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An Intelligent Fire Fighting Robot using WSN

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ABSTRACT: Increasing human population and technological development has lead to increase in fire accidents and hazards. Adverse conditions and physical limitations of human being make fire extinguishing challenging and demanding task. Fire extinguishing is very risky task and it may involve loss of life. Robotics is the emerging solution to protect the surrounding and human lives. Fire extinguishing robot is a hardware model which can be used for extinguishing the fire during fire accidents. It can reduce the errors and limitations faced by the humans during fire extinguishing task. Our designed robot can search the area, locate the fire and extinguish fire before it rages out of control. Our proposed robot can efficiently extinguish any kind of fire in any geographical location. It is able to navigate the building while actively scanning for the flame. It can send various data from the sensor to the display and can be operated wirelessly by any person from safest distance from fire. With the help of Internet of Things, it can send alert and notifications to the user about the status of the fire. The robot which we have proposed in this paper found its application in fire extinguishing operations during fire accidents where the possibility of the servicemen to enter the fire prone area is very less.

KEYWORDS: Firefighting robot, Flame sensor, Remote control.

I. INTRODUCTION

Fires are the most important aspects of all these problems. Robot industry is available and has a lot of work in this area. Some of the industries are to be fixed mobile robots with different features, structures and which are equipped with different sensors that detect before the fire is out. These robots are used for the fire extinguishers by various sensors. In the history of the world, accidents from the fire are alarming and devastating. From the service, we ensure that damage to the fire accident we will find that it both cost life and wealth. So, to prevent this kind of accident or to save the lives, fire extinguisher robots will play a vital role. Another thing is that the rescuers of this accident have a great risk of their lives when they rescue the victims. The place of the fire accident is so much important because if the fire occurs in the place of chemical mills or garments or gas and petrol stations, it not only affects the particular area but also affects the area around. This type of accident also costs a huge life and a polluted environment. Fire accidents in garments area cost the most damage in present time. So, at that time we should not rely on humans to save us from fire that is the reason we built a robot that can sense the fire and extinguish it at the same time. Our project is not only sensing but also extinguishes the fire at the same time. Basically, we made this robot in a sense of monitoring the whole area around it, and if fire occurred then it will reach that point by sense the fire and try to extinguish it. Another interesting part of this robot is that it will work both day and night mode. The remote control part will help us to find out the exact location of the fire. The interesting feature of this robot is it has a visual system by which we can visualize what is happening around the robot and what action we should provide to extinguish the fire. A robot is an automated device which performs functions usually attributed to humans or machines tasked with repetitive or flexible set of actions.

Numerous studies have shown that robot can be beneficial in medicine rehabilitation, rescue operation and industry. Over the years, robotics has been introduced in various industries. The industrial robots are multi-function manipulators designed for more specialized materials, divisions, gadgets or devices through various programmatic movements to

perform various tasks. In line with the Fourth Industrial Revolution (4IR), there is demand for a one system that can control, communicate and integrate different robots regardless of their types and specifications. Machine learning has also heated up interest in robotics, although only a portion of recent development in robotics can be associated with machine learning. Recent robotic development project has embedded machine learning algorithms to increase the intelligence in robots. This will increase the productivity in industry while reducing the cost and electronic waste in a long run. Studies on the use of humanoid robots are actively carried out to minimize firefighters' injuries and deaths as well as increasing productivity, safety, efficiency and quality of the task given. Robot can be divided into several groups such as Tele-robots, Telepresence robots, Mobile robots, autonomous robots and Androids robots. Telepresence robot is similar to a tele-robot with the main difference of providing feedback from video, sound and other data. Hence, telepresence robots are widely used in many fields requiring monitoring capability, such as in child nursery and education, and on improving older adult's social and daily activities. Mobile robot is designed to navigate and carry out tasks with the intervention of human beings. Meanwhile, autonomous robots can perform the task independently and receive the power from the environment, as opposed to android robots which are built to mimic humans.

II. PROPOSED SYSTEM

It is impossible to extinguish fire and rescue many victims at a time of huge disaster. The accidents from the fire are alarming and devastating. From the service, we ensure that damage to the fire accident we will find that it both cost life and wealth. So, to prevent this kind of accident or to save the lives, fire extinguisher robots will play a vital role. Another thing is that the rescuers of this accident have a great risk of their lives when they rescue the victims. The place of the fire accident is so much important because if the fire occurs in the place of chemical mills or garments or gas and petrol stations, it not only affects the particular area but also affects the area around. This type of accident also costs a huge life and a polluted environment. Fire accidents in garments area cost the most damage in present time. So, at that time we should not rely on humans to save us from fire that is the reason we built a robot that can sense the fire and extinguish it at the same time. Our project is not only sensing but also extinguishes the fire at the same time. Basically, we made this robot in a sense of monitoring the whole area around it, and if fire occurred then it will reach that point by sense the fire and try to extinguish it. Another interesting part of this robot is that it will work both day and night mode. The remote control part will help us to find out the exact location of the fire. The interesting feature of this robot is it has a visual system by which we can visualize what is happening around the robot and what action we should provide to extinguish the fire.

