1.Introduction:

🔥 Arduino Fire Fighting Robot with SMS and Call Alert 🔥

Fires can cause devastating damage, and early detection is crucial to minimizing losses. The **Arduino Fire Fighting Robot** is an innovative solution designed to combat fires autonomously while keeping you informed in real time.

This robot not only detects fires using advanced sensors but also takes immediate action to extinguish them. Additionally, it sends an SMS or makes a phone call to alert you about the situation, ensuring that you are always in the loop, even if you’re away.

This project combines automation, safety, and communication to provide an efficient and reliable fire-fighting system. Ideal for homes, offices, or warehouses, this smart robot adds an extra layer of protection against unexpected fire hazards. 🚒✨

Ardunio Fire Fighting Robot with Sms And Call Alert

💡 **Idea of Use**:

- **.Automatic Fire Detection:**
  Using flame or heat sensors, the robot can quickly detect the presence of a fire.
- **.Fire Extinguishing:**
  Equipped with a small water tank or a fire suppression system, it can spray water directly onto the flames.
- **Instant Alerts:**
  - Sends an SMS 📩 immediately upon detecting a fire.
  - If the situation escalates, it can make a phone call 📞 to alert you.

❒ **Remote Control:**
Can be manually controlled via Bluetooth or wireless connection if needed.

This project is ideal for homes or warehouses to protect them from fires in a smart and efficient way. 🚒✨

❒ Hard Ware Component

1.1 Arduino uno:

The **Arduino Uno** is a microcontroller board used for building electronic projects. Its main functions include:

1. **Controlling electronic components**: It serves as the "brain" of a project, sending signals to control devices like LEDs, motors, and sensors.
2. **Programming platform**: It uses an easy-to-learn programming language based on C/C++, allowing users to write code for automation and interactivity.
3. **Interface between hardware and software**: It connects physical components to a computer or other devices, enabling communication and data exchange.

The Arduino Uno is popular for its simplicity, versatility, and ability to prototype quickly.

1.2 Sim 800L :

The **SIM800L** is a GSM/GPRS module used for communication in electronics projects. Its main functions include:

1. **Sending and receiving SMS**: It enables text messaging functionality in embedded systems.
2. **Voice calls**: It allows devices to make and receive voice calls over GSM networks.
3. **Internet connectivity**: Through GPRS, it provides basic internet access for data transfer, such as sending HTTP requests or connecting to servers.
4. **Low power consumption**: Ideal for IoT projects where energy efficiency is crucial.

The SIM800L is commonly used in smart devices, remote monitoring, and IoT applications.

1.3 Flam sensor :

A **flame sensor** is an electronic device designed to detect the presence of a flame or fire. Its main functions include:

1. **Fire detection**: It identifies the presence of a flame by detecting infrared (IR) or ultraviolet (UV) light emitted by the flame.
2. **Safety control**: Commonly used in systems like furnaces or gas-powered appliances, it ensures proper operation by shutting down the system if no flame is detected.
3. **Early warning**: In fire alarm systems, it helps provide early detection and alert to prevent accidents or damage.

Flame sensors are widely used in industrial applications, safety systems, and robotics.

1.4 MQ2 Sensor :

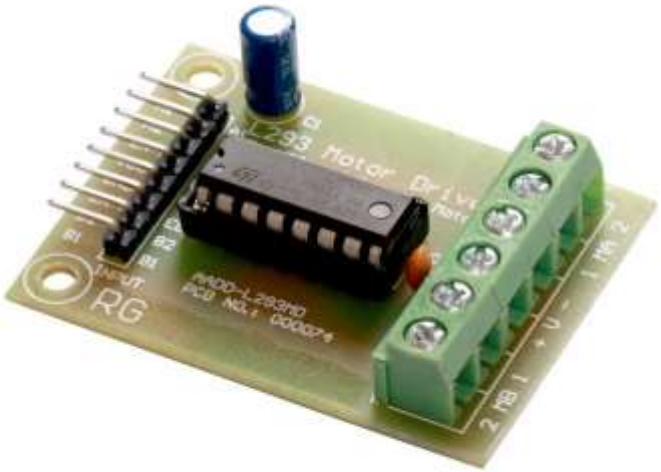
The **MQ2 sensor** is a gas sensor commonly used in electronics projects to detect various gases. Its main functions include:

