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Solar Based Fire Dousing Robot with GSM Module

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ABSTRACT: Fire fighting is an important job but it is very dangerous occupa- tion. . With the advent of technology, humans are replaced with robots in life-threatening situations. Due to that, Robots are designed to find a fire, before it rages out of control. It could be used to work with fire fighters to reduce the risk of injury to victims. This paper presents the Fire Fighting Robot that could identify the fire at the time of emerging and extinguish it. The robot development is consisting of three ele- ments which is the hardware, electronic, and programming. We aim to design a robot capable of detecting and suppressing fires. By de- signing and implementing an autonomous robot capable of detecting and extinguishing flames, disasters can be avoided with minimal risk to human life.

I. INTRODUCTION

Fire dousing is the act of extinguishing fire. A fire fighter must be capable of stopping the fire quickly and safely, preventing further further damage. Technology has finally bridged the gap between fire fighting and machines allowing for a more efficient and effective method of fighting. The robots could efficiently fight the fire during accidents. The fire fighting robots could autonomously move around the place and stop the fire. The main and only work is to deploy the robot in the fire prone zones and the robot will automatically work once it detects a fire breakout. This prototype helps in rescue operations during fire accidents where the entry of service man is very difficult in the fire prone zones. By using such robots, fire iden- tification and rescue activities can be done with higher security without placing fire fighters at higher risk and dangerous condition.

There have been numerous and devasting losses because of lack in techno- logical advancement. Additionally, the current methods applied in fire fighting are inadequate and inefficient relying heavily on humans who are prone to error, no matter how extensively they have been trained. A recent trend that has become popular is to use robots instead of humans to handle fire hazards. This is mainly because they can be used in situations that are too dangerous for any individual to involve themselves. In our project, we develop a robot that is able to locate and extinguish fire in a given environment. The robot navigates the area and avoids any obstacles it faces in its excursion. Arduino board acts as a brain of the whole control circuitry. In addition, the robot also has gas sensor to detect any cause of gas leak- age that occurs even before the flame. This robot designed is also possessed with GSM module, which is an added advantage to the existing fire fighting robots.

II. LITERATURE SURVEY

TawfiqurRakib, M. A. Rashid Sarkar proposed a fire fighting robot model which consists of a base platform made up of 'Kerosene wood', LM35 sensor for temperature detection, flame sensors to detect the fire and a water container of 1 litre capacity which is made up of a strong cardboard that makes it water resistant. The robot has two wheels for its movement. [1]

Saravanan P. ,SoniIshawarya proposed a model which uses Atmega2560 micro- controller and in which the robot is divided into three basic units each unit performs their task in order to achieve the desired output of extinguishing fire.The fire detecting unit is used to detect fire using LDR and temperature sensor. The extinguishing unit is used to extinguish the fire using water container and BLDC motor. The robot also have a bluetooth module that is connected with the smartphones in order to navigate it in the proper direction. [2]

S. JakthiPriyanka,R. Sangeetha proposed an android controlled fire fighting robot which uses Arduino UNO R3. The robot consists of gas sensor for fire detection, gear mo- tor and motor drive for the movement of robot, a bluetooth module to connect the robot with the android device and to control the robot with the smartphone as well. Water pump and sprinkler is also used in this.[3]

Nagesh MS, Deepika T V , Stafford Michahial, Dr M Shivakumar proposed a fire extinguishing robot which employs DTMF (Dual Tone Multi Frequency Tones) technology for the navigation of the robot and uses a flame sensor for fire detection that is capable of sensing flame of the wavelength range 760 to 1100 nm and sensitivity varies from 10cm to 1.5feet. [4]

SushrutKhajuria, Rakesh Johar, Varenyam Sharma, Abhideep Bhatti proposed an arduino based fire fighter robot which consists of RF based remote operation to operate the robot and water pump .The robot is controlled by the user within a range of 7 metres. It also consists of a wireless camera which helps user to move the robot in the required direction.[5]

III. EXISTING SYSTEM

The common conventional firefighting methods involve fire brigades, portable fire extinguisher (hand held) and sprinklers. These conventional methods consume lot of time to reach the place of the mishap like the fire brigade must be deployed from the fire station and should get through the traffic and reach the fire struck area, the portable extinguisher is also no gift because it is generally place at one off the corners of the building which may be difficult to reach and it needs constant maintenance. On the other hand the sprinkler and smoke detector set up is very non reliable method because the sprinkler pipes has any defect may not provide enough pressure and it is suited to cover large areas.

