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An IoT Based Fire Extinguishing Robot Industrial and Residential Safety

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Abstract: *Accidents are on the rise in today's world. An accident may potentially cause the loss of many lives, valuable properties, or sometimes may lead to permanent disability to the victim. New and improved technologies are being used to prevent these accidents. In this paper, we have proposed an IoT-based multifunctional fire extinguishing robot that will minimize the damage of the accidents like fire hazards, building collapse, deadly gas leakage, etc. This project aims to ensure the safety of our lives and valuable properties by minimizing the damages that occurred from any accident.*

Keywords: IDE, AVR, PWM, LPG, CNG, ADC

I. INTRODUCTION

Cultural property management is entrusted with the responsibility of protecting and preserving an institution's buildings, collections, operations and occupants. Constant attention is required to minimize adverse impact due to climate, pollution, theft, vandalism, insects, mold and fire. Because of the speed and totality of the destructive forces of fire, it constitutes one of the more serious threats. Vandalized or environmentally damaged structures can be repaired and stolen objects recovered. Items destroyed by fire, however, are gone forever. An uncontrolled fire can obliterate an entire room's contents within a few minutes and completely burn out a building in a couple of hours. Hence it has become very necessary to control and cease the fire to protect the Life and costlier things. For that we purposed to design and fabricate the fire-fighting robot. Autonomous robots can act on their own, independent of any controller. The basic idea is to program the robot to respond in a certain way to outside stimuli. The very simple bump-and-go robot is a good illustration of how this works. This sort of robot has a sensor to detect obstacles. When you turn the robot on, it zips along in a straight line. When it finally hits an obstacle, the impact is on sensors, i.e, sansors may get damaged. Using Ultrasonic sensor and programming logic, the robot is guided to turn right and move forward again, when the robot finds an obstacle in its way. In this way, the robot changes direction any time it encounters an obstacle. Advanced robots use more elaborate versions of this same idea. Roboticists create new programs and sensor systems, to make robots more smarter and more perceptive. Today, robots can effectively navigate in a variety of environments.

1.1 PROPOSED SYSTEM

The system utilizes high-quality piezoelectric materials integrated into the flooring or shoe systems. These transducers are strategically positioned to capture the mechanical stress and vibrations caused by footsteps.The flooring mechanism plays a crucial role in the system's efficiency and user experience. It is designed to be robust, yet comfortable and safe for walking or running. Excess energy generated during high foot traffic periods can be stored for later use through energy storage units. User safety and comfort are paramount considerations in the proposed system. The flooring mechanism is designed to provide a stable and slip-resistant surface, minimizing the risk of accidents

Kinetic energy is one of the renewable energy sources. A significant amount of research was done to see if it was possible to transform kinetic energy into electricity. The majority of past studies focused on the selection of appropriate materials and the sophisticated design of power generators by installing a mechanical footstep powe.

The purpose of this study is to demonstrate how people can generate electricity by walking on the floor. Consider the forces you exert that are wasted when someone walks. The concept is to transform weight energy into electrical energy.

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The Power Generating floor's goal is to convert kinetic energy into electrical energy. The world's most pressing concern these days is the energy crisis.

Electricity is critical and increasingly demanded. A great deal of energy was lost and depleted. When walking on a population of humans, an alternative means of generating energy was found the vibration between the surface and the move was wasted. The use of this wasteful energy will create and satisfy demand for electrical energy.

1.2 TECHNOLOGY USED

Hardware Requirements:

- ATMEGA 328 Microcontroller
- Power supply
- LCD display
- UART
- Wi-Fi
- Piezo electric plates
- Relay

Software Requirements:

- Embedded C programming
- Arduino IDE
- Express PCB

II. BLOCK DIAGRAM

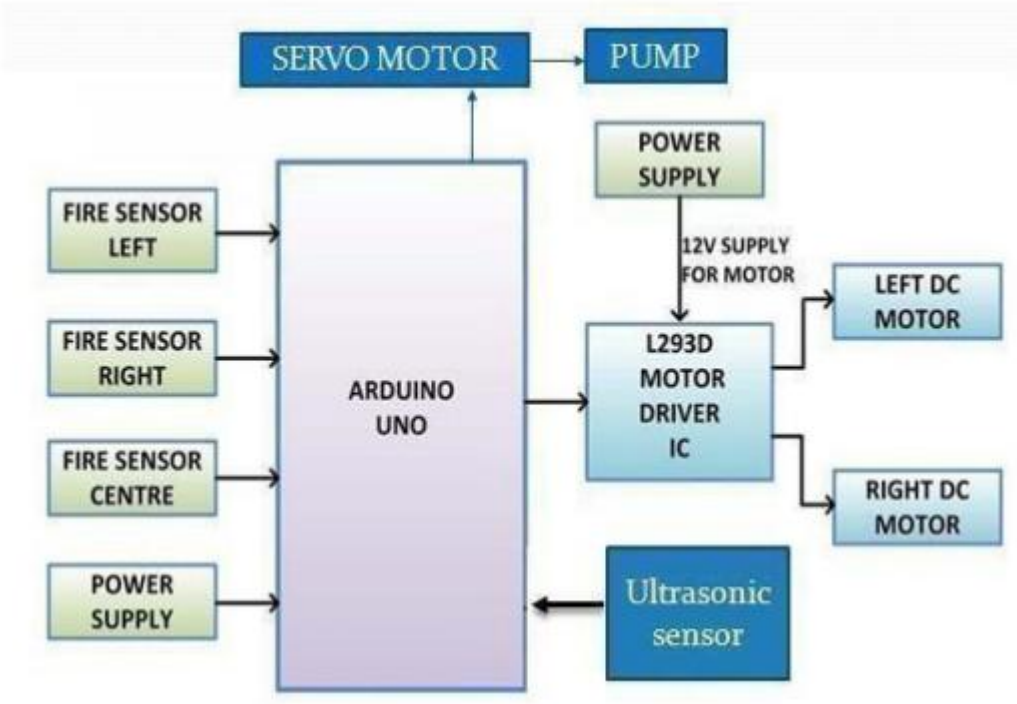

Fig 2.1: Block diagram

As explained in the introduction chapter, the realization of complete potential of the sensors and the wired medium in information transfer is the major issue that the following thesis of the following project deals with L293d driver module, Arduino-uno with Microcontroller, flame sensors, ultrasonic sensors, servo motor and 5v pump. Here arduino uno acts a heart of our project, in the above block diagram we can see that there are three flame sensors and ultrasonic sensor which acts as input interface to the microcontroller and sevomotor, pump, driver module acts a output interface

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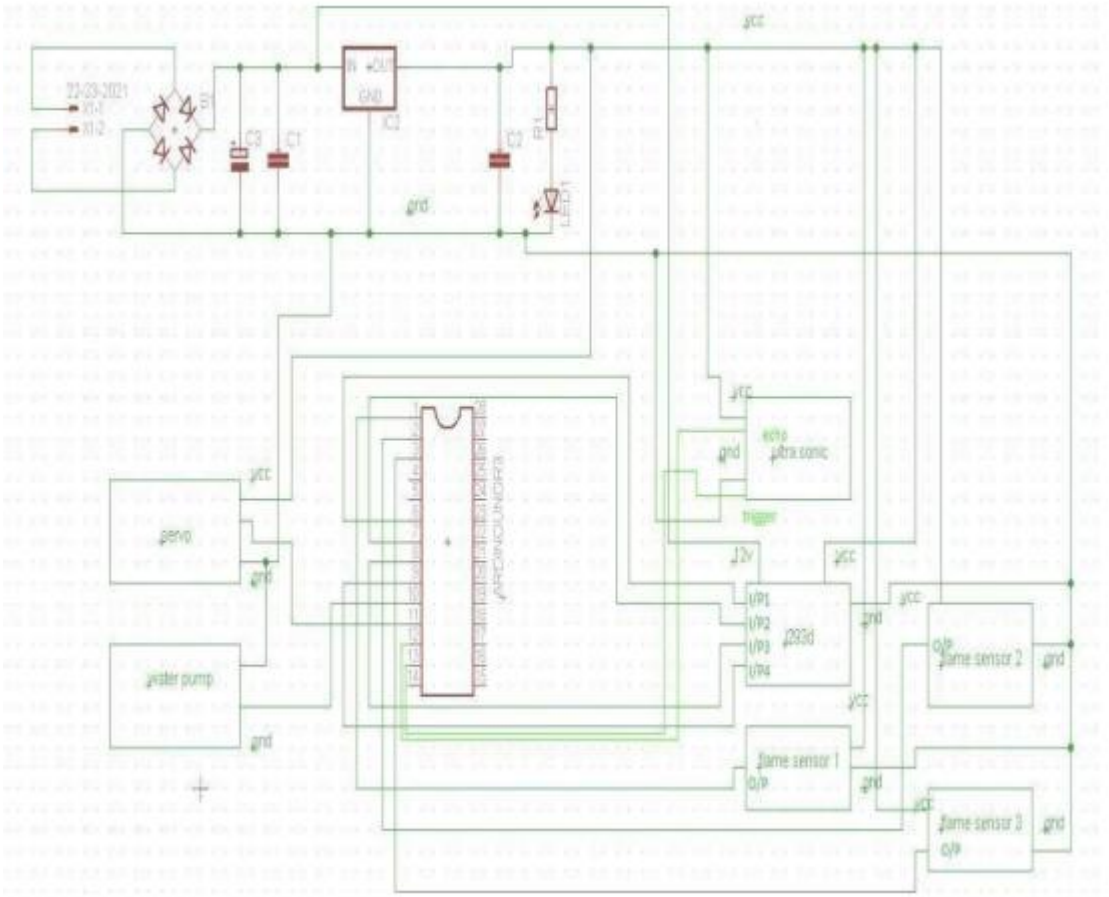
to the microcontroller, here the input and output interface can be indicated with the arrow lines with the respective the microcontroller performs with the respective commands and delay which is programmed on arduino software. A problem definition overview provides a high-level understanding of a specific issue or challenge that needs to be addressed. It helps to clarify the problem statement, scope, and context before delving into more detailed analysis or problem-solving processes.



