

ROBOTIC SPRINKLER WITH OBSTACLE DETECTION

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ABSTRACT:

Now a day's many industries are using robots due to their high level of performance and reliability and which is a great help for human beings. There are many places where man cannot put his efforts. This is because of some constraints like high temperature, small space. Safety is one of the major concerns of process safety engineers in most industrial facilities all over the world. To this scope, some events plays an important role once the effect of their consequences can be assumed as totally undesirable. One of these events refers to the occurrence of high temperatures. Such event can result in catastrophic consequences for life, equipment, and continuity of activities or even leading to environmental damage.

This Robotic sprinkler with obstacle detection is a device which is used to sprinkle the coolant at sizzling areas. It also has an additional feature of obstacle detection. The heart of the device is arduino. This robot is a gesture controlled which can be operated by using a switch. Obstacles are detected by using ultrasonic sensors which is controlled by using a bluetooth module.

This can be fairly used in city wars, military applications and industrial applications.

Keywords: motors, sensors, arduino uno

INTRODUCTION:

Robot is defined as a mechanical design that is capable of performing human tasks[1] or behaving in a human-like manner. Building a robot requires expertise and complex programming. It's about building systems and putting together motors, flame sensors and wires, among other important components. A fire fighter robot is one that has a small fire extinguisher added to it. By attaching a small fire extinguisher to the robot, the automation put out the fire by human controlling. The project helps to generate interests as well as innovations in the fields of robotics while working towards a practical and obtainable solution to save lives and mitigate the risk of property damage.

Fire fighters face risky situations when extinguishing fires and rescuing victims, it is an inevitable part of being a fire fighter. In contrast, a robot can function by itself or be controlled from a distance, which means that fire fighting and rescue activities could be executed without putting fire fighters at risk by using robot technology instead. This robot provides[1] fire protection when there is a fire in a tunnel or in an industry by using automatic control of robot by the use of microcontroller in order to reduced loss of life and property damage.

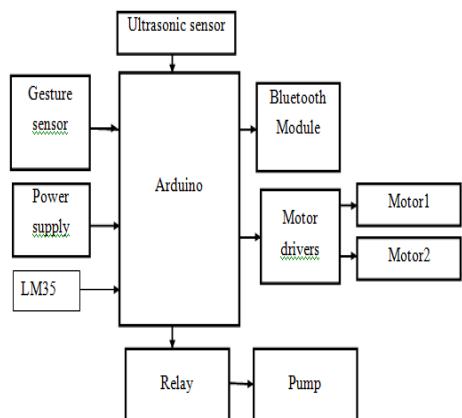
LITERATURE REVIEW:

With the ever-increasing technology, the developments are increasing in the face of the situations that cause human life. Every day, the robot industry emerges as a model that is produced as an alternative to human element in a new branch. Flying, robots, wheeled robots legged robots, humanoid robots, underwater robots[2] are just some of them. The growing world population is bringing involuntary problems together. Fires are among the most important of these problems. Robot industry has a lot of work in this area. Some of these are fixed mobile robots with different features, which are equipped with different sensors that detect before the fire is out, mobile rescue robots as fire search and rescue equipment, mobile locating robots used for fire detection, fire extinguishing robots in many different models designed to assist firefighters in the fire. There are many studies on robotics both in the sector and academically. The robots obtained by this study, infrastructure works, geophysical surveys, etc., which are difficult to view, were able to get underground images which were applied to many areas.

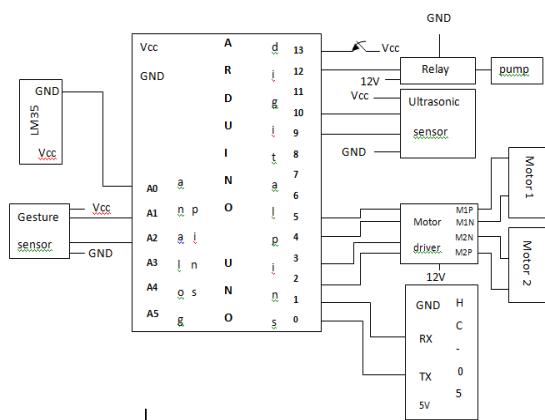
The main goal of the fire fighting robot application in this study is to extinguish the fire with the help of the sprinkler when the fire is found[2]. A variety of mechanical and electronic components were provided for this purpose and then the robot was assembled. Finally, the designed robot has been programmed to perform the intended functions like gesture sensing and avoiding obstacles by detecting them. The two wheels that make the

movement of the traveling robot are connected to two reducer motor. It can work independently from each other within the flow chart determined on both wheels. Both wheels can operate independently of each other. Rear wheels are fitted with ball bearings that do not interfere with rotation so that the wheels cannot keep the system standing

BLOCK DIAGRAM :



SCHEMATIC REPRESENTATION:



The above figure is the schematic representation of the Robotic Sprinkler with Obstacle Detection[3]. We can clearly understand the connections by taking a glance at the schematic connections of kit.

