FIRE EXTINGUISHER ROBOT

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ABSTRACT

The project aims at designing an intelligent fire extinguishing robotic vehicle which can be controlled wirelessly through Wi-Fi communication. The proposed vehicle has a water jet spray which is capable of sprinkling water. The sprinkler can be moved towards the required direction. The advent of new high-speed technology provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drivers and advanced control algorithms. This project describes a new economical solution of robot control systems. The presented robot control system can be used for different sophisticated robotic applications.

Keywords :- *Node MCU, Motordriver, Wi-Fi Module, Battery, Waterpump, Diode, Resister, DC Motor, Ultrasonic Sensor*

1. INTRODUCTION

For educational establishments to effectively manage resources and offer a proper learning environment, an accurate assessment of class size is essential. Though it can be laborious, prone to mistakes, and interfere with the learning process, manual counting has been used historically. Thus, an automated, non- intrusive method for precisely measuring class strength is required. To tackle this problem, we present a research project that uses an Arduino Uno and infrared sensors to create a class strength measuring device [1]. Due to human mistake, deliberate manipulation, or the sheer logistical difficulty of supervising big groups, traditional pen-and-paper or spreadsheet- based attendance systems are prone to errors. Using Infrared (IR) sensors and the adaptable Arduino Uno microcontroller is a calculated move that combines processing power. This project aims to provide a reliable, efficient, and technologically advanced solution to automate attendance tracking, ensuring not only accuracy but also real-time feedback for enhanced user experience [2]. To enhance the overall user experience, the system will offer immediate confirmation of attendance through real-time feedback mechanisms. The integration of an LCD display will provide visual confirmation, while a buzzer will offer audible feedback. This real-time feedback not only serves as a confirmation for the individuals registering their attendance but also facilitates quick corrections in case of any discrepancies.

2. LITERATURE REVIEW

A firefighting robot model was proposed by comprises a base platform composed of "Kerosene wood," an LM35 sensor for temperature detection, flame sensors for fire detection, and a one-liter water container made of sturdy cardboard that is water resistant. The robot can move on its two wheels. [1] The Atmega2560 microcontroller model divide the robot into three primary sections based on its intended use: a locomotive unit, a fire detection unit, and an extinguisher unit. Every unit carries out its assigned duties in order to achieve the intended result of putting out fires. ..With the aid of four infrared and four ultrasonic sensors, the locomotive unit moves the robot and helps it avoid obstacles. The temperature sensor and LDR are employed by the fire detection device to identify fire. The extinguishing equipment uses a BLDC motor and a water container to put out the fire. To guide itself in the right direction, the robot is equipped with a Bluetooth module that is linked to smartphones.

[2] A Node MCU UNO R3-powered android-controlled firefighting robot was a Node MCU UNO R3-powered android-controlled firefighting robot. The robot's components include a gas sensor fordetecting fires, a gear motor and motor drivefor movement, and a Bluetooth module for controlling the robot from a smartphone andconnecting it to an Android device.

Sprinklers and a water pump are also utilizedin this. In order to program and implement code in the Node MCU UNO, an open-sourceprogram called Node MCU IDE is needed. [3] A fire extinguishing robot that uses a flame sensor for fire detection that can detect flames with a wavelength range of 760 to 1100 nm and a sensitivity that varies from 10 cm to 1.5 feet. The robot is navigated using 6 DTMF (Dual Tone Multi Frequency Tones) technologies. [4] A firefighting robot based on a node MCU that uses RF- based remote operation to control the water pump and robot has been suggested. The user can operate the robot up to seven meters away. Additionally, it has a wireless camera that allows the operator to steer the robot in the desired direction. .[5] The Amphibious Autonomous Vehicle, an obstacle avoidance robot has been suggested. A fuzzy controller is utilized in this robot to avoid static obstacles in real time. Its goal isto direct the robot or vehicle along its intended route while dodging all obstacles in its path.[6] A self-contained firefighting robot with notification was proposed. Three flame sensors are used by this robot to detect fires in the left, right, and center directions. Three ultrasonic sensors are also included for obstacle avoidance and detection. By means of a Bluetooth module, the robot notifies the user when it detects fire.

