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FIRE FIGHTING ROBOT WITH ARTIFICIAL INTELLIGENCE

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Abstract: For many people, robot is a machine that imitates a human like the androids in Star Wars, Terminator and Star Trek: The Next Generation. However much these robots capture our imagination, such robots still only inhabit Science Fiction. People still haven't been able to give a robot enough 'common sense' to reliably interact with a dynamic world. The types of robots that we will encounter most frequently are the robots that do work that is too dangerous, boring, onerous or just plain nasty. Most of the robots in the world are of this type. They can be found in auto, medical, manufacturing and space industries. In fact, there are over a million of these types of robots working for us today. Robot exactly, is a system that contains sensors, control systems, manipulators, power supplies and software all working together to perform a task. Designing, building, programming and testing a robot is a combination of physics, mechanical engineering, electrical engineering, structural engineering, mathematics and computing. The need for a device that can detect and extinguish a fire on its own is long past due. Many house fires originate when someone is either sleeping or not home. With the invention of such a device, people and property can be saved at a much higher rate with relatively minimal damage caused by the fire. Our task as electrical engineers was to design and build a prototype system that could autonomously detect and extinguish a fire. Also aims at minimizing air pollution. It is the Robot that can move through a model structure, find an oilfield and then extinguish it with help of a Pump set motor. This is meant to simulate the real world operation of a Robot performing a fire extinguishing function in an oilfield.

INTRODUCTION

1.1 OVERVIEW

In defense service many times it is not affordable in many situations to put human life in trouble in case of rescue operations and emergencies. Requirement of such a situation is to take the inner view of situation without risking any lives. For this purpose a non-living system should be employed. Therefore, we developed an idea to build a robot that does more than just move in a maze.

Having a video signal makes this Robot very useful as a vehicle used for searching and exploring places that human being is limited to such as detecting mines and exploring the unsafe environment. Controlling

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the robot from different computer a terminal through the internet gives the user flexibility to access it from any computer terminal at any place.

SOFTWARE AND HARDWARE TOOLS:

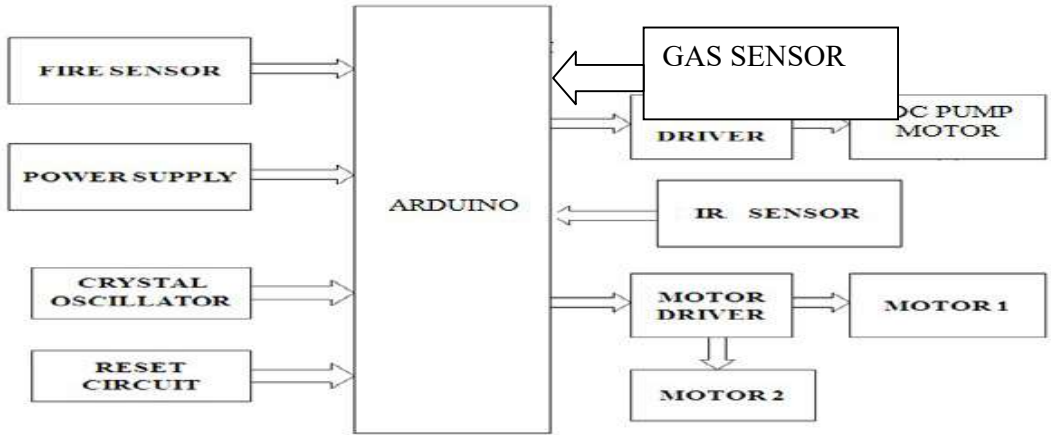
Software Tools:

1. Arduino IDE

Hardware Tools:

1. Arduino Uno
2. Fire sensor.
3. DC motors
4. L293D
5. DC Pump Motor
6. Buzzer

Block diagram



L293D

L293D

- 600mA OUTPUT CURRENT CAPABILITY PER CHANNEL
- 1.2A PEAK OUTPUT CURRENT (non repetitive) PER CHANNEL
- ENABLE FACILITY
- OVERTEMPERATURE PROTECTION
- LOGICAL "0" INPUT VOLTAGE UP TO 1.5 V
- (HIGH NOISE IMMUNITY)
- INTERNAL CLAMP DIODES