1. **Gas detection**: It can detect gases such as methane, butane, propane, hydrogen, smoke, and other flammable substances.
2. **Safety monitoring**: Often used in gas leak detection systems to enhance safety in homes, industries, and vehicles.
3. **Air quality monitoring**: Helps measure the concentration of harmful gases in the environment.
4. **Versatility**: It provides analog and digital outputs, making it compatible with microcontrollers like Arduino and Raspberry Pi.

The MQ2 sensor is popular for its sensitivity and affordability in safety and environmental monitoring applications.

1.5 L293 Motor Driver :

The **L293 motor driver** is an integrated circuit (IC) designed to control the direction and speed of motors. Its main functions include:



1. **Motor control**: It allows you to drive DC motors, stepper motors, and other types of motors by controlling their direction and speed.
2. **Bidirectional control**: It can change the direction of a motor (clockwise or counterclockwise) using two input pins.
3. **Speed control**: By adjusting the voltage supplied to the motor or using pulse-width modulation (PWM), it can control the motor's speed.
4. **Current amplification**: The L293 amplifies low-power control signals from microcontrollers (like Arduino) to higher currents suitable for driving motors.

The L293 motor driver is widely used in robotics, automation systems, and various motor-driven applications.

1.6 Rlay Module :

A **Relay Module** is an electrical component used to control high-power devices using low-power signals. Its main functions include:

1. **Switching high-power devices**: It allows a low-power control signal (from a microcontroller or other logic circuits) to switch high-voltage devices like motors, lamps, or home appliances on and off.
2. **Electrical isolation**: The relay provides isolation between the low-power control circuit and the high-power device, protecting sensitive electronics.
3. **Automation**: Used in automation systems to control devices remotely or as part of more complex operations.
4. **Multiple channels**: Some relay modules offer multiple relays, enabling control of several devices simultaneously.

Relay modules are commonly used in home automation, robotics, and industrial control systems.

1.7 LM25 Buck Converter :

The **LM2596 Buck Converter** is a popular voltage regulator IC used **Voltage step-down**: It efficiently converts a higher input voltage (up to 40V) to a lower output voltage (typically between 1.25V and 37V), making it ideal for powering low-voltage devices from higher-voltage sources.

1. **High efficiency**: The LM2596 is designed to be highly efficient (up to 90%) compared to linear regulators, reducing power loss and heat generation.
2. **Adjustable output**: It has an adjustable output voltage feature, allowing users to set the output voltage using an external resistor.
3. **Current capability**: It can supply up to 2-3 amps of current, depending on the input and output conditions, making it suitable for a wide range of applications.
4. **Heat management**: The converter includes built-in thermal shutdown and overcurrent protection features to safeguard against damage.

The LM2596 is commonly used in power supplies, battery-powered systems, and various electronics that require stable and efficient voltage regulation.

1.8 Servo S9 90 :

The **Servo S9 90** is a type of servo motor commonly used in robotics and automation. Its main functions include:

1. **Precise control**: It provides precise control of angular position, allowing for accurate movement of mechanical parts.
2. **Rotation**: The Servo S9 90 can rotate 90 degrees, typically used to control parts that require a limited range of motion.
3. **Positioning**: It is often used for tasks such as steering in robots, controlling the position of camera gimbals, or adjusting the angle of antennas.
4. **High torque**: It offers a relatively high torque, making it suitable for applications requiring more force or stability in movement.

The Servo S9 90 is widely used in robotics, remote control systems, and automation projects.

