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Wireless Fire Fighting Robot

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Abstract: At present world of science and robots, there are still some fields of work where human tends to risk their life. A major precaution to be taken in any medium of work any establishment is safety. It is our turn to create a Machine which is capable of reducing human life at risk in work and increase in efficiency of work. Today fire accidents are very common in every degree of latitude and longitude of human survival Humans, the fireman tends to keep his life at risk and secure the people life or loss occurred. It is not that easy for a normal human to work in temperature of 100 's degree for hours of time. Here comes the main motto of the project which is used to increase the efficiency of the work done and reduce manpower and human effort. The title itself judges the project " WIRELESS FIRE FIGHTING ROBOT VEHICLE" the total is setup is wireless controlled using RF frequency with a microcontroller which has enough data stored in it and motor drivers for the directional motion of the vehicle and tilt pan of the outlet motor. The relay for water pump to activate and deactivate. Finally, a Fire sensor which buzzers on detecting the temperature difference in the range of it. A camera which is mounted to the motor which is directional, which helps to view the location of fire being raised. To which a sprinkler is fixed which enables the flow of water in the required direction.

I. INTRODUCTION

Firefighting is a dangerous occupation. A firefighter must be able to get to a fire quickly and safely under his control, preventing further damage and reduce losses. Robots are to be designed to find a fire before it rages out of control, which helps one day with firefighters to greatly reduce the risk of injury to victims. Our world is currently facing pollution in which the major is the global warming where the average temperature of our earth atmosphere and oceans is increasing about 0.8degrees year by year(since 1980). The global warming of the earth may lead to more forest fire and fire accidents occur as everything gets more flammable due to the high temperature on our surface of the earth. Firefighting robot is needed to reduce all the damage caused by natural or human-made fire disaster. This project targets at designing a live video firefighting robot vehicle which can be controlled Wirelessly through RF communication. The Robot has a camera mounted on it whose direction can also be controlled by the directional control of the jet sprinkler. The robotic vehicle has a water spray which is capable of sprinkling water. The sprinkler can be moved towards the required direction of tilt and pan at any inclination and any position. This technical improvement together with the need for highly efficient robots created faster and more accurate. This project defines a new economical solution for robot control systems. The presented robot vehicle control system can be used for different robotic applications. The devices of the system are wireless transceiver modules, water spray, Relay, Motor drivers DC motors and buzzer are interconnected to Microcontroller. The data which is fed into aurdino uno board the microcontroller commands the relay and motor drivers accordingly by the commands given to it. A wireless camera is mounted to the motor which is the directional attack of the vehicle, the sprinkler which enables us to view the live feedback of the position of the fire accident. It can be connected to any android device, IOS or PC using an IP address.

A. Schematic layout of the Project

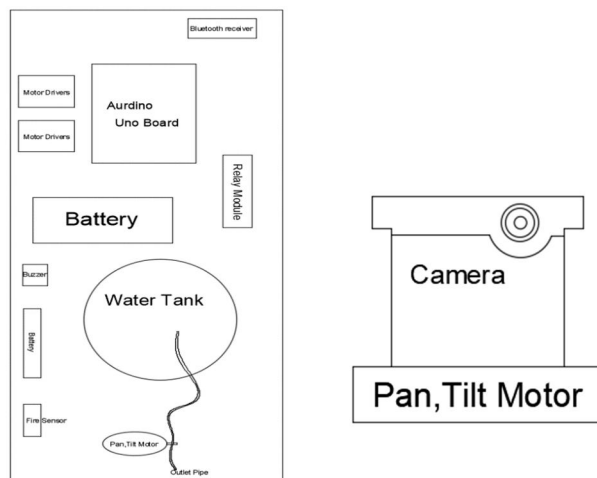


Fig 1a. Top View

1b. Front view

B. View of the Fire fighting Robotic vehicle

