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IOT Based Fire Fighting Robot

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Abstract: *Fire incident is a disaster that can potentially cause the loss of life, property damage and permanent disability to the affected victim. They can also suffer from prolonged psychological and trauma. Fire fighters are primarily tasked to handle fire incidents, but they are often exposed to higher risks when extinguishing fire, especially in hazardous environments such as in nuclear power plant, petroleum refineries and gas tanks. They are also faced with other difficulties, particularly if fire occurs in narrow and restricted places, as it is necessary to explore the ruins of buildings and obstacles to extinguish the fire and save the victim. With high barriers and risks in fire extinguishment operations, technological innovations can be utilized to assist firefighting. Therefore, this paper presents the development of a firefighting robot dubbed that can extinguish fire without the need for fire fighters to be exposed to unnecessary danger..*

Keywords: Robot, Fire fighting

I. INTRODUCTION

Fire is a classical element that has been an equalizer on Earth prior to the start of written history. It has many positive attributes (heat, energy, cleansing, etc.) but it can be extremely dangerous when outside of control. Thankfully, brave men and women have dedicated their lives to protecting others from flames that can occur due to a myriad of reasons anywhere, at any time. Unfortunately, firefighters are only human and can succumb to injury or death as well. Fire spreads rapidly if it is not controlled. In case of a gas leakage there even may be an explosion. This firefighting robotic system is powered by Arduino Uno development board it consists of the HC-SR04 ultra-sonic sensor mounted on a servo motor for obstacles detection and free path navigation, it is also equipped with the fire flame sensor for detecting and approaching fire it also makes use of water tank and spray mechanism for extinguishing the fire. Water spraying nozzle is mounted on servo motor to cover maximum area. Water is pumped from the main water tank to the water nozzle with the help of 12V pump.

1.1 Necessity of IoT Based Firefighting Robot

This model is an IOT based firefighting robot that detects fire. After being informed the authorities can start visualizing the fire location and can communicate with people stuck with a help of an automatic receiver installed. The main function of this robot is to become an unmanned support vehicle, developed to search and extinguish fire. There are several existing types of vehicles for firefighting at home and extinguish forest fires. Our proposed robot is designed to be able to work on its own or be controlled remotely.

1.2 Need of Project/ Problem Statement

Recently, it has sometimes been impossible for fire-fighting personnel to access the site of a fire, even as the fire causes tremendous property damage and loss of human life, due to high temperatures or the presence of explosive materials. In such environments, fire-fighting robots can be useful for extinguishing a fire. Thus, Fire-fighting robots are operated in places where fire fighters are unable to work. Besides that, firefighting robot can be used for protecting fire fighters from extreme danger in petrochemical, chemical dangerous product, toxicity or exploder fire accidents. Therefore, it also can reduce the human injury from a fire burning

II. LITERATURE SURVEY

In today's era firefighting is a dangerous issue. Many authors are working on different techniques for firefighting. Author Ratnesh Malik et al. has developed an approach towards firefighting robot. The robot is designed and constructed which is able to extinguish fire. The robot is fully autonomous. It implements the concept likes environmental sensing and awareness,

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proportional motor control. The robot processes information from its sensors and hardware elements. Ultraviolet, Infrared and visible light are used to detect the components of environment. The robot is capable of fighting tunnel fire, industry fire and military applications are designed and built. Ultraviolet sensors are used to detect fire. The robot provides security at home, buildings, factory and laboratory.

III. DEFINITION OF PROJECT

A project program is any undertaking, carried out individually or collaboratively and possibly involving research or design that is carefully planned usually by a project team but sometimes by a project manager or by a project planner to achieve a particular aim.

An alternative view sees a project managerially as a sequence of events: a "set of interrelated tasks to be executed over a fixed period and within certain cost and other limitations". A project may be a temporary social system, possibly staffed by teams to accomplish particular tasks under time constraints.