1.9 Mini Water Pumb 5V :

The **mini water pump 5V** is a compact electric pump designed to circulate or transfer small amounts of water or other liquids. Its main functions include:

1. **Water Circulation:** Used in small-scale systems like aquariums, fountains, or cooling systems to keep water flowing.
2. **Liquid Transfer:** Helps move liquids between containers or through small tubing in DIY or hobby projects.
3. **Cooling Systems:** Often used in electronics cooling, such as in small liquid cooling loops for computers or other devices.
4. **Irrigation or Gardening:** Can be integrated into miniature watering systems for plants.

Its 5V power requirement makes it compatible with USB power sources or small batteries, ideal for portable and low-energy applications.

1.10 BO Motor .wheele x4 :

The **BO motor with 4 wheels** is commonly used in robotics and small DIY projects. Its primary functions include:

1. **Driving Mechanism:** The BO motor powers the wheels, enabling motion for small robots or vehicles.
2. **Directional Movement:** With four wheels connected to the motors, it allows forward, backward, and turning movements.
3. **Educational Use:** Ideal for teaching robotics, coding, and engineering principles due to its simplicity and ease of use.
4. **Prototyping:** Often used in hobby projects or prototypes to test designs and mechanisms.

The combination of a BO motor and wheels is well-suited for lightweight, battery-operated devices, such as line-following robots, obstacle-avoiding robots, and other small automated systems.

1.11 18650 Battery X3 :

The **18650 battery (x3)** refers to three cylindrical lithium-ion rechargeable batteries, each typically sized at 18mm in diameter and 65mm in length. Their primary functions include:

1. **Power Supply:** Provides a reliable and high-capacity energy source for electronic devices, such as portable tools, flashlights, or robotics projects.
2. **Energy Storage:** Often used in combination to power systems requiring more voltage or capacity, like DIY electronics or small vehicles.
3. **Rechargeability:** Supports multiple charge/discharge cycles, making it ideal for sustainable and reusable power setups.
4. **High Performance:** Commonly used in applications demanding high energy output, such as electric vehicles, drones, or power banks.

When using three 18650 batteries together, they are often connected in series (to increase voltage) or parallel (to increase capacity) based on the project's requirements. Always ensure proper handling and a suitable battery management system (BMS) for safety.

1.12 Mini Bread Board :

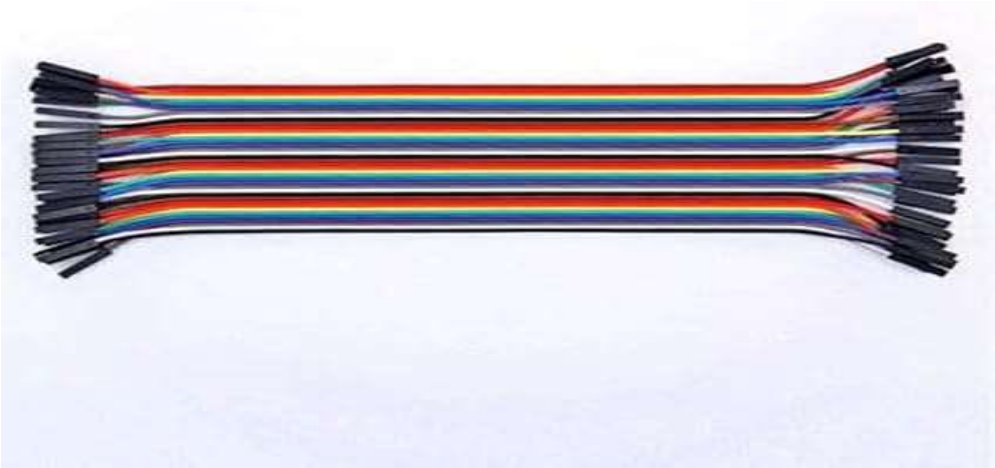
The **mini breadboard** is a small, reusable platform used for building and testing electronic circuits. Its primary functions include:

