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ARDUINO BASED FIRE DETECTION AND EXTINGUISHING ROBOT

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ABSTRACT
Now a days, fire accidents are very common and sometimes these become more difficult for fireman to control the situation. It is not possible to appoint a person to observe continuously for accidental fire where robot can do that. In such cases fire fighting robot comes in picture. Robot will detect fire automatically. The proposed system is able to detect presence of fire by using gas sensors and temperature sensors and extinguish it automatically. Once it detects the fire then it alerts with the beep sound and simultaneously send a message to the user via Bluetooth.
Keywords:-arduino, fire detecting-extinguishing robot, flame sensor, alert message, Bluetooth.

INTRODUCTION

One of the technical sectors that is expanding the fastest right now is robotics. Robots are made to perform labor-intensive or dangerous tasks without the involvement of humans, as well as in environments that are difficult to reach. Today, robot use is more widespread than ever before, and it is no longer limited to heavy industrial businesses. The goal of the project is to build and create an intelligent robot that can recognise flame and potentially harmful gas and smoke. The robot is programmed to follow the controller instructions when moving. to be able to travel left, right, backward, and all other directions. The robot will activate the alert buzzer if any gas, smoke, or flame is detected. Wherever it is unsafe for people to enter, the robot will be used. As soon as a fire is detected, the automatic water sprinkler will activate. With the help of a bluetooth app, fire sensors can detect temperature and emit a buzzer. A fire in an industry could happen in a number of ways. Electric leaks, for example, can cause massive fires and damage in places like cotton mills, fuel storage tanks, and electrical equipment.

In the worst situations, fire results in significant losses in both money and human life. The best means of protecting people lives, property, and environment are robotics. A robot for fire detection has been created, and it can recognise fire flames. The design of this robot prevents it from searching a fire before it gets out of control and range. Sooner or later, this kind of fire detection robot will be able to identify fires, considerably lowering the risk of injury to victims. In addition, the Fire detection robotic project will promote interest in robotics advancements as it works to find a workable and practical solution to save
lives and less the risk to property.

II .EXISTING METHOD:

Nowadays, some factories and buildings have proper installation and fire safety and control arrangements such as fire alarm, fire extinguishers, water supply system etc. But the problem is these conventional fire extinguishing systems are not enough to take prompt action during fire outbreak and hence, save life. The best way to reduce these losses is to respond to the emergency situation as quickly as possible. So, there comes the necessity of a standalone fire detection systems.

III. PROPOSED METHOD

The project is designed with a low cost and all level users can have one for a safety purpose. This project seeks to design a fire alarm system that will continuously monitor the presence of significant

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amount of heat and activate an buzzer and send a alert message and extinguish the fire as a safety measure to contain the situations.

Fig1: Manual Fire Truck

FIRE DETECTION ROBOT

To overcome the limitations of the existing system which are direct human involvement, immediate action & reaction and less accuracy in detection .So we introduce the controlled robot for fire Detection and Extinguish using Arduino based technology. The main aim is human safety during fire extinguish and it provides high accuracy detection of fire so that we can mitigate the heavy loss means we can prevent the huge loss in terms of lives and money. The proposed system can detect the fire even in the initial stage by using high accruable flame and smoke sensors as well.

BLOCK DIAGRAM

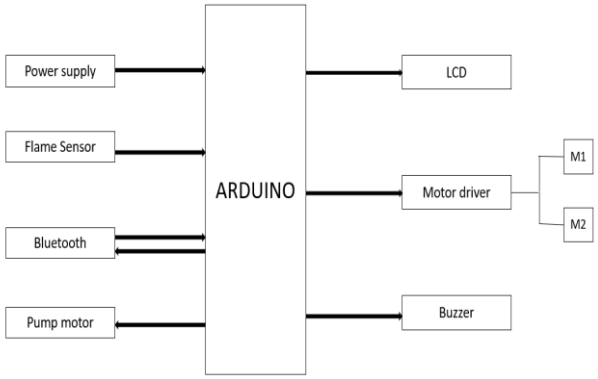

Fig.2: Block diagram of Fire detection Robot

The components of this system are as follows, and they are given below

1.ARDUNIO
2.LCD Display
3.Stepdown Transformer
4.Flame sensor
5.Power Supply
6.Buzzer
7.Bluetooth

Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything

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needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.
V_{CC} and V_{SS} are the supply voltage and ground for the whole device (the analogand digital supplies are separate in the 16-pin package).
The power pins are as follows:
VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
5V. The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
3.3V.A 3.3volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
GND. Ground pins.
Input and Output:
Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:
Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip .
External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, arising or falling edge, or a change in value. See the attach Interrupt() function for details.
PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which although provided by the underlying hardware, is not currently included in the Arduino language.
LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
The Uno has 6 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function. Additionally, some pins have specialized
functionality:
I2C: 4 (SDA) and 5 (SCL). Support I2C (TWI) communication using the Wire library.
There are a couple of other pins on the board:
AREF. Reference voltage for the analog inputs. Used with analog Reference().
Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the
Low Supply-Voltage Range: 1.8 V to 3.6 V.
Two 16-Bit Timer_ A with three compare registers. Five power saving modes.16-Bit RISC Architecture, 62.5-ns Instruction(A/D) Conversion Cycle Time.


Fig.3: ARDUINO UNO

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LCD Display

LCD (Liquid Crystal Display) is one of the flat panel display types, which uses liquid crystals in its primary form of operation. It displays the digital format output as shown in figure 4. In the proposed system it displays the alert message along with buzzer sound.