DESCRIPTION

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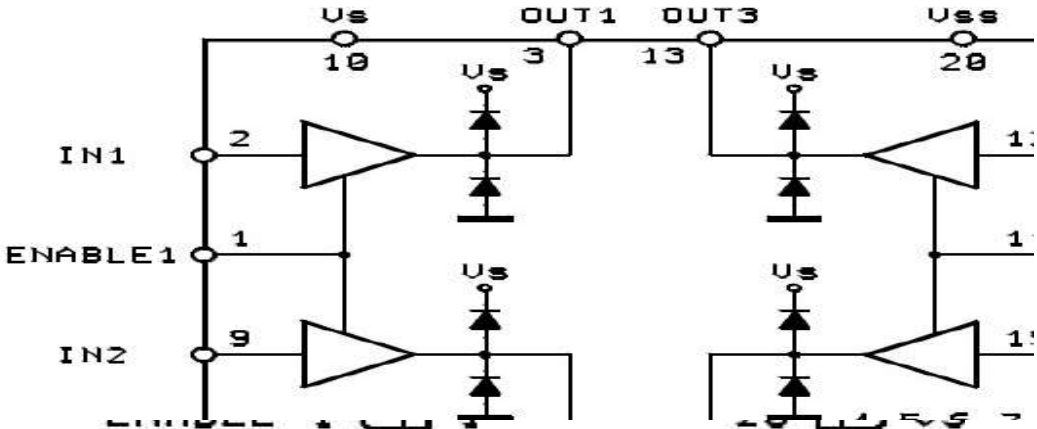
The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors.

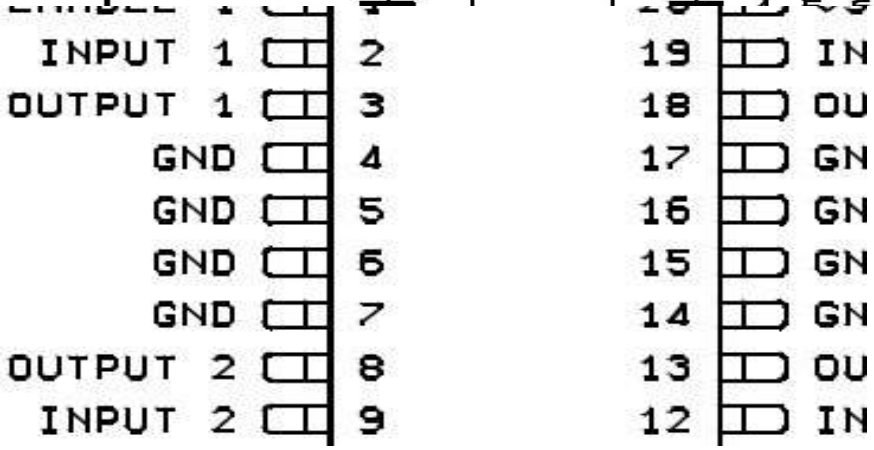
To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included.

This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking. The L293DD is assembled in a 20 lead suIRace mount which has 8 center pins connected together and used for heat sinking.

BLOCK DIAGRAM



PIN CONNECTION



ASSEMBLY INSTRUCTIONS

- Check the components supplied in the Kit against the Component list and identify all the components.

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- It is generally best to solder the lowest height components first. Solder the components in the following order:
- Jumpers, resistors, diodes, IC base, transistors and other components.
- Take care of terminals polarity while soldering diodes, LED s and electrolytic capacitors.
- Identify the terminals of transistors and solder them in correct direction.
- Connect the LCD with the help of 16-pin male-female work-strip connector.
- Use flux cored lead to avoid dry solderability.
- Inspect the solder points against dry solder / excess solder

ARDUINO

Overview:

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 ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything 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.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

The board has the following new features:

1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

FIRE SENSOR

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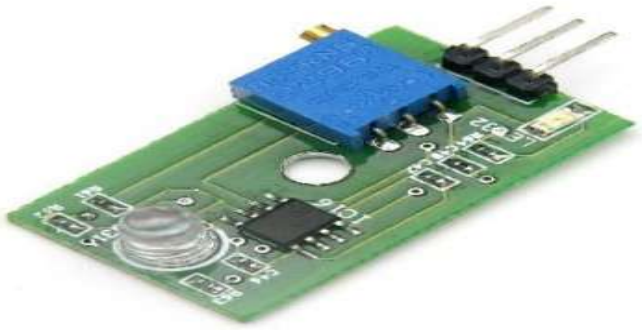

There are several types of flame detector. The optical **flame detector** is a detector that uses optical sensors to detect flames. There are also ionization flame detectors, which use current flow in the flame to detect flame presence, and thermocouple flame detectors.