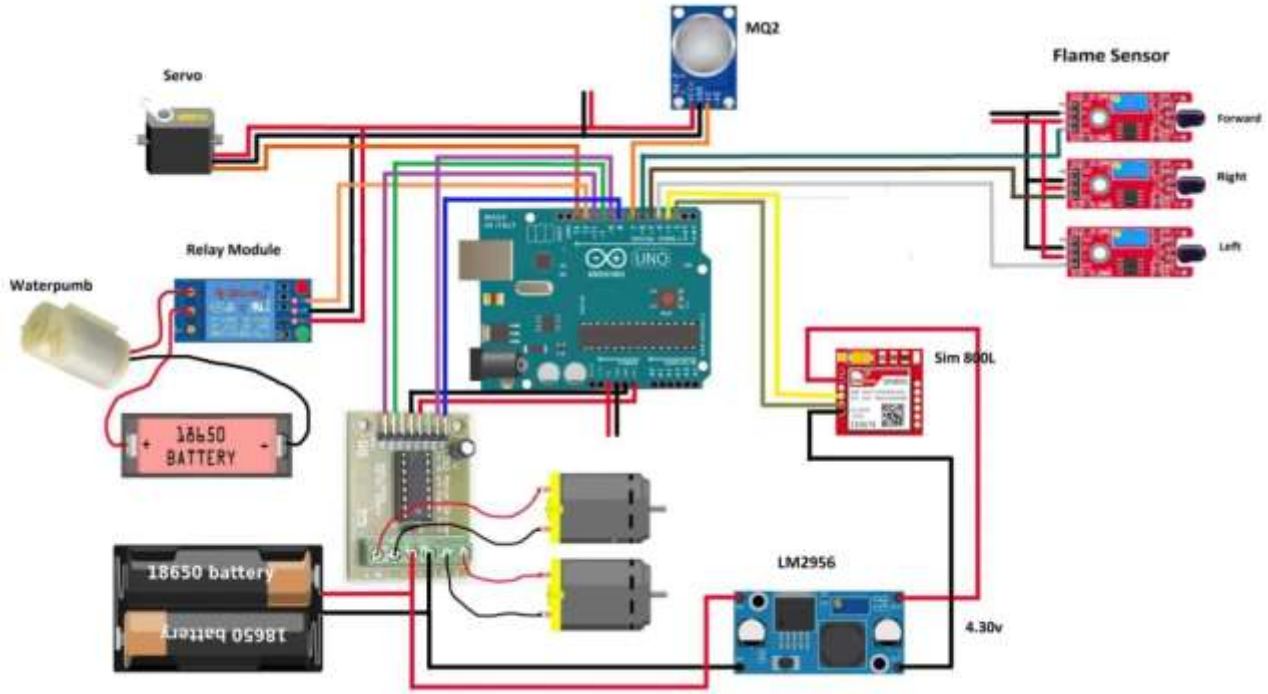
1. **Prototyping Circuits:** Allows users to assemble and test electronic circuits without soldering, making it ideal for temporary setups and experimentation.
2. **Component Connection:** Provides a grid of interconnected holes where electronic components, such as resistors, capacitors, LEDs, and microcontrollers, can be inserted and connected.
3. **Educational Use:** Popular for learning electronics and practicing circuit design due to its simplicity and ease of use.
4. **Portability:** Its compact size makes it suitable for small-scale projects and portable applications.

Mini breadboards are especially useful in DIY projects and for prototyping before creating permanent soldered circuits.

1.13 Jumber Wire :

Jumper wires are used to connect components or points in a circuit





The diagram illustrates a project using an Arduino Uno, which connects various sensors and control modules. Here's a simplified explanation of the wiring:

Wiring Explanation:

1. Arduino Uno:

Most components (sensors, motors, etc.) connect to its digital or analog input/output pins.

2. Servo Motor:

Signal wire connects to a digital pin on the Arduino. Power and Ground connect to 5V and GND pins.

3. MQ2 Sensor:

Signal pin connects to an analog or digital pin on the Arduino. Power and Ground connect to 5V and GND.

4. Flame Sensors:

The signal wires from the front, right, and left sensors are connected to separate pins on the Arduino to determine the flame's direction. Power and Ground are connected to 5V and GND.