As you can see these sensors have an IR Receiver (Photodiode) which is used to detect the fire. How is this possible? When fire burns it emits a small amount of Infra-red light, this light will be received by the IR receiver on the sensor module. Then we use an Op- Amp to check for change in voltage across the IR Receiver, so that if a fire is detected theoutput pin will give 0V(LOW) and if the is no fire the output pin will be 5V(HIGH).So, weplace three such sensors in three directions of the robot to sense on which direction thefireis burning. We detect the direction of the fire we can use the motors to move near the fire by driving our motors through the L293D module. When near a fire we have to put itout using water. Using a small container we can carry water, a 5V pump is also placed inthe container and the whole container is placed on top of a servo motor so that we can controlthe direction in which the water has to be sprayed.

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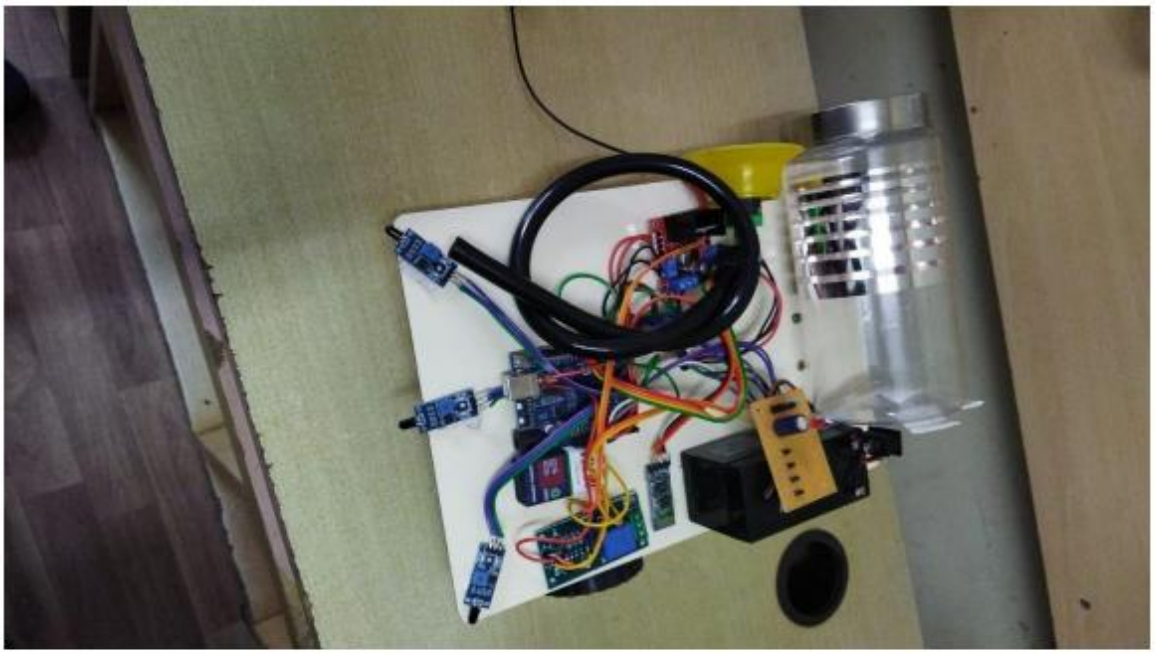
III. RESULT AND DISCUSSION



Working model of fire fighting robot

IV. CONCLUSION

The prototype of the fire fighter robot was efficiently designed. This prototype has facilities to be integrated with many sensors making it move forward. The toolkit detects the infrared light emitted by the fire with photo diode and sends signal to controller. We intend to extend this work to provide a keypad programmed to allow manipulation of robot to move desired direction with help of motor driver module and extinguish the flames using water tank which is rotated at 180 degress with help of servo in order for faster result. This future work will also explore to the use of a long distance sensor with suitable hardware to get more better and faster results addition to the characters.

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