. Since the components are not soldered, you can easily change your circuit design at any time. It consists of a series of conductive metal clips encased in a white ABS plastic box, with each clip insulated from another clip. There are a series of holes in the plastic box that are arranged in a specific way. A typical breadboard layout consists of two types of areas, also called strips:- Busbars and connector strips. Bus strips are typically used to provide power to the circuit. It consists of two columns, one for supply voltage and one for ground.

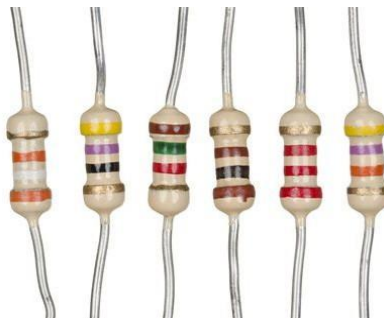
Power strips are used to hold most components in a circuit. It generally consists of two sections, each with five rows and 64 columns. Each column is connected from the inside.

LED:



LED (Light Emitting Diode) is an optoelectronic component that works on the principle of electro-luminescence. Electro-luminescence is the material's ability to convert electrical energy into light energy and then emit that light energy. In the same way, this is how the semiconductor in LED emits light under the influence of the electric field. The LED symbol is formed by merging the P-N junction diode symbol and the outward pointing arrows. These outward-pointing arrows symbolize the light emitted by the light emitting diode.

RESISTOR:



A two-terminal passive electrical device used to limit or regulate the flow of current in electrical circuits.

PIEZO:



A piezoelectric is a device that generates a voltage when a force is applied or deforms when a voltage is applied.

GAS SENSOR:



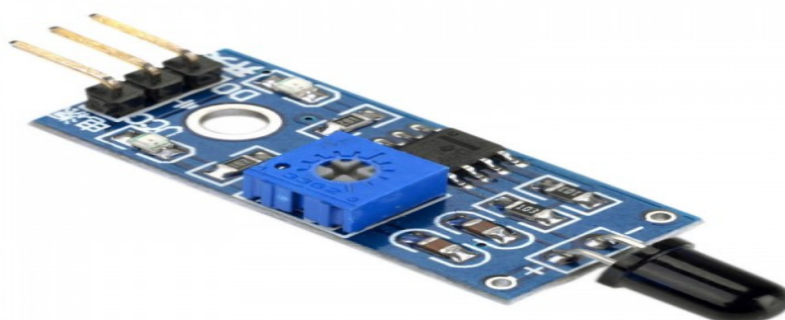
A gas sensor is a device that detects the presence or concentration of gasses in the atmosphere. Based on the concentration of the gas, the sensor creates a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured using this voltage value as the output voltage type and concentration of the gas can be estimated.

TEMPERATURE SENSOR:



A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors. Some temperature sensors require direct contact with the physical object that is being monitored (contact temperature sensors), while others indirectly measure the temperature of an object (non-contact temperature sensors).