5. Relay Module:

Signal pin is connected to a digital pin on the Arduino. The relay switches the water pump on/off based on the Arduino's command.

6. Water Pump:

Connected to the relay, which controls its power from the battery.

7. SIM800L Module:

TX and RX pins are connected to the Arduino for communication via UART. Powered by the LM2596 regulator to provide 4.2V.

8. Motor Driver (e.g., L298N):

Motors connect to the output terminals of the driver. Input pins connect to the Arduino for speed and direction control. Powered by the 18650 batteries.

9. LM2596 Voltage Regulator:

Used to step down the battery voltage to a safe level for sensitive modules like the SIM800L.

10. 18650 Batteries:

The primary power source for the project.

Supplies power to the motor driver, water pump, and voltage regulator.

--- How It Works:

The MQ2 sensor or flame sensors detect smoke or flame. The Arduino determines the direction of the flame using the input from

the flame sensors. The robot moves toward the fire using the motor driver to control the wheels. The water pump is activated via the relay to extinguish the fire. The SIM800L module sends an SMS alert to notify the user.

Soft Ware Component :

```
define enA 10//Enable1 L298 Pin enA#
int LM1 = 8;              // المحرك الأيسر الأمامي
int LM2 = 9;              // المحرك الأيسر الخلفي
int RM1 = 10;             // المحرك الأيمن الأمامي
int RM2 = 11;             // المحرك الأيمن الخلفي
define enB 5 //Enable2 L298 Pin enB#
define ir_R A0#
define ir_F A1#
define ir_L A2#
define servo A4#
define pump A5#
int Speed = 160; // Write The Duty Cycle 0 to 255 Enable for Motor Speed
int s1, s2, s3;
void setup()
{
Serial.begin(9600); // start serial communication at 9600bps
pinMode(ir_R, INPUT);// declare fire sensor pin as input
pinMode(ir_F, INPUT);// declare fire sensor pin as input
pinMode(ir_L, INPUT);// declare fire sensor pin as input
pinMode(enA, OUTPUT); // declare as output for L298 Pin enA
pinMode(LM1, OUTPUT); // declare as output for L298 Pin in1
pinMode(LM2, OUTPUT); // declare as output for L298 Pin in2
pinMode(RM1, OUTPUT); // declare as output for L298 Pin in3
pinMode(RM2, OUTPUT); // declare as output for L298 Pin in4
pinMode(enB, OUTPUT); // declare as output for L298 Pin enB
pinMode(servo, OUTPUT);
pinMode(pump, OUTPUT);
for (int angle = 90; angle <= 140; angle += 5)
}
servoPulse(servo, angle);
{
for (int angle = 140; angle >= 40; angle -= 5)
```

```
}
;servoPulse(servo, angle)
{

for (int angle = 40; angle <= 95; angle += 5)
}
;servoPulse(servo, angle)
{
;analogWrite(enA, Speed)
;analogWrite(enB, Speed)
;(500)delay
{
()void loop
}
;s1 = analogRead(ir_R)
;s2 = analogRead(ir_F)
;s3 = analogRead(ir_L)

if (s1 < 100)
}
;()Stop
;digitalWrite(pump, 1)
for (int angle = 90; angle >= 40; angle -= 3)
}
;servoPulse(servo, angle)
{
for (int angle = 40; angle <= 90; angle += 3)
}
;servoPulse(servo, angle)
{
{

else if (s2 < 100)
}
;()Stop
```

```
;digitalWrite(pump, 1)
for (int angle = 90; angle <= 140; angle += 3)
}
;servoPulse(servo, angle)
{
for (int angle = 140; angle >= 40; angle -= 3)
}
;servoPulse(servo, angle)
{
for (int angle = 40; angle <= 90; angle += 3)
}
;servoPulse(servo, angle)
{
{
else if (s3 < 100)
}
;()Stop
;digitalWrite(pump, 1)
for (int angle = 90; angle <= 140; angle += 3)
}
;servoPulse(servo, angle)
{
for (int angle = 140; angle >= 90; angle -= 3)
}
;servoPulse(servo, angle)
{
{
else if (s1 >= 200 && s1 <= 500)
}
;digitalWrite(pump, 0)
;()Left
;(200)delay
{
else if (s2 >= 200 && s2 <= 500)
}
```

```
;digitalWrite(pump, 0)
;()forword
;(200)delay
{
else if (s3 >= 200 && s3 <= 500)
}
;digitalWrite(pump, 0)
;()Right
;(200)delay
{
else
}
;digitalWrite(pump, 0)
;()Stop
{
;(200)delay
{

void servoPulse (int pin, int angle)
}
;int pwm = (angle * 11) + 500
;digitalWrite(pin, HIGH)
;delayMicroseconds(pwm)
;digitalWrite(pin, LOW)
;(50)delay
{
()void forword
}
digitalWrite(LM1, HIGH); //Right Motor forword Pin
digitalWrite(LM2, LOW);  //Right Motor backword Pin
digitalWrite(RM1, HIGH);  //Left Motor backword Pin
digitalWrite(RM2, LOW); //Left Motor forword Pin
{
()void Left
}
```

```
;digitalWrite(LM1, HIGH)
;digitalWrite(LM2, LOW)
;digitalWrite(RM1, LOW)
;digitalWrite(RM2, LOW)
{
()void Right
}
;digitalWrite(LM1, LOW)
;digitalWrite(LM2, LOW)
;digitalWrite(RM1, HIGH)
;digitalWrite(RM2, LOW)
{
()void Stop
}
;digitalWrite(LM1, LOW)
;digitalWrite(LM2, LOW)
;digitalWrite(RM1, LOW)
;digitalWrite(RM2, LOW)
{
```