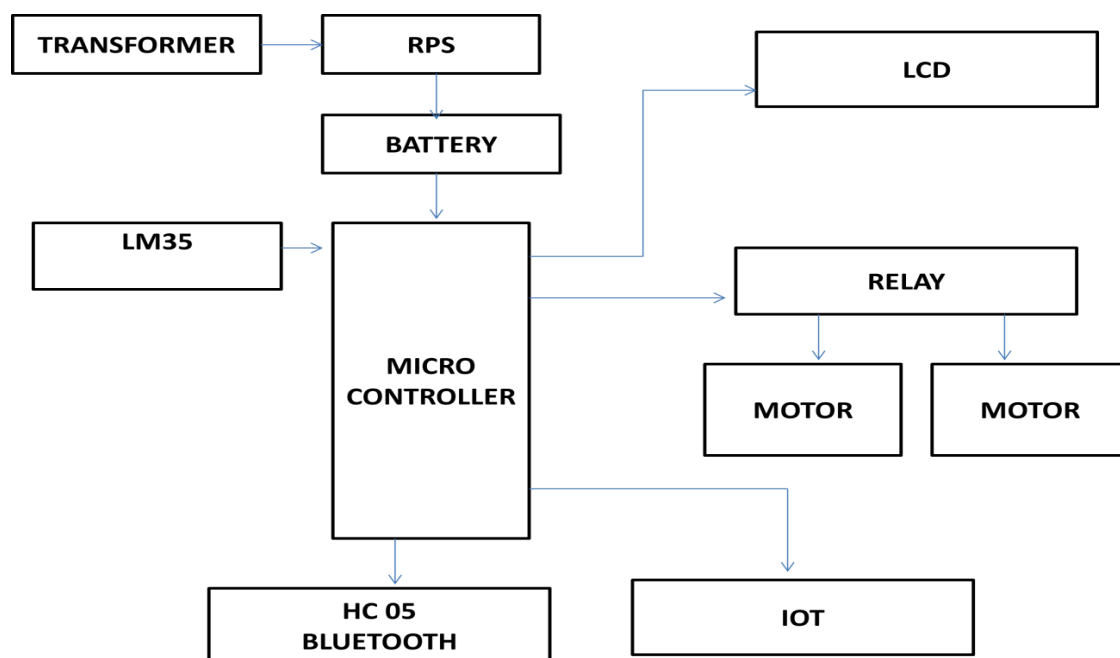


Fig.1. Block Diagram of the proposed system

A. Power Supply

A power supply (sometimes known as a power supply unit or PSU) is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. All digital circuits work only with low DC voltage. A power supply unit is required to provide the appropriate voltage supply. This unit consists of transformer, rectifier, filter and a regulator. AC voltage typically of 230Vrms is connected to a transformer which steps that AC voltage down to the desired AC voltage level. A diode rectifier then provides a full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage. This resulting DC voltage usually has some ripple or AC voltage variations. Regulator circuit can use this DC input to provide DC voltage that not only has much less ripple voltage but also remains in the same DC value, even when the DC voltage varies, or the load connected to the output DC voltage changes. The main components used in the power supply unit are Transformer, Rectifier, Filter and Regulator.

B. Transformer

Transformer is a device used either for stepping-up or stepping-down the AC supply voltage with a corresponding decreases or increases in the current. Here, a transformer is used for stepping-down the voltage so as to get a voltage that can be regulated to get a constant 5V.

C. Rectifier

A rectifier is a device like semiconductor, capable of converting sinusoidal input waveform units into a unidirectional waveform, with a nonzero average component.

D. Filters

Capacitors are used as filters in the power supply unit. The action of the system depends upon the fact, that the capacitors stores energy during the conduction period and delivers this energy to the load during the inverse or non- conducting period. In this way, time during which the current passes through the load is prolonged and ripple is considerably reduced.

E. Battery

A lead-acid storage battery is an electrochemical device that produces voltage and delivers electrical current. The battery is the primary "source" of electrical energy used in vehicles today. It's important to remember that a battery does not store electricity, but rather it stores a series of chemicals, and through a chemical process electricity is produced. Basically, two different types of lead in an acid mixture react to produce an electrical pressure called voltage. This electrochemical reaction changes chemical energy to electrical energy and is the basis for all automotive batteries.