Infrared Flame Detector

Infrared (IR) flame detectors work within the infrared spectral band. Hot gases emit a specific spectral pattern in the infrared region, which can be sensed with a thermal imaging camera (TIC) a type of thermo graphic. False alarms can be caused by other hot surfaces and background thermal radiation in the area as well as blinding from water and solar energy. A typical frequency where single frequency IR flame detector is sensitive is in the 4.4 micrometer range. Typical response time is 3-5 seconds.

IR SENSOR

IR the same principle in ALL Infra-Red proximity sensors. The basic idea is to send infra red light through IR-LEDs, which is then reflected by any object in front of the sensor.

Then all you have to do is to pick-up the reflected IR light. **For detecting the reflected IR light, we are going to use a very original technique: we are going to use another IR-LED,** to detect the IR light that was emitted from another led of the exact same type. This is an electrical property of Light Emitting Diodes (LEDs) which is the fact that a led produce a voltage difference across its leads when it is subjected to light. As if it was a photo-cell, but with much lower output current. In other words, the voltage generated by the leds can't be - in any way - used to generate electrical power from light, It can barely be detected. that's why as you will notice in the schematic, we are going to use a Op-Amp (operational Amplifier) to accurately detect very small voltage changes.

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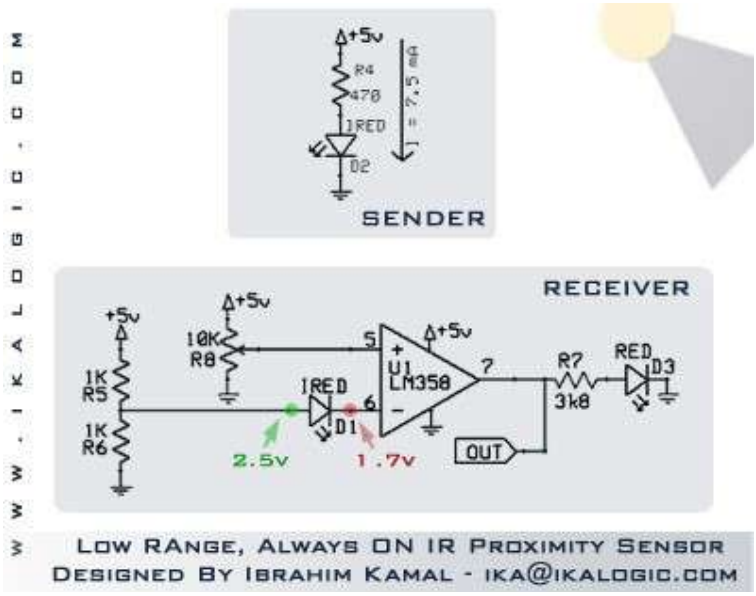

The sender is composed of an IR LED (D2) in series with a 470 Ohm resistor, yielding a forward current of 7.5mA. **The receiver** part is more complicated, the 2 resistors R5 and R6 form a voltage divider which provides 2.5V at the anode of the IR LED (here, this led will be used as a sensor). When IR light falls on the LED (D1), the voltage drop increases, the cathode's voltage of D1 may go as low as 1.4V or more, depending on the light intensity. This voltage drop can be detected using an Op-Amp (operational Amplifier **LM358**).

You will have to adjust the variable resistor (POT.) R8 so the the voltage at the positive input of the Op-Amp (pin No. 5) would be somewhere near 1.6 Volt. if you understand the functioning of Op-Amps, you will notice that the output will go High when the volt at the cathode of D1 drops under 1.6. So the output will be High when IR light is detected, which is the purpose of the receiver.

IR Advantages:

- Low power requirements: therefore ideal for laptops, telephones, personal digital assistants
- Low circuitry costs: $2-$5 for the entire coding/decoding circuitry
- Simple circuitry: no special or proprietary hardware is required, can be incorporated into the integrated circuit of a product
- Higher security: directionality of the beam helps ensure that data isn't leaked or spilled to nearby devices as it's transmitted
- Portable
- Few international regulatory constraints: IrDA (Infrared Data Association) functional devices will ideally be usable by international travelers, no matter where they may be
- High noise immunity: not as likely to have interference from signals from other devices

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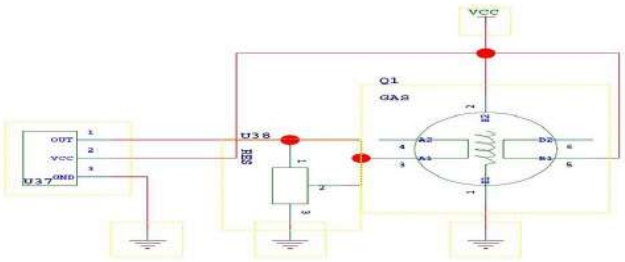
IR Disadvantages:

- Line of sight: transmitters and receivers must be almost directly aligned (i.e. able to see each other) to communicate
- Blocked by common materials: people, walls, plants, etc. can block transmission
- Short range: performance drops off with longer distances
- Light, weather sensitive: direct sunlight, rain, fog, dust, pollution can affect transmission
- Speed: data rate transmission is lower than typical wired transmission
-

GAS DETECTOR:

A device that detects gases.. Commercial, industrial, and mass residential devices issue a signal to a fire alarm system, while household detectors, known as smoke alarms, generally issue a local audible or visual alarm from

the detector itself.



Gas detectors are typically housed in a disk-shaped plastic enclosure about 150 millimeters (6 in) in diameter and 25 millimeters (1 in) thick, but the shape can vary by manufacturer or product line. Most smoke detectors work either by optical detection (photoelectric) or by physical process (ionization), while others use both detection methods to increase sensitivity to smoke. Sensitive alarms can be used to detect, and thus deter, smoking in areas where it is banned such as toilets and schools. Smoke detectors in large commercial, industrial, and residential buildings are usually powered by a central fire alarm system, which is powered by the building power with a battery backup. However, in many single family detached and smaller multiple family housings, a smoke alarm is often powered only by a single disposable battery.

In the United States, the National Fire Protection Association estimates that nearly two-thirds of deaths from home fires occur in properties without working smoke alarms/detectors.

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WORKING PRINCIPLE

An LPG gas is a versatile fuel used in homes, but the leakage of LPG gas could lead a disaster. To aware of LPG gas leakage and avoid any mis happening there are different products to notice the leakage. Here we have designed an 8052 microcontroller based LPG detector circuit. Whenever LPG gas leakage occurs,then this system notices and gives an alert through the buzzer which is attached to the circuit. The entire system is easy to design who have some basic knowledge of electronics and programming, The proposed system uses an LPG gas sensor to sense LPG gas when LPG gas leakage occurs. We have used an LPG gas sensor module to detect LPG Gas. When LPG gas leakage occurs, it gives a HIGH pulse on its P1^0pin. When the microcontroller board gets a HIGH pulse from a gas sensor then it displays a message LCD display and activates buzzer which is connected to P0^0 to generate beep sound and starts the exhaust fan through relay which is connected to P0^1pin of microcontroller. When an LPG gas sensor gives a LOW pulse to microcontroller board, then the display shows "no gas leakage" message on LCD.

DC MOTOR

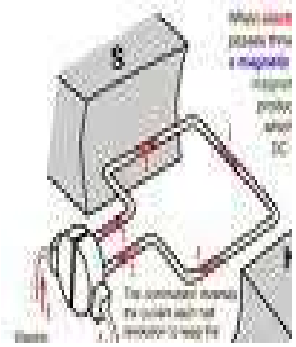
WORKING PRINCIPLE OF A DC MOTOR

A DC motor is an electric motor that runs on DC electricity. It works on the principle of electromagnetism. A current carrying conductor when placed in an external magnetic field will experience a force proportional to the current in the conductor.

OPERATION OF A DC MOTOR

There are two magnetic fields produced in the motor. One magnetic field is produced by the permanent magnets and the other magnetic field is produced by the electrical current flowing in the motor windings. These two fields result in a torque which tends to rotate the rotor. As the rotor turns, the current in the windings is commutated to produce a continuous

Torque output this makes the motor to run.



Arduino software

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The Arduino Uno can be programmed with the Arduino software. Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board).For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes preburned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).We can also bypass the boot loader and programs the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an .information file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a library to simplify use of the I2C bus.

RESULT

INTODUCTION

Our effort to design the pathfinder robot system results in a versatile robot that has demonstrated several surveillance applications successfully. Since the mechanical assembly is robust. It can work well in the critical conditions. It is useful in military application, Geographical survey. Due to the use of only two motors robot can be moved in all direction. Since it uses 6V, 4.5AH battery it can work for longer duration.

FUTURE DEVELOPMENTS

The speed of vehicle can be increased using high torque dc motors and reducing the weight of assembly with the help of nickel-cadmium batteries. Our system employs analog video transmission techniques and can be received by any ordinary receiver. Therefore for security reason we have to switch over to digital transmission along with encryption. For wide range of application GPS (Global Positioning System) technology can be used effectively in place of IR module.

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