3. METHODOLOGY

The methodology for developing a firefighting robot typically involves several key steps: Needs Assessment and Requirements Gathering: Understand the specific requirements and challenges faced by firefighters in different scenarios. This may involve consulting with firefighting professionals to identify the most critical needs and desired capabilities for a firefighting robot. Conceptual Design: Brainstorm and develop conceptual designs for the firefighting robot based on the identified requirements. Consider factors such as mobility, size, payload capacity, firefighting mechanisms, and autonomylevels. Detailed Design and Prototyping: Create detailed designs based on the chosenconcept. This involves selecting components, specifying materials, and designing the mechanical, electrical, and software systems of the robot. Develop prototypes to test and validate the design concepts. Sensor Integration: Integrate sensors into the robot's design to enable it to perceive its environment. This may include sensors for detecting fire, smoke, heat, gases, and obstacles. Ensure that the sensor suite provides the necessary data for effective navigation and firefighting. Fire Suppression Mechanism Development: Develop and integrate firefighting mechanisms into the robot. This could involve designing water cannons, foam sprayers, or other extinguishing systems capable of accurately targeting and suppressing fires. Autonomous Navigation and Control System Development: Develop the software and algorithms required for autonomous navigation, path planning, and obstacle avoidance. Implement control systems to enable the robot to operate safely and effectively in dynamic firefighting environments. Testing and Validation: Conduct rigorous testing of the firefighting robot in controlled environments to evaluate itsperformance, reliability, and safety. Test the robot's ability to detect and suppress fires, navigate through obstacles, and withstand environmental factors such as heat and smoke. Iterative Improvement: Gatherfeedback from testing and iterate on the design to address any identified during testing. Continuously refine the robot's design and capabilities to enhance its effectiveness and reliability. Integration with Operational Procedures: Ensure that the firefighting robot integrates seamlessly with existing firefightingprocedures and protocols. Provide training to firefighters on how to deploy and operate the robot effectively during firefighting operations. Deployment and Evaluation: Deploy the firefighting robot in real-world firefighting scenarios to evaluate its performance in actual operational environments. Gather feedback from firefighters and stakeholders to identify areas for further improvement.

BATTERY:

The electronics project utilizes 1200mAh 3.7V 18650 Li-ion lithium rechargeable cell batteries, which are a common choice for high-demand electronicsdue to their high energy density and recharge ability.

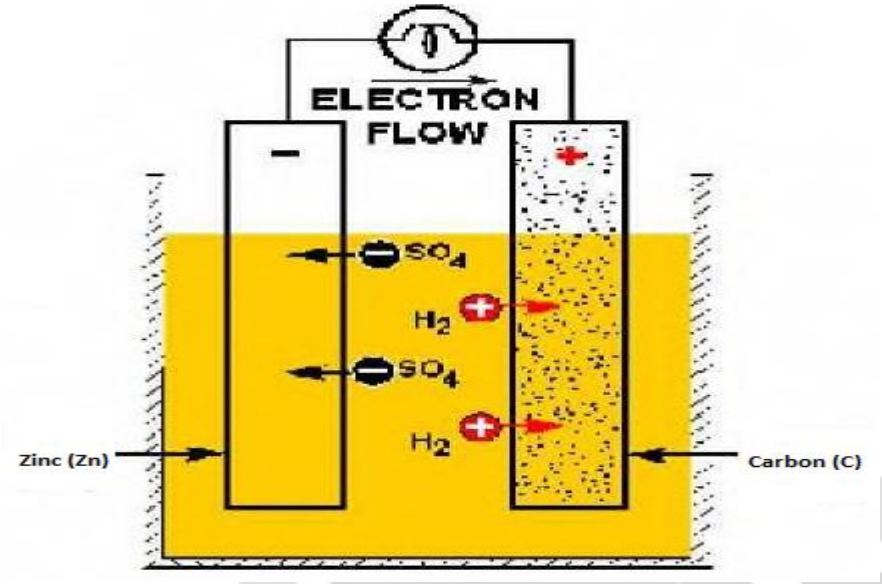

Fig-1 Galvanic cell

A cell is a device that transforms chemical energy into electrical energy. The simplest cell, known as either a galvanic or voltaic cell, is shown in figure 2-1. It consists of a piece of carbon (C) and a piece of zinc (Zn) suspended in a jar that contains a solution ofwater (H20) and sulfuric acid (H2S04) called the electrolyte.

