FIRE FIGHTER ROBOT

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ABSTRACT : *Most of the fire accidents occurring in industries like nuclear power plants, petroleum refineries, gas tanks, chemical factories and other large-scale fire industries resulting in quite serious consequences. With the advancement in the field of Robotics, human intervention is becoming less every day and robots are used widely for purpose of safety. Fire-fighting is an important but dangerous occupation. A fire-fighter must be able to reach the situation quickly and safely extinguish the fire, preventing further damage and reduce fatalities. Technology has come to rescue this issue, firefighters and machines are now having more efficient and effective method of firefighting. This paper gives you the design idea of firefighting robot using autonomous operation. The robotic vehicle is loaded with fire extinguisher and a water pump which is controlled over valve to throw water. An Arduino UNO is a microcontroller is used for the desired operation.*
***Keywords*—** Aurdino, Microcontroller, Sensors, water tank and fire extinguisher

I.INTRODUCTION

Now a days mobile robots are very useful in construction sites, warehouses and manufacturing plants. Mobile robots can also be used in material handling applications which applications are growing day by day. For analyzing different items and for handling materials mobile robots can be used. Wireless navigation is also possible for movements of mobile robot, can be controlled through android. Fuzzy logic control mechanism is used to control robot. That model does not need any mathematical model controlling. Previously Fire Fighting Robots were controlled by using different electronics devices. But this reduces the scope of control of fire fighting robot. However, with the advanced techniques we can build the same robot by using android application to control the actions of the robot. With the help of such robots, fireman's work really decreased and movements of robot are so much effective.

II.LITERATURE SURVEY

Kristi Kokasih, et al [1]: has developed intelligent fire fighting tank robot. Tank robot is made from acrylic, plastic, aluminum and iron. Robot components are two servo motors, two DC motors, ultrasonic sensor, compass sensors, flame detector, thermal array sensor, white detector (IR and photo transistor) ,sound activation circuit and micro switch sensor. The objective is to search certain area, find and extinguish the flame for different flame positions, room configuration with disturbance. Robot is activated through DTMF transmitter and receiver.

H.P. Singh, et al [2]: The paper describes the construction and design of mobile fire fighting robot. The system contains two optically isolated D.C. motors. Robot performs analog to digital conversion of the data provided by infrared sensors. Five infrared sensor are used. Two sensors control the motion of the robots and three are for flame detection. The extinguisher comprises of D.C water pump and a water container. The basic theme of the paper is to sense the flames of fire and extinguish it. For this infrared sensor is used as input sensor which senses the infrared rays coming out of the fire. The microcontroller controls the extinguishing system.

Swati Deshmukh, et al [3]: It comprises of machine which has ability to detect fire and extinguish it. The fire fighting robot can move in both forward and reverse direction and can turned in left and right directions. Thus fire fighter can operate the robot over a long distance and there is no need for human near the area on fire. Light dependent resistors are used for detection of fire. These resistors are highly sensitive devices and are capable of detecting very small fire. The robot provides security

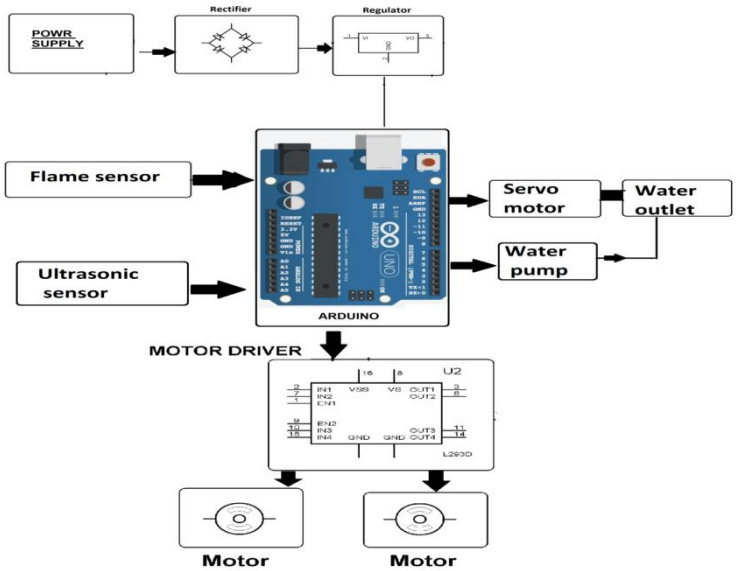
at home, buildings, factory and laboratory. It is an intelligent multisensory based security system which contains fire fighting system in daily life.