IV. PROBLEMS IN EXISTING SYSTEM

The problem with existing system is that exposure to the hazardous and cha- otic fire environment, rather than to the fire itself, is the most significant cause of injury and death in fires. The reachability of precise information in real-time on the conditions directly at the center of the fire ground is a crucial factor in the guidance of rescue actions together with feasible counter-plans. Unfortunately the fire- fighting environments are normally hard to reach and restricted in accessibility by obstacles, tumbledown architectures and visibility by smoke, dangerous gases or dust. Therefore, the fire scene is an information-poor environment due to lack of information on location of fire, firefighters and victims, and the search and rescue opportunities are previously unimaginable due to lack of situational conditions and real-time information for targeted decision making.to this the accidents occurs. Additionally, the current methods applied in firefighting are inadequate and inefficient relying heavily on humans who are prone to error, no matter how extensively they have been trained.

V. PROPOSED SYSTEM

The proposed model is able to detect presence of fire and moves the robot to fire accident location. It contains gear motors and motor driver to control the movement of robot. When it detects fire it communicates with microcontroller (Arduino UNO) and the robot will move towards the fire affected area. The fire ex- tinguisheris mounted on the robotic vehicle which is then initiated so that it extinguishes the fire automatically. This autonomous robot also consists of a gsm module through which the information about the fire accident is sent to the re- spective person via alert messages. The robot is also possessed with solar battery setup so that the robot batteries are charged through solar power. This constitutes to the renewable design.

ADVANTAGES OF THE PROPOSED SYSTEM

- ☐ The robot will be used at places where it is dangerous for humans to enter

- ☐ Capability of sensing accurately with increased flexibility.

- ☐ Reduce human effort.

- ☐ It reduces the time delay in reaching fire affected area.

☐   It reduces the errors and the limitations that are faced by human fire fighters.

☐   It uses gas sensor which is an added advantage.

☐   The system gets charged from solar power, which makes the system reliable and non polluting source.

☐   The gsm module enables the user to receive information of the emergency situation and take immediate backup setup

VI. METHODOLOGY

First we need to assemble the required components and proceed with hardware assembly. Then the arduino of the system has to be programmed as per the mech- anism to be followed. The system has to be checked for the power supply before introducing it into the required environment.
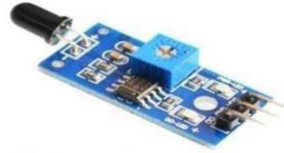
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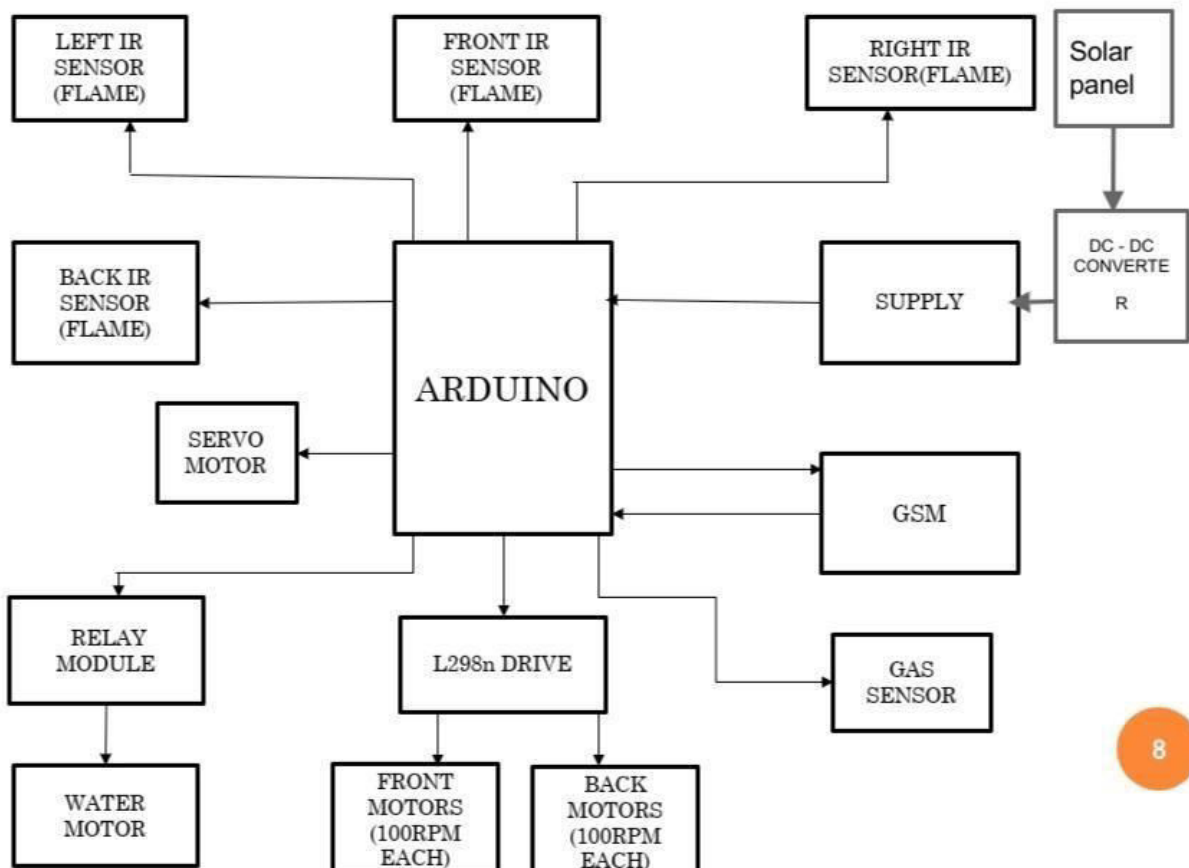
HARDWARE DESCRIPTION
FLAME SENSOR