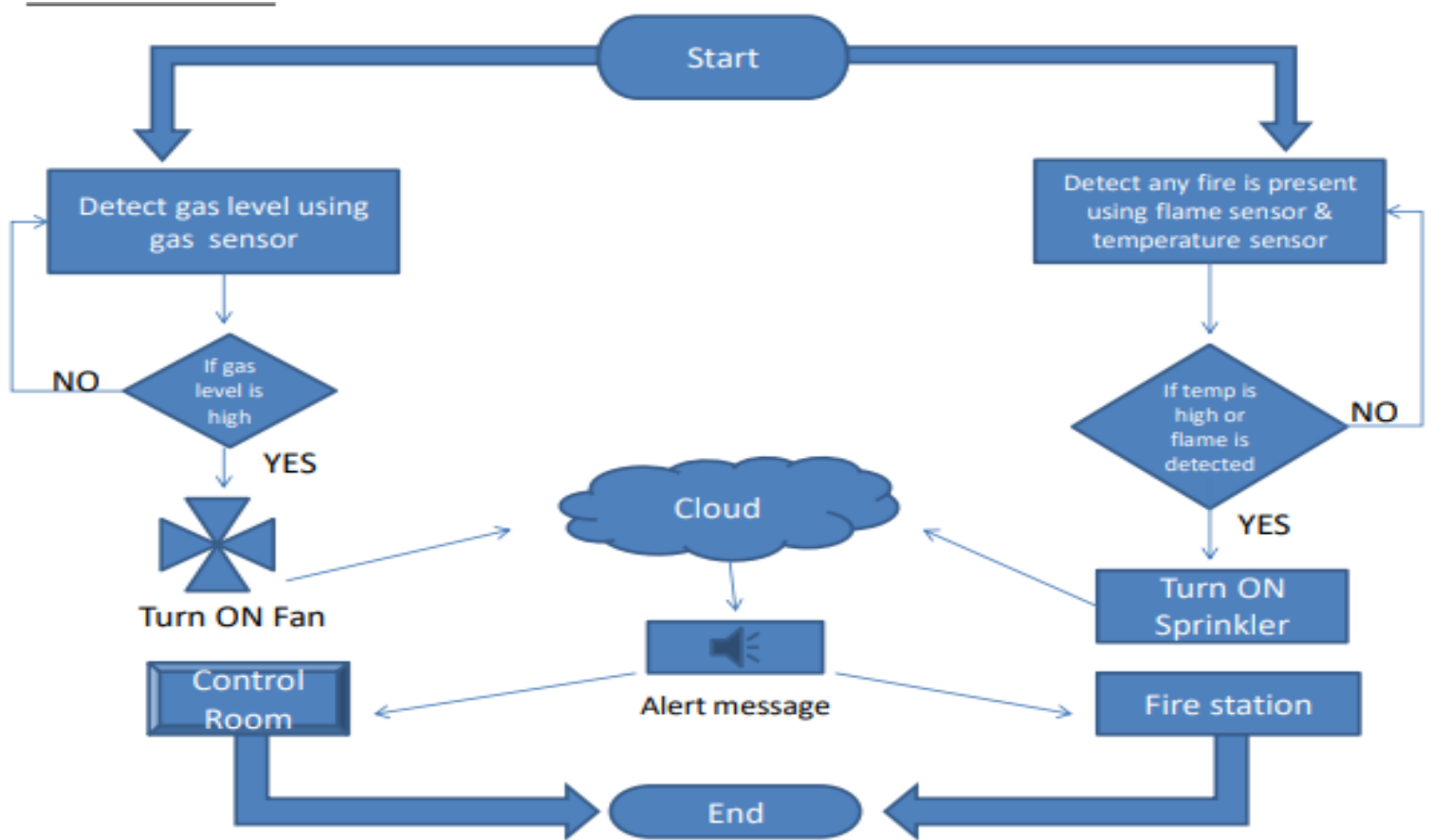
FLAME SENSOR:



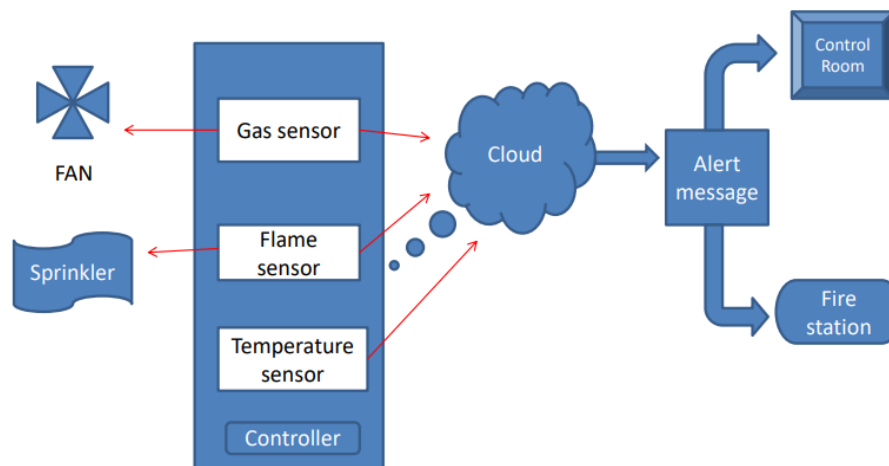
A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an alarm system, a natural gas line, propane & a fire suppression system. This sensor is used in industrial boilers. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compared with a heat/smoke detector because of its mechanism while detecting the flame. This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, or otherwise ice.