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Project Summary:

Arduino Fire Fighting Robot with SMS and Call Alert

Core Idea: This project involves creating a fire-fighting robot using **Arduino** that detects fire or smoke and activates a fire-fighting mechanism (such as a water pump). Additionally, it sends alerts via **SMS** messages and **phone calls** using a **GSM module** to notify the user in case of fire.

Main Components:

1. **Arduino Board (e.g., Arduino Uno)**: To program and control the system.
2. **GSM Module (e.g., SIM900 or SIM800)**: For sending SMS and making phone calls.
3. **Fire Detection Sensor (e.g., MQ-2 or DHT11)**: To detect smoke or fire.
4. **Motor Driver (e.g., L298N)**: To control the robot's movement using DC motors.
5. **Water Pump or Extinguisher Mechanism**: To extinguish the fire.
6. **Relay Module**: To control the activation of the water pump or extinguisher.
7. **Battery**: To power the system.

How It Works:

1. **Fire Detection**: The robot uses sensors like the **MQ-2** (smoke sensor) or **DHT11** (temperature sensor) to detect fire or smoke.
2. **Fire Extinguishing Mechanism**: Upon detecting fire or smoke, the robot activates the fire-fighting mechanism (e.g., a water pump).
3. **Movement**: The robot moves toward the fire using DC motors controlled by the **L298N motor driver**.
4. **Sending Alerts**: Once a fire is detected, the robot sends an **SMS alert** via the **GSM module** to a designated phone number. Additionally, it can **make a phone call** to notify the user.

Key Functions:

- Detecting fire or smoke.
- Activating the fire-fighting mechanism.
- Sending SMS alerts to the user upon fire detection.
- Making phone calls for emergency notification.
- Moving toward the fire to extinguish it.

Code Explanation:

The Arduino program uses the **SoftwareSerial** library to communicate with the GSM module. The code reads the sensor data, and if a fire is detected, it activates the fire-extinguishing mechanism and sends an alert via SMS or makes a phone call.

Project Goal:

The goal of this project is to build an intelligent robot that can detect and extinguish fires automatically while sending notifications to users via **SMS** and **phone calls**. This system can enhance fire safety and emergency response in places prone to fire hazards.