5. RESULT ANALYSIS AND DISCUSSION

In this project, an autonomous Firefighting Robot has been implementedwhich is capable of detecting flames & smokes and extinguishing them successfully. This robot can move forward, move left & right flawlessly. The motors andNode MCU code work together to control themovement of the robot. If any of the flame sensors or smoke sensor are triggered, then buzzer will start to buzz & warning about the danger environment will be displayed on theVirtual Terminal & safe environment will beshown in case of no such detection. This process will be continued until the fire or smoke has been extinguished completely.Then it will display about the safe environment. After successfully building theproject, the simulation was run and the desired output was obtained. Proper snapshots of the results were attached. Thus,an autonomous firefighting robot has been built to achieve the objectives of this project successfully.

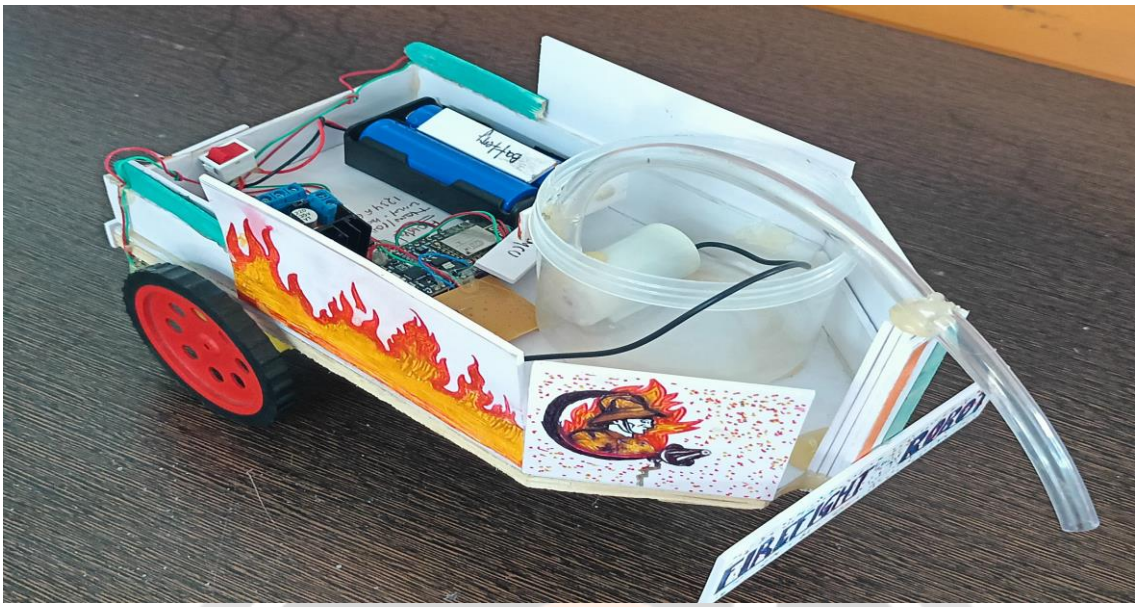

Fig-1 Proposed Model

.6. CONCLUSION

The robotic vehicle designed in this project has six degree of freedom. So it can access the entire spherical area radius R1 + R2 = R. The design is made in such a way that the access point can be at any place in a sphere of maximum radius R and the value of R can be varied between zero to R i.e. 0 < R < (R1+R2). The VEHICLE moving in the vertical plane is controlled by a Geared PMDC motor. The movement is quit continuous and moves smoothly in the vertical plane. The movement of the motor off course restricts the precision of the robotic vehicle but this precession is quite satisfactory for the purpose of laboratory demonstration.

7. REFERENCES

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