A Flame Sensor module or Fire Sensor module is a small size electronics de- vice that can detect a fire source or any other bright light sources. This sensor ba- sically detects IR (Infrared) light wavelength between 760 nm – 1100 nm that is emitted from the fire flame or light source. The flame sensor comes with a YG1006 Phototransistor sensor which is a high speed and high sensitivity. Two types of IR Infrared Flame Sensor Module available in the market one having three pins (D0, Gnd, Vcc) and another one having four pins (A0, D0, Gnd, Vcc) both are can be easily used with Arduino and other microcontroller boards

MQ2 GAS SENSOR

The MQ2 sensor is one of the most widely used in the MQ sensor series. It is a MOS (Metal Oxide Semiconductor) sensor. Metal oxide sensors are also known as Chemi-resistors because sensing is based on the change in resistance of the sensing material when exposed to gasses. The MQ2 sensor operates on 5V DC and consumes approximately 800mW.

ARDUINO UNO

Arduino is an open-sourceplatform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a micro controller) and a piece of software, or IDE (Integrated Development En- vironment) that runs on your computer, used to write and upload computer code to the physical board. Unlike most previous programmable circuit boards, the Ar- duino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to pro- gram. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

L298 MOTOR DRIVE
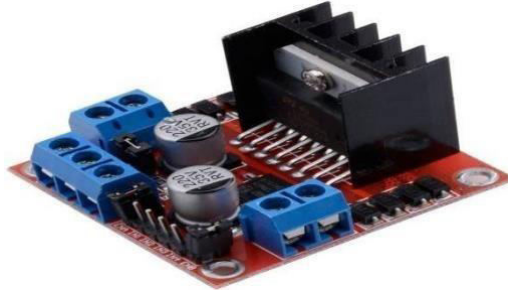
This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC mo- tors with directional and speed control. The L298N Motor Driver module consists of an L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, Power LED, 5V jumper in an integrated circuit. 78M05 Voltage regulator will be enabled only when jumper is placed.

SERVO MOTOR (SG90)