PROPOSED METHOD:

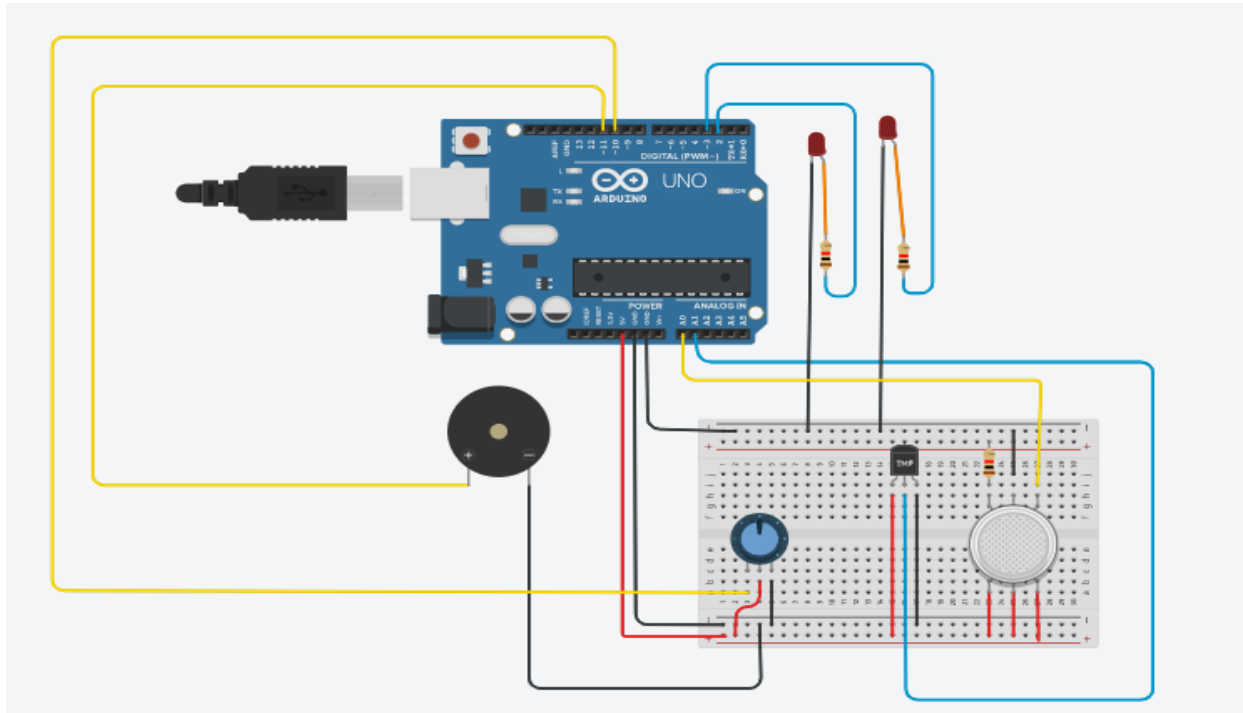
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BLOCK DIAGRAM:



CIRCUIT DIAGRAM:



SOLUTION STATEMENT:

The smart fire management system includes a Gas sensor, Flame sensor and temperature sensors to detect any changes in the environment.

- Based on the temperature readings and if any Gasses are present the exhaust fans are powered ON.
- If any flame is detected the sprinklers will be switched on automatically.
- Emergency alerts are notified to the authorities and Fire station.

CONCLUSION:

On completion of this project, We can conclude that the gas leak detection in the project system is amazing. Successfully applicable in industrial scenarios. In dangerous situations we can save valuable human lives with this system. The sensor module externally out throws an alert. A gas sensor node detects gasses such as CO₂, oxygen, propane. Whereas a fire sensor node detects for a heated environment and a temperature sensor is used to show the particular temperature at the surroundings. Finally all the random variables are linked through cloud computing technologies and the alert is sent to the required person who has the access to the clouding platform through necessary login credentials where the obtained output is organized , manipulated and displayed.