WORKING MODEL OF THE PROJECT:



HARDWARE:

THE HARDWARE COMPONENTS USED IN THIS PROJECT ARE:

1. ATMEGA 328P microcontroller
2. Ultrasonic sensor
3. Temperature sensor
4. Accelerometer sensor
5. Motor driver
6. Relay
7. Bluetooth module
8. Pump
9. Sprinkler

ULTRASONIC SENSOR:

The ultrasonic sensor is a transducer which converts electrical energy into sound waves and vice versa. These sound waves fall above the normal range of human hearing and hence it is known as ultrasonic waves. These type of waves are above the frequency of about 18000 Hz. Ultrasonic sensors[4] are wonderful creatures. Blind from the eyes and yet a vision so precise that could distinguish between a moth and a broken leaf even when flying at full speed. No doubt the vision is sharper than ours and is much beyond human capabilities of seeing, but is certainly not beyond our understanding. Ultrasonic ranging is the technique used by bats and many other creatures of the animal kingdom for navigational purposes. In a bid to imitate the ways of nature to obtain an edge over everything, we humans have not only understood it but have successfully imitated some of these manifestations and harnessed their potential to the greatest extent.

TEMPERATURE SENSOR:

The LM35 series[4] are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of $\pm\frac{1}{4}^{\circ}\text{C}$ at room temperature and $\pm\frac{3}{4}^{\circ}\text{C}$ over a full -55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy.

ACCELEROMETER SENSOR:

The ADXL335[5] is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ± 3 g . It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

MOTOR DRIVER:

L293D:

Description of L293D[6] 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. Dual H-bridge Motor Driver integrated circuit (IC). The L293D can drive small and quiet big motors as well, check the Voltage Specification at the end of this page for more information.

BLUETOOTH MODULE:

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-05 Bluetooth

SOFTWARE:

ARDUINO IDE:

Arduino is an open-source electronics 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[7].

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.

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.

ARDUINO BOARDS BASED ON ATMEGA328 MICROCONTROLLER:

Board Name	Operating Volt	Clock Speed	Digital i/o	Analog Inputs	PWM	UART	Programming Interface
Arduino Uno R3	5V	16MHz	14	6	6	1	USB via ATmega16U2
Arduino Uno R3 SMD	5V	16MHz	14	6	6	1	USB via ATmega16U2
Red Board	5V	16MHz	14	6	6	1	USB via FTDI
Arduino Pro	3.3V 8	8 MHz	14	6	6	1	FTDI Compatible

3.3v/8 MHz								Header
Arduino Pro 5V/16MHz	5V	16MHz	14	6	6	1		FTDI Compatible Header
Arduino mini 05	5V	16MHz	14	8	6	1		FTDI Compatible Header
Arduino Pro mini 3.3v/8mhz	3.3V	8MHz	14	8	6	1		FTDI Compatible Header
Arduino Pro mini 5v/16mhz	5V	16MHz	14	8	6	1		FTDI Compatible Header
Arduino Ethernet	5V	16MHz	14	6	6	1		FTDI Compatible Header
Arduino Fio	3.3V	8MHz	14	8	6	1		FTDI Compatible Header
LilyPad Arduino 3.3V 328 main board	3.3V	8MHz	14	6	6	1		FTDI Compatible Header
LilyPad Arduino simply board	3.3V	8MHz	9	4	5	0		FTDI Compatible Header

EXPERIMENTAL RESULTS:

MERITS:

1. Prevention from dangerous incidents
2. Minimization of
 - i. ecological consequences
 - ii. financial loss
 - iii. a threat to a human life
3. Needs no micro-controller programming
4. The reconstruction of the curse of operator's work

DEMERITS:

1. Neither predict nor interfere with operator's thoughts.
2. The operator directly can't make the robot to work.

CONCLUSION:

The project "Robotic Sprinkler With Obstacle Detection"[8] using Ultrasonic Sensors, gesture sensor and temperature sensor has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

This paper has presented a unique vision of the concepts which are used in this particular field. It aims to promote technology innovation to achieve a reliable and efficient outcome from the various instruments. With a common digitalized platform, these latest instruments will enable increased flexibility in control, operation, and expansion; allow for embedded intelligence, essentially foster the resilience of the instruments; and eventually benefit the customers with improved services, reliability and increased convenience.

The Mechatronics application ensures a convenient way of simplifying the life by providing more delicate and user friendly facilities in computing devices. Instead of using cumbersome modules to gather information about the user, it will be better to use smaller and less intrusive units. The day is not far when this technology will push its way into your house hold, making you more lazy.

This paper presents the major features and functions of the various concepts that could be used in this field in detail through various categories[9]. Since this initial work cannot address everything within the proposed framework and vision, more research and development efforts are needed to fully implement the proposed framework through a joint effort of various entities. Benefited from this technology, since the expense of activating other types of fire extinguishers may outweigh that of a robot, where product stock could be damaged by imprecise fire control methods.

FUTURE SCOPE:

The project has been motivated by the desire to design a system that can avoid obstacles and detect fires and take appropriate action without any human intervention. The development of sensor networks[8] and the enhancement of robotics suggests that we can use mobile agents for tasks that involve perception of an external stimulus and reacting to the stimulus, even when the reaction involves a significant amount of mechanical actions. 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 fire-fighting, the system we envision is crying for adoption. Furthermore, we believe that the techniques developed in this work will carry over to other areas involving sensing and reacting to stimulus[9], where we desire to replace the human with an automated mobile agent.

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 during an operation. All such concerns were outside the scope of this project. to measure the data for every second and to measure the number of parameters at the same time. However, there has been research on many of these pieces in different contexts, e.g. coordination among mobile agents, techniques for detecting and avoiding obstacles, on communication between humans and mobile agents, etc. It will be and challenging to put all this together into a practical, autonomous fire-fighting service. The result is simulated and achieved by **ARDUINO IDE** software.

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