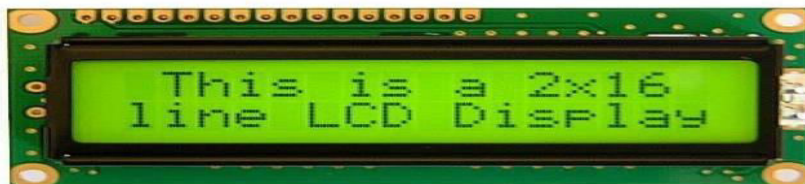
F. LCD Display

Fig.2.LCD Display

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube (CRT) displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma display, and since they do not use phosphors, they cannot suffer image burn-in. LCDs are more energy efficient and offer safer disposal than CRTs. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. It is an electronically-modulated optical device made up of any number of pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in

color or monochrome. The earliest discovery leading to the development of LCD technology, the discovery of liquid crystals, dates from 1888. By 2008, worldwide sales of televisions with LCD screens had surpassed the sale of CRT units.

G.Relay Driver

A relay driver circuit is a circuit which can drive, or operate, a relay so that it can function appropriately in a circuit. The driven relay can then operate as a switch in the circuit which can open or close, according to the needs of the circuit and its operation. In this project, we will build a relay driver for both DC and AC relays. Since DC and AC voltages operate differently, to build relay drivers for them requires slightly different setup. We will also go over a generic relay driver which can operate from either AC or DC voltage and operate both AC and DC relays. All the circuits are relatively simple to understand.

III. SIMULATION

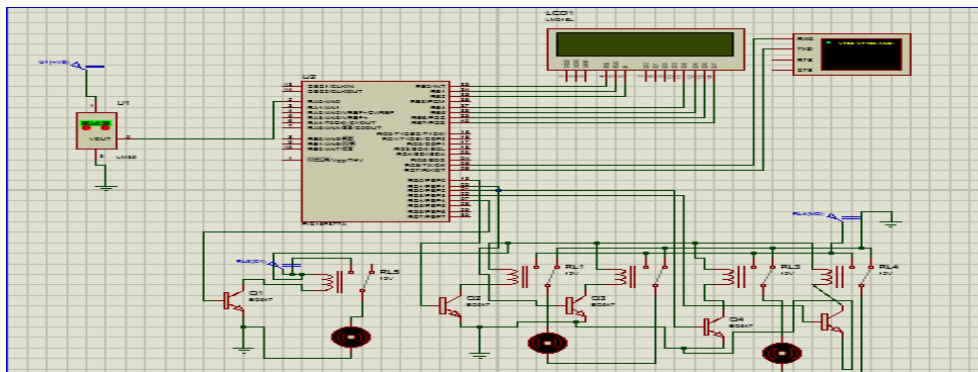


Fig .3. Simulation of Proposed Work

IV. HARDWARE IMPLEMENTATION

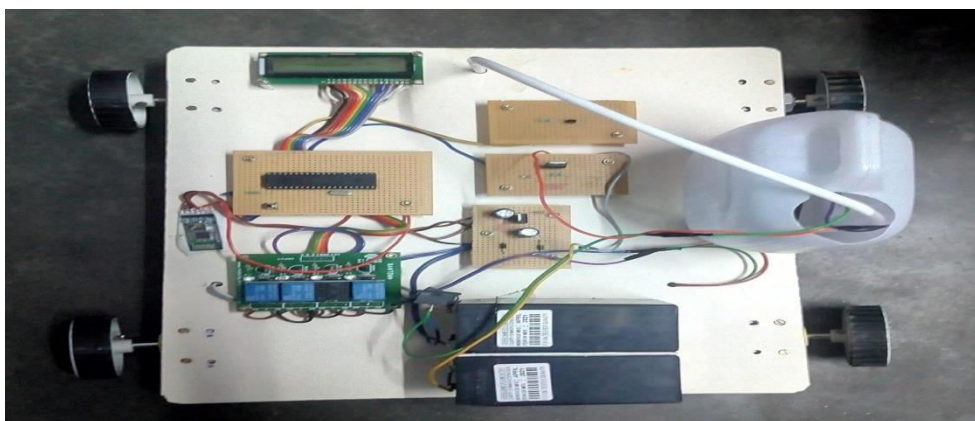


Fig.4. Hardware Implementation

V. CONCLUSIONS

Fire causes tremendous damage and loss of human life and property. It is sometimes impossible for the fire fighter personnel to access the sight of fire because of explosive materials, smoke and high temperature. Through this we can conclude that robot can be placed where human lives are at risk. The robot can operate in the environment which is out of human reach in very short time. In such environments, fire fighting robots can be useful for extinguishing fire. These robots should be controlled remote operators who are located far away from the fire site using remote communication systems. The robot accurately and efficiently finds the fire within minimum time after the fire is

detected. In future work Project aims to promote technology innovation to achieve a reliable and efficient outcome. Mobile robot that can move through a model structure, find fire and extinguish it. The movement of the robot is controlled by the sensors which are fixed on the mobile platform .is to provide security of home, laboratory, office, factory and building is important to human life. We develop an intelligent multisensory based security system that contains a fire fighting system in our daily life. We design the fire detection system using sensors in the system, and program the fire detection and fighting procedure using sensor based method.

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