A servo motor is an electromechanical device that produces torque and velocity based on the supplied current and voltage. A servo motor works as part of a closed loop system providing torque and velocity as commanded from a servo controller utilizing a feedback device to close the loop. The feedback device supplies infor- mation such as current, velocity, or position to the servo controller, which adjusts the motor action depending on the commanded parameters.
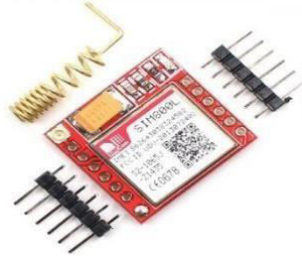
RELAY MODULE
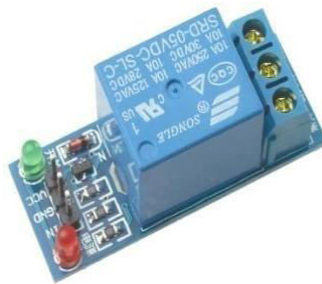
A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro con- troller. When activated, the electromagnet pulls to either open or close an electrical circuit.
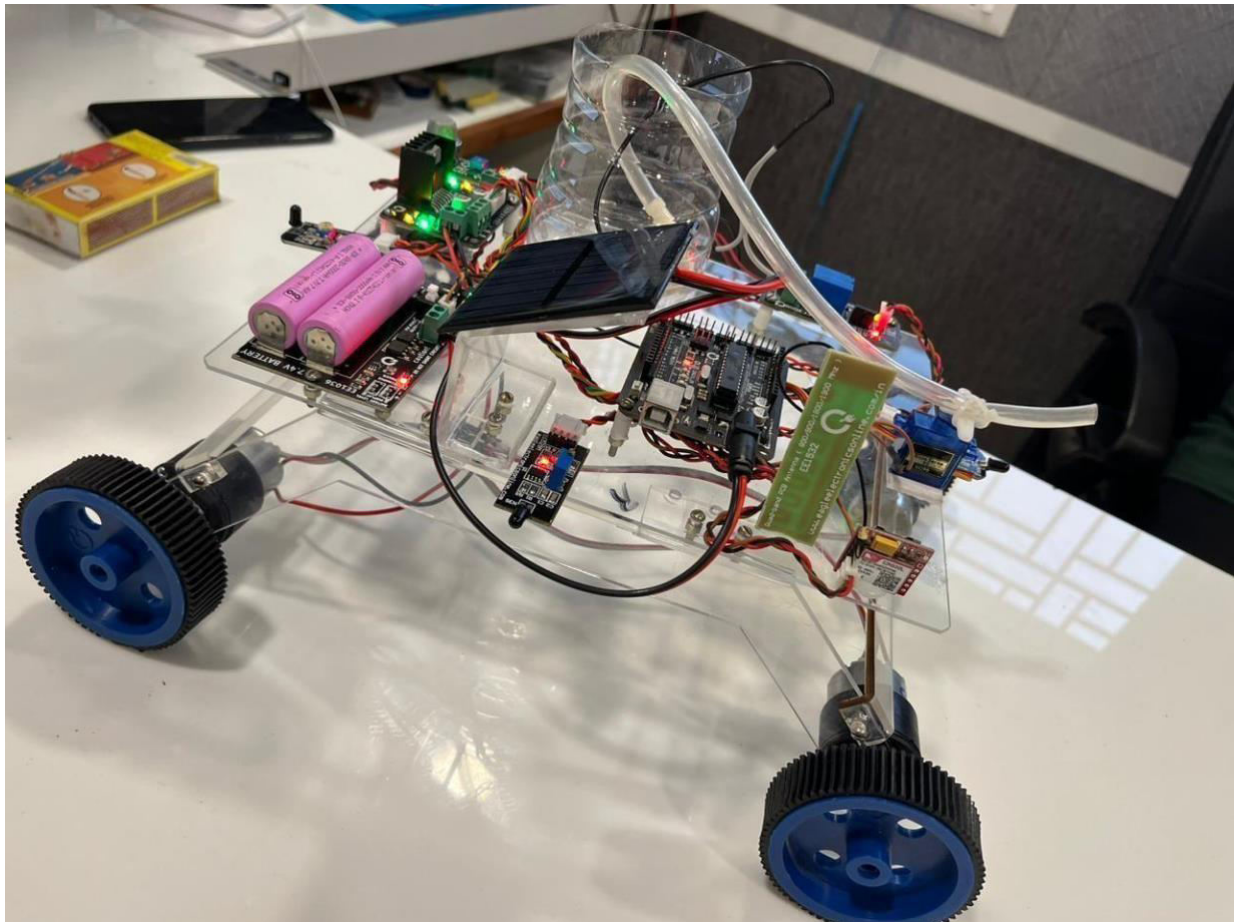
GSM MODULE

A GSM modem or GSM module is a device that uses GSM mobile telephone tech- nology to provide a wireless data link to a network. GSM modems are used in mo- bile telephones and other equipment that communicates with mobile telephone networks.