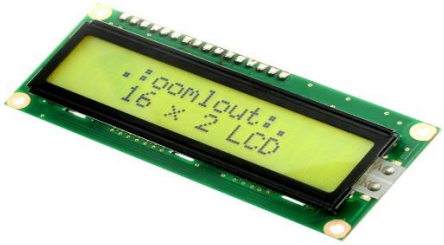

Fig: LCD Display

BLUETOOTH Module

The HC-05 is a class 2 Bluetooth module designed for transparent wireless serial communication. It is pre-configured as a slave Bluetooth device. Once it is paired to a master Bluetooth device such as PC, smart phones and tablet, its operation becomes transparent to the user.

1. Receive, send SMS messages to user
2. Act as communication bridge between user and robot.

Fig: BLUETOOTH Module

Flame Sensor

The fire sensor circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity. Ordinary signal diodes like IN 34 and OA 71 exhibits this property and the internal resistance of these devices will decrease when temperature rises. In the reverse biased mode, this effect will be more significant. The diode can generate around 600 milli volts at 5 degree centigrade. For each degree rise in temperature; the diode generates 2 mV output voltage. That is at 5 degree it is 10 mV and when the temperature rises to 50 degree.

Fig: Flame Sensor

Power Supply and RELAY

A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

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The relay allows the isolation of two separate sections of a system with two different voltage sources i.e., a small amount of voltage/current on one side can handle a large amount of voltage/current on the other side but there is no chance that these two voltages mix up.

Fig:Power supply and Relay

BUZZER

The buzzer in this circuit is used when microcontroller provides high signal, i.e. when a temperature is greater than or equals to 40 degrees Celsius, the circuit will be completed and the buzzer will start alarming

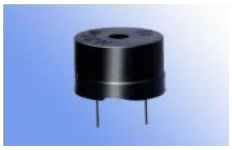

Fig.7 BUZZER

DC MOTORS and DRIVER MODULE

A DC motor is an electrical motors that convert direct current electrical energy into mechanical energy.in the proposed system it is used to movements of the robot towards fire affecting region. The Motor Driver is a module for motors that allows you to control the working speed and direction of two motors simultaneously. This Motor Driver is designed and developed based on L293D IC.L293D is a 16 Pin Motor Driver IC.

Fig: DC motor & DRIVER module

PUMP MOTOR

A Motor pump is a mechanical device, used to move the liquids/gases from one place to another by using mechanical action. The working principle of the water pump is, it converts the motor's energy from mechanical to fluid flow.

Fig:Pump Motor

RESULT AND OUPUT:

To get the output we can perform the following steps .
Step1: If sensor detects the fire(by using fire source)
Step2: Display and send the alert message with buzzer to the user via Bluetooth
Step3: Pump motor gets ON to extinguish the fire by controls of robot in Bluetooth app.
The controls includes

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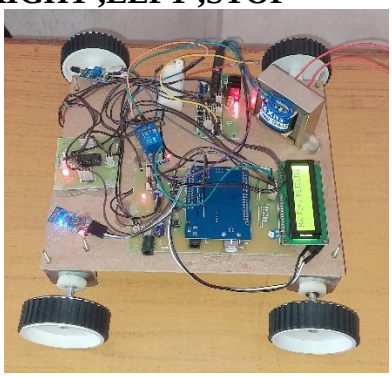
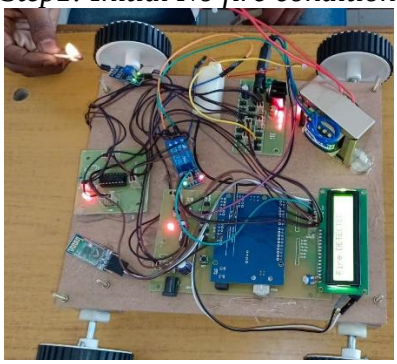
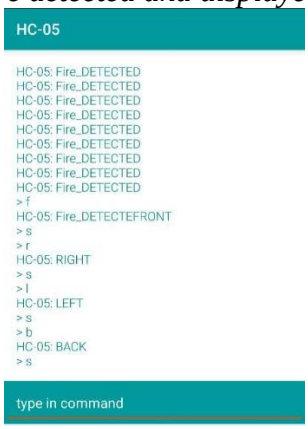
FORWARD , BACKWARD & RIGHT ,LEFT ,STOP



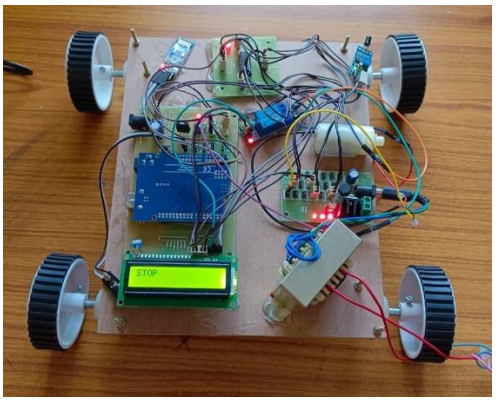
Step1: Initial No fire condition



Step2: Fire detected and displayed on LCD



Step3:Sent alert message to user via Bluetooth and control the robot using pre defined commands(f ,b, l,r,s)



Step4:Finally after extinguish fire STOP condition of robot.

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VI. CONCLUSION

In this work, an attempt has been done to design a fire detection system using Flame sensor and arduino It will help to reduce the loss of assets and save lives, reduce percentage of accident. The main objective of this project has been to design a circuit that detects high temperature and consequently triggers an alarm, send SMS message and extinguish the fire. These objectives were met since the systems works effectively.

VII. FUTURE SCOPE

This project can be developed by interfacing it with a wireless camera, so that the person can view the controlling operation of the robot remotely on a display. Video transmission can be added. Improve weight capacity of the robot. Obstacle detection and avoiding. This project

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