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IoT Based Fire Fighting Robot

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Abstract

In today's world sometimes when fire accidents occur it is difficult for the fireman to access the place of fire and extinguish it. Also it is difficult to monitor such hazards, since human beings find difficulty in accessing these places. This job could be done with the help of robots. These robots have the capability to detect and extinguish fire automatically .These robots are based on IoT and has flame sensor to detect the fire. The movement of robot is controlled by gear and motor driver. The communication is done with Arduino ATmega258 microcontroller and IoT device. The robot also has the capability to detect obstacles which comes across its path. It can send live updates to webpage by means of IoT device.

Keywords: Internet of Things (IoT), Obstacle avoidance, L293D driver, Water sprinkler, Web alert.

1. Introduction

In current world scenario communication between everyday objects is done by the use of microcontrollers. Many smart devise assist human being in their day to day activities. These devices perform work cost effective and also efficiently. Now comes the use of robots which are used in dangerous places[1] like bomb detection in aeronautical applications, chemical industries, etc, Our aim of this paper to design such a robot which would detect and extinguish fire where human beings are not accessible.

2.Proposed System

This proposed system can detect and extinguish fire on its own. If fire in a place is not detected in its early stage it would spread rapidly. If this place is a gas prone area it may lead to an explosion. Hence the fireman who are normally involved in this process may lose their lives ,Therefore the purpose of fire fighting robot[3] is that it would sense the fire using ultrasonic sensor and flame sensor , extinguish it using water by means of the water spraying mechanism. IoT plays a role of monitoring and sends the identified fire detected details to the cloud server.[2]

3. Methodolgy

The methodology can be explained in two sections. The first section is about hardware implementation. The second section is about design structure of the proposed system.

3.1. Hardware Description

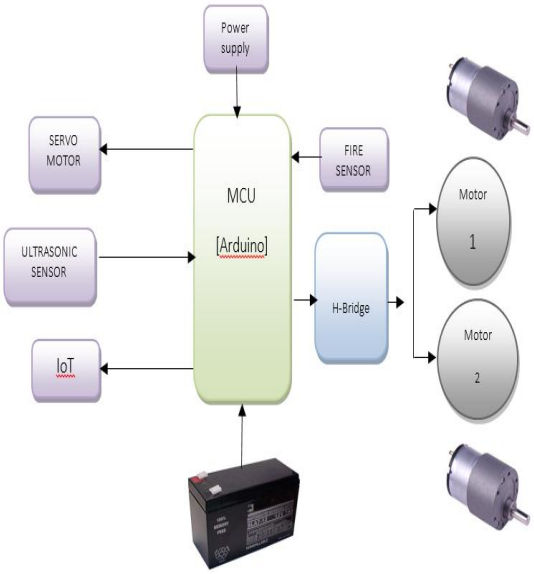

Fig.1.Block Diagram

3.1.1.ARDUINO -MICROCONTROLLER-ATMEGA258

The Arduino Board is basically a microcontroller. Various I/O pins, a quartz crystal a power point ,a point for USB connection is found in this board. This board can be connected to battery or adapter to make it start functioning. Various Digital I/O and Analog I/O pins are also available in this board[4]

Fig.2.Arduino Microcontroller

3.1.1..1 Pin Functions

The Flash memory chips can be connected to pin numbers 6-11.Attaching and Detaching the interrupt functions can also be done. The Change, Rising and Falling are the various Arduino Interrupt types.

3.1.1.2 DC Motor

While we construct a robot the important thing is that robot has to be made to move over the ground.We can either use a DC Motor or Stepper Motor[7,8] for this purpose.When DC Motor interfaced with

microcontroller there are as many things which can be done. For this only a Driver IC is used to perform all these functions.

Fig.3. DC Motor and Wheels.

"H-Bridge" resembles the formation of the switching circuit which will control the movement of the motor.

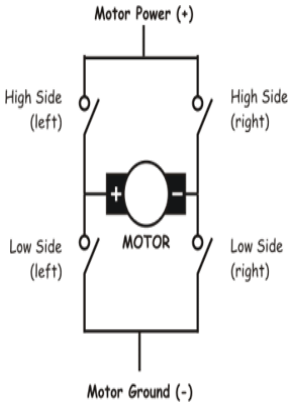

Fig.4. H-Bridge of Dc Motor.

3.1.1.3 L293D Motor Drive

This motor drive is a dual H Bridge motor driver.

Two number of DC motors which can run in clockwise and anti-clockwise direction can be controlled using this motor driver[9].

Pinout:

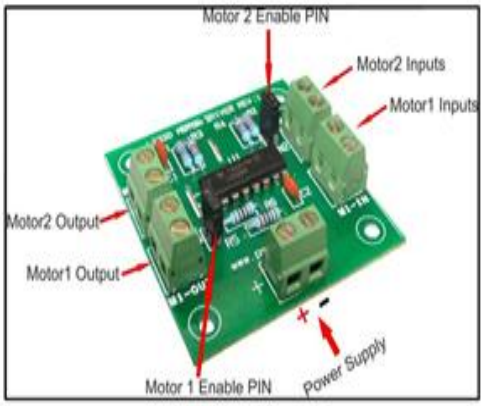

Fig.5 L293DMotor Drive

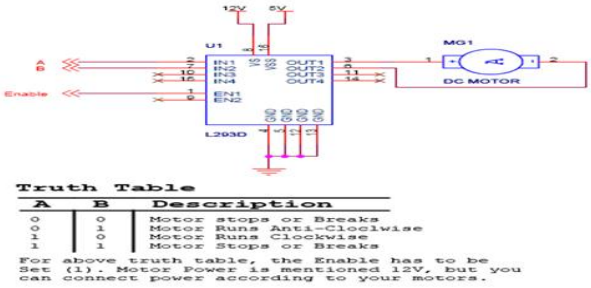

Fig 6 Interfacing DC Motor with L293D

3.1.1.4 LCD Display

One of the commonly used electronic display module is Liquid Crystal Display. Its Pin diagram is given in next section.It can be employed for many applications. Cost wise its low but it can be programmed according to our application.

3.1.1.5. Pin Diagram

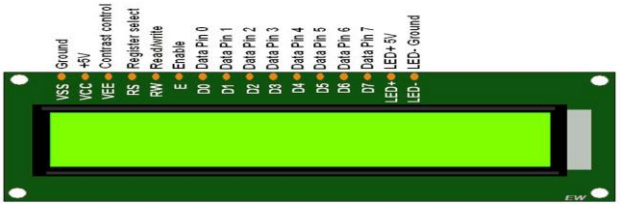

Fig.7 Pin Diagram of LCD

3.1.1.6 Flame Sensor

The presence of flame can be identified using a flame sensor[5] . Light can also be detected using this flame sensor The detection distance is ranging from 50 to 100 cm. The Flame sensor is possible of giving output in the form of analog or digital signal.

Fig 8 Flame Sensor

3.1.1.7 Ultrasonic Sensor

Ultrasonic transmitter and Receiver is placed in the front of the module like two eyes. An ultrasonic wave is transmitted by this transmitter, when an object comes in between the wave gets reflected back and received by the receiver module.

Fig.9.Ultrasonic Sensor

3.1.1.8 IoT Device

The is a low cost IC which are being allowed to connect to the internet[6].

Fig.10.IoT Device-ESP8266

3.1.1.9 Battery

Here for this model lead acid battery is. being used The charge time is 12–16 hours. Lead acid battery cannot be charged as quickly as other battery systems.

3.2. Software Used in the proposed system

3.2.1.Arduino IDE

Step 1:First the ARDUINO IDE software is opened.Step 2**:**After opening the software write the code on the editor windowStep 3**:** File→preference tick the compilation option for generating .hex file.Step 4**:**After written the code click verify for compiling.Step 5**:**After compiling, the window it indicated

3.2.2.Proteus Simulation Software

Proteus PCB Design is being done with this simulation software .Simulation of the electronic circuits is being done using the above software.

4. Results

The after effect of fire in any place is very dreadful and human lives, property are being damaged. When robots are used to find the fire it reaches the place successfully though obstacles are in its path. Hence this proposed model can be developed into a fire fighting robot which can access the dangerous place of fire. This fire fighting robot paves a way for a chance for automation and will do the job successfully.

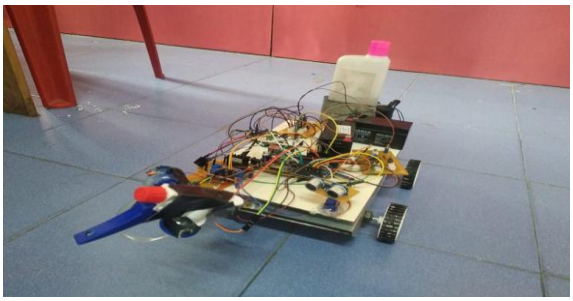

Fig.11.The Robot under Normal Condition

Fig.12.The Robot when finds an Obstacle, working of Ultrasonic Sensor

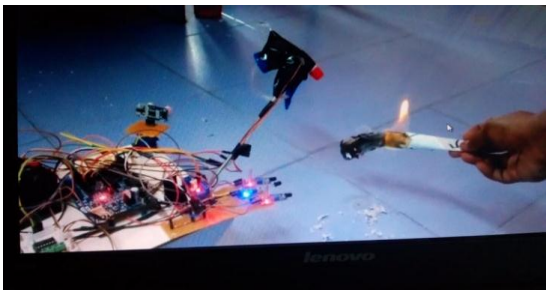

Fig.13.The Robot when finds fire , working of Flame Sensor

Fig.14 Output for IoT in web message

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