3.1 Hardware Requirements

- Microcontroller board (ARDUINO)
- Power supply
- DC Motor
- Lithium-ion battery
- Water pump
- Flame sensor
- Motor driver
- Relay module
- Bluetooth module

3.2 Software Requirements

- Arduino IDE Software
- Embedded system
- Multiple languages C or C++

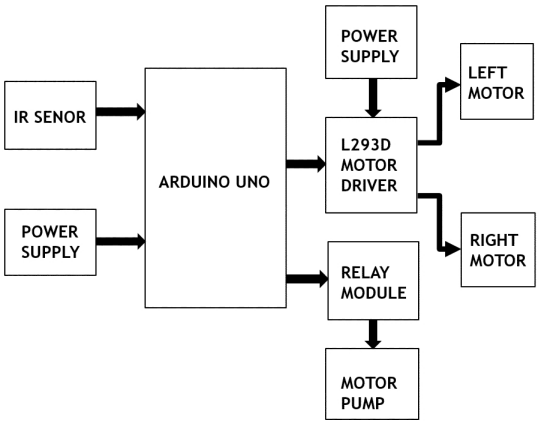

Figure 1: Block diagram of proposed system

3.3 Component Description

A. Arduino Uno

- The Arduino Mega is a microcontroller board based on the ATmega328p.
- It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 Analog inputs, 4 UARTs (hardware serial ports), a 16 MHz Crystal oscillator, a USB connection, a power Jack, an ICSP header, and a reset button.

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- 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.

Figure 2: Arduino uno

B. Relay Module

Relay module consists of six pins such as normally open pin, normally closed, common, signal, Vcc and ground pins. Signal Pin. It is used to control the relay. This pin can be active low or active high. In case of active low, the relay will activate when we apply an active low signal to the signal pin.

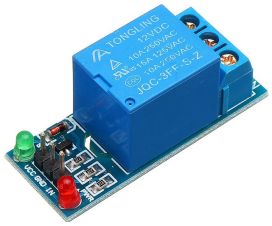

Figure 3: Relay Module

C. Bluetooth Module

HC-05 Pinout, Datasheet, Features & Projects. HC05 is a Bluetooth module, works on Serial Protocol (RX/TX) for sending and receiving data. We have also designed Bluetooth Library for Proteus, which will help you in simulating this Bluetooth Module in Proteus software.

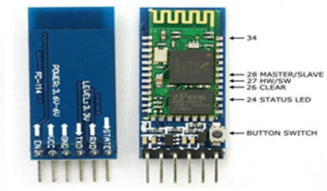

Figure 4: Bluetooth Module

D. Motor Driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

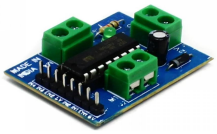

Figure 5: Motor Driver

E. Temperature Sensor (Infrared Sensor)

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor.

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Figure 6: Temperature Sensor

F. Pump

A pump is a device that is used for lifting the liquid from ground sources to the upper top surface or from one place to another place. Pumps are operated by the mechanism that is rotary, reciprocating and it consumes energy while performing mechanical work which is moving fluid from one place to another.

Figure 7: Pump

G. Lithium-Ion Battery

A lithium-ion battery is a type of rechargeable battery composed of cells in which lithium ions move from the negative electrode through an electrolyte to the positive electrode during discharge and back when charging.

Figure 8: Lithium-ion battery

H. DC Motor

A DC motor is an electric motor that runs on direct current power. In an electric motor, the operation is dependent upon simple electromagnetism. A current-carrying conductor generates a magnetic field, when this is then placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field.

Figure 9: DC Motor

3.4 Advantages

1. Completely replaces the human effort of putting of the fire.
2. IoT temperature sensors also outweigh traditional smoke detectors by detecting ignited fires much faster – even before they emit smoke.
3. The Robot performs well in manual and automatic mode.

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3.5 Limitations

The equipment used in this system are costly and so the basic cost is higher.

3.6 Application

- IOT based firefighting system using arduino can be used in Chemical Factories, Shopping Malls, local shops, Educational institutes, Parking Areas, Companies etc.
- The robot could be owned in any environment where humans cannot go and put off the fire

3.7 Flow Chart

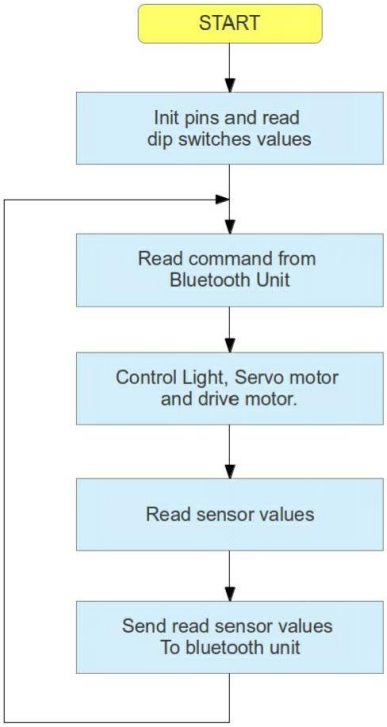

Figure 10: Flow chart of proposed system

3.8 Circuit Diagram

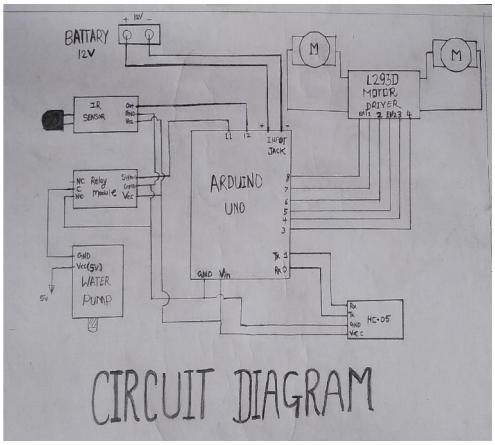

Figure 11: Circuit Diagram

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IV. RESULTS

Integrating all the hardware component with controller.

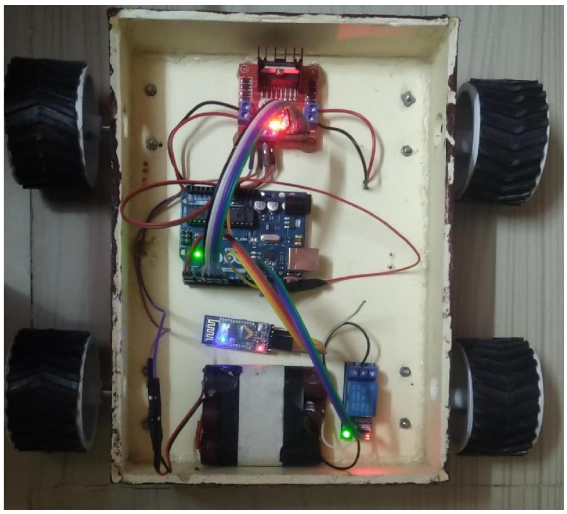

Figure 12: Integration of hardware.

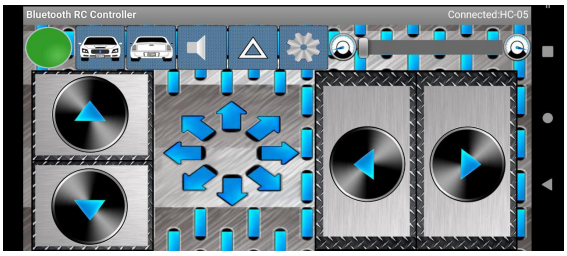

Figure 13: Bluetooth controller.

V. CONCLUSION

- This system offers a real opportunity for fire surveillance and control
- It has low operating power requirements
- It has quick response time
- It is not very expensive

VI. FUTURE SCOPE

1. In future, the proposed idea can be extended by using various sprinklers to put off the fire automatically based on the type of fire occurred.
2. It can also be enhanced to send alerts to the user or owner of the place about the reason for the fire accident based on the gas from the fire using gas detectors.
3. By implementing the above mentioned ideas the system becomes fully automated and the user also is alerted by the robot about the fire place

VII. ACKNOWLEDGEMENT

We would like to thank all who have helped us in completing this project. We would like to thank our guide and H.O.D of ECE Department, Sanjivani College of Engineering, Kopargaon for providing us an opportunity to work on project “IOT Based Fire Fighting Robot”.

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