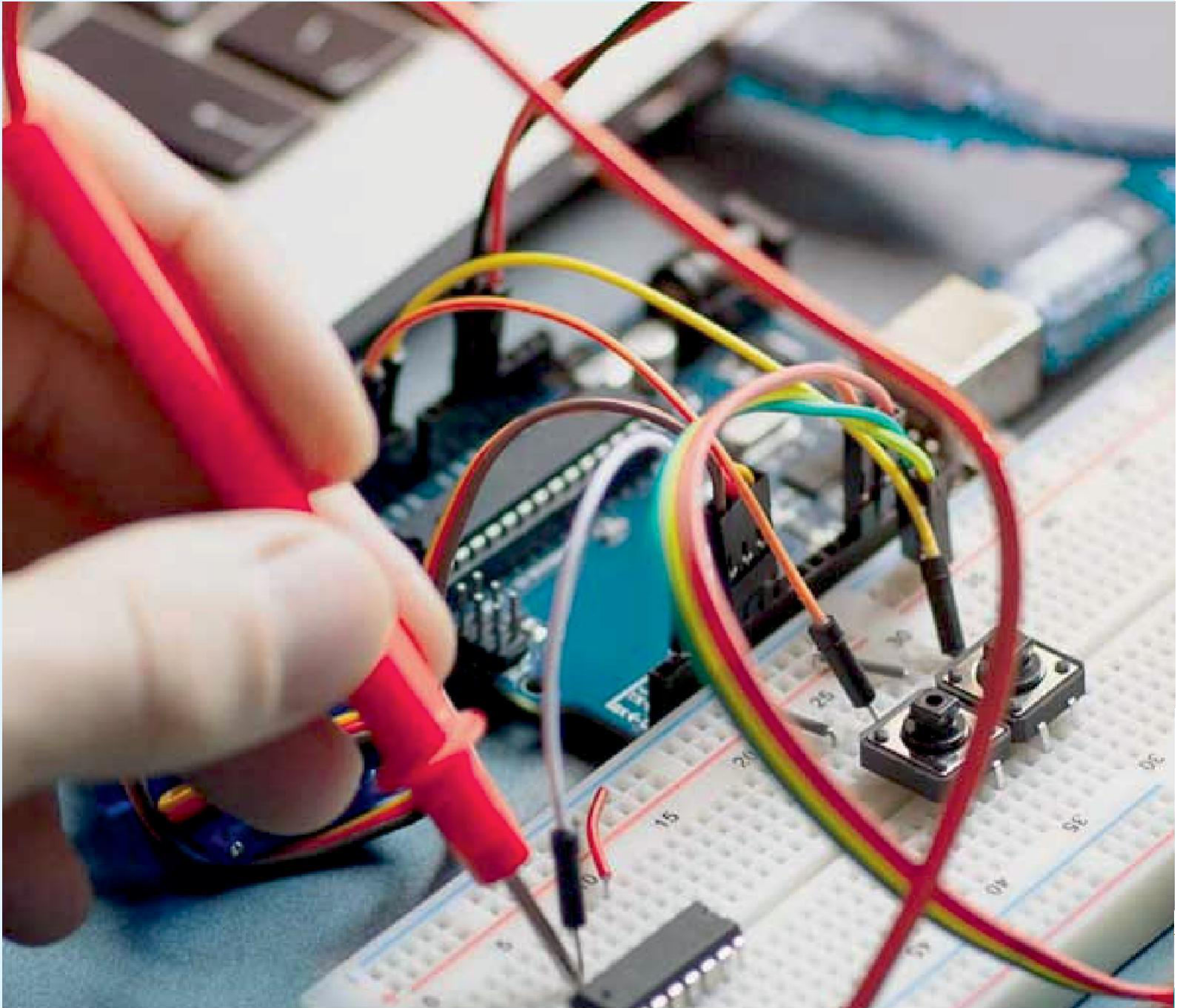## VII. EXPERIMENTAL OUTPUT

VIII. CONCLUSION

This model of Fire Extinguishing Robot aids to share out the burden of fire fighters in firefighting task. Our project aims to build a real time firefighting robot which moves in a constant speed, identify the fire and then extinguish it with the help of pumping mechanism. The detection and extinguishing was done with the help basic hardware components attached with the robot. Firstly, IR Flame sensors are used for the detection of fire. Secondly, BO Motors and Rubber wheels are used to navigate the robot to reach the fireplace. Finally, the robot extinguishes the fire with the help of

submersible water pump and servo motors. h. This paper pro- vides an overview of current research efforts by researchers to make firefighting robots smarter, less expensive and more efficient.

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