Lakshay Arora, et al [4]: consist of mobile phone which controls a robot by making a call to the mobile phone which is attached to the robot. During the call activation period, if any button is pressed on the phone, the tone corresponding to the button pressed is heard at the other end of the call that is placed on the robot. The robot perceives Dual-Tone Multiple-Frequency (DTMF) tone with the help of phone mounted on the robot. The received code is processed by the microcontroller and then the robot performs actions accordingly.

Arpit Sharma, et al [5]: Various techniques of Human Machine interaction using gestures are presented. Gestures are captured by using the accelerometer. The paper analyses the motion technology to capture gestures using an android smart phone which has inbuilt accelerometer and Bluetooth module to control kinetics of the robot.

III.METHODOLOGY & BLOCK DIAGRAM

The structure of fire distinguisher robot is shown in Fig. 1 and Fig. 2 Fig. 1. 3D Structure of QRob with Dimension. B. Hardware Implementation The electronic part is one of the vital parts in the development of QRob. It includes the several types of sensors, microcontroller, DC motor with wheel, Transmitter and Remote control and Water pump. Fig. 3 shows the block diagram of the QRob operation which consists of flame sensor and ultrasonic sensor as input of the system. Arduino Uno is used as a microcontroller that connected with other components. Motor Driver (L298N) is used to activate the moving of the gear motor while Transmitter Remote Control will give output of the system. Flow of water and fire extinguisher were pump after being controlled by the operator. On the other hand, the operator can monitor the robot movements by using camera (Go Pro) which connects to a smartphone. Fig. 2. Firefighting Robot (QRob). 1) Flame sensor: In most firefighting robots, fire sensors perform an essential part in investigations, which are always used as robot eyes to discover sources of fire. It can be utilized to identify fire based on wavelength of the light at 760 nm to 1100 nm. The detection angle and distance are roughly 60 degrees and distance 20 cm (4.8V) to 100 cm (1V) respectively. Flame sensor has two signal pins that are Digital Output (DO) and Analog Output (AO). DO pins will give two kind of information that it's has flame or non-flame while AO pins will detect exact wavelength of different light.



FIRE SENSOR:

The Fire sensing element, because the name suggests, is employed as a straightforward and compact device for cover against hearth. The module makes use of IR sensing element and comparator to sight kindle to a spread of one metre. The device, deliberation regarding five grams, is often simply mounted on the device body. It offers a high output on police investigation hearth. This output will

then be wont to take the requisite action. AN on-board crystal rectifier is additionally provided for visual indication.

Pin Configuration:

The figure to the aspect is that the prime read of the fireplace sensing element. Following is that the pin description with pin one being the right

RELAY :

Relay could be an important device currently days. They're utilized in varied circuits and lots of people have drawback of a way to use a relay. With the assistance of this text I actually have tried to clarify 2 things.

1.Operation of relay

2.The way to use a relay

As we all know relay could be a device that is employed to supply association between 2 or a lot of points or device in response to the sign applied. In another words relay offer isolation between the controller and therefore the device as we all know devices may go on AC yet as on DC. However, they receive signals from microcontroller that works on DC thus we have a tendency to need a relay to bridge the gap. Relay is very helpful after you have to be compelled to management an outsized quantity of current or voltage with tiny electrical signal.

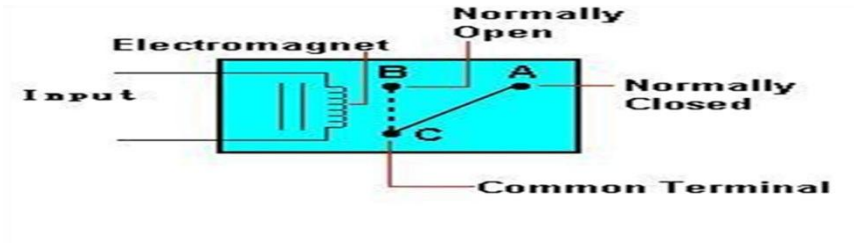


Fig:10 Fire Sensor

SOFTWARE IMPLEMENTATION:

Proteus:

Proteus is code for semiconductor device simulation, schematic capture, and circuit board (PCB) vogue. It's developed by science lab centre natural science.

The X Game Station little Edition was designed victimization PCB layout tools and Proteus schematic entry.

System parts

ISIS Schematic Capture - a tool for stepping into designs.

PROSPICE Mixed Mode SPICE Simulation – business traditional SPICE3F5 machine combined with a digital machine.

ARES PCB Layout – PCB vogue system with automatic half deposit, rip-up and hear auto-router and interactive vogue rule checking.

VSM – Virtual System Modelling lets co-simulate embedded code for well-liked micro-controllers aboard hardware vogue.

System edges integrated package with common interface and completely context sensitive facilitate.

PROTUES combines advanced schematic capture, mixed mode SPICE simulation, PCB layout and car routing to form a full electronic vogue system

The PROTUES product varies put together includes our revolutionary VSM technology to perform the system desired task.

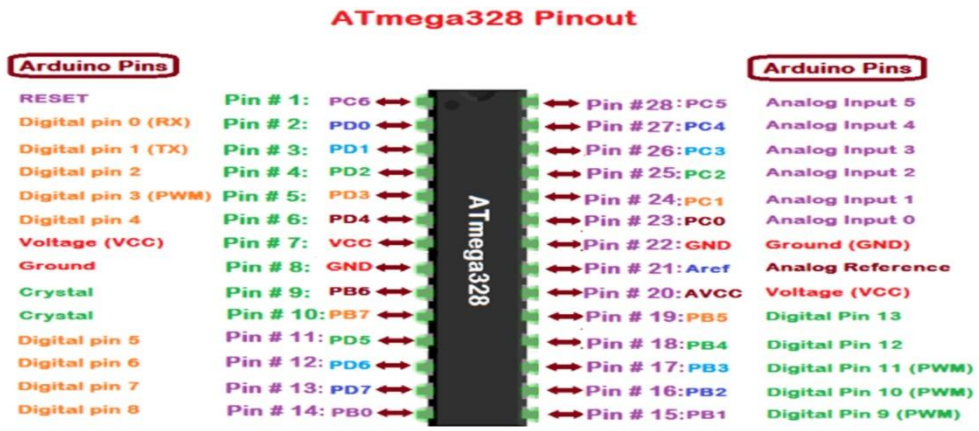
Intelligent Schematic Input System (ISIS):

ISIS lies right at the heart of the PROTUES system and is far over merely another schematic package. It's powerful setting to manage most aspects of the drawing look. whether or not or not your demand is that the speedy entry of difficult vogue for simulation & PCB layout, or the creation of participating Schematic for publication ISIS is that the correct tool for the work Product.

IV.COMPONENTS

MICRO CONTROLLER:

A microcontroller is a tiny, affordable and self-contained computer-on-a-chip which will be used as an embedded system. It's a pc on-a-chip optimized to manage electrical gadgets. It is meant significantly for specific tasks like an exact system. A microcontroller is often abbreviated as µC, or MCU. Also, a micro-controller could be a fraction of a set in system that is essentially a whole card. A fixed-in system could be a computing system supposed to hold out one or a lot of functions over and all over again with real-time estimate limits.



BATTERY :

The lead–acid battery was invented in 1859 by French physicist Gaston Planté and is the oldest type of rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, makes it attractive for use in motor vehicles to provide the high current required by automobile starter motors.

DC MOTOR:

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homoploid motor (which is uncommon), and the ball bearin motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.

DC SUMERSIBLE PUMP:

The submersible pumps used in ESP installations are multistage centrifugal pumps operating in a vertical position. Although their constructional and operational features underwent a continuous evolution over the years, their basic operational principle remained the same. Produced liquids, after being subjected to great centrifugal forces caused by the high rotational speed of the impeller, lose their kinetic energy in the diffuser where a conversion of kinetic to pressure energy takes place. This is the main operational mechanism of radial and mixed flow pumps.

V.SOFTWARE(ARDUINO)

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals- has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open- source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Purpose Of This Arduino:

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community. There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Net media's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality.

VI.EXPERIMENTALWORK

The electronic part is one of the vital parts in the development of QRob. It includes the several types of sensors, microcontroller, DC motor with wheel, Transmitter and Remote control and Water pump. Fig. 3 shows the block diagram of the QRob operation which consists of flame sensor and ultrasonic sensor as input of the system. Arduino Uno is used as a microcontroller that connected with other

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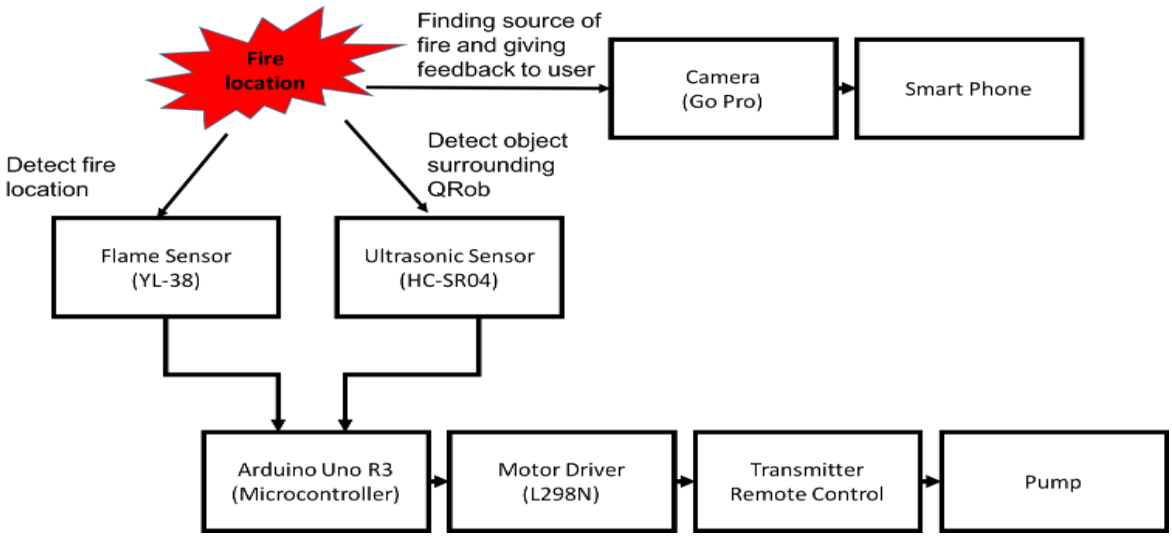

Fig 1. Block Diagram of QRob

CONCLUSIONS

Proposed approach of modular design strategy was a good solution in implementing the fire fighting robot to help people at the critical condition. The proposed robot can move in forward, backward, left, right and can stop also. It reduces human efforts and protect their property. Robot detects fire and extinguish the fire with the help of sprinkler pump. For extinguishing that fire robot has to reach upto there and it moves towards the target with the obstacle avoidance property. In this way robot can detects obstacle and avoid them also.

FUTURE SCOPE

This project has been motivated by the desire to design a system that can detect fires and intervention. In the present condition it can extinguish fire only in the way and not in all the rooms. It can be extended to a real fire extinguisher by replacing the fan by a carbon-di-oxide carrier and by making it to extinguish fires of all the room using microprogramming. This provides us the opportunity to pass on to robots tasks that traditionally humans had to do but were inherently life threatening. Fire-fighting is an obvious candidate for such automation. Given the number of lives lost regularly in firefighting, the system we envision is crying for adoption. Of course, this project has only scratched the surface. As in the design simplifications and the implementation constraints in suggest, our project is very much a proof-of-concept. In particular, a practical autonomous fire-fighting system must include a collection of robots, communicating and cooperating in the mission; furthermore, such a system requires facilities for going through obstacles in the presence of fire, and ability to receive instructions on-thefly during an operation. All such concerns were outside the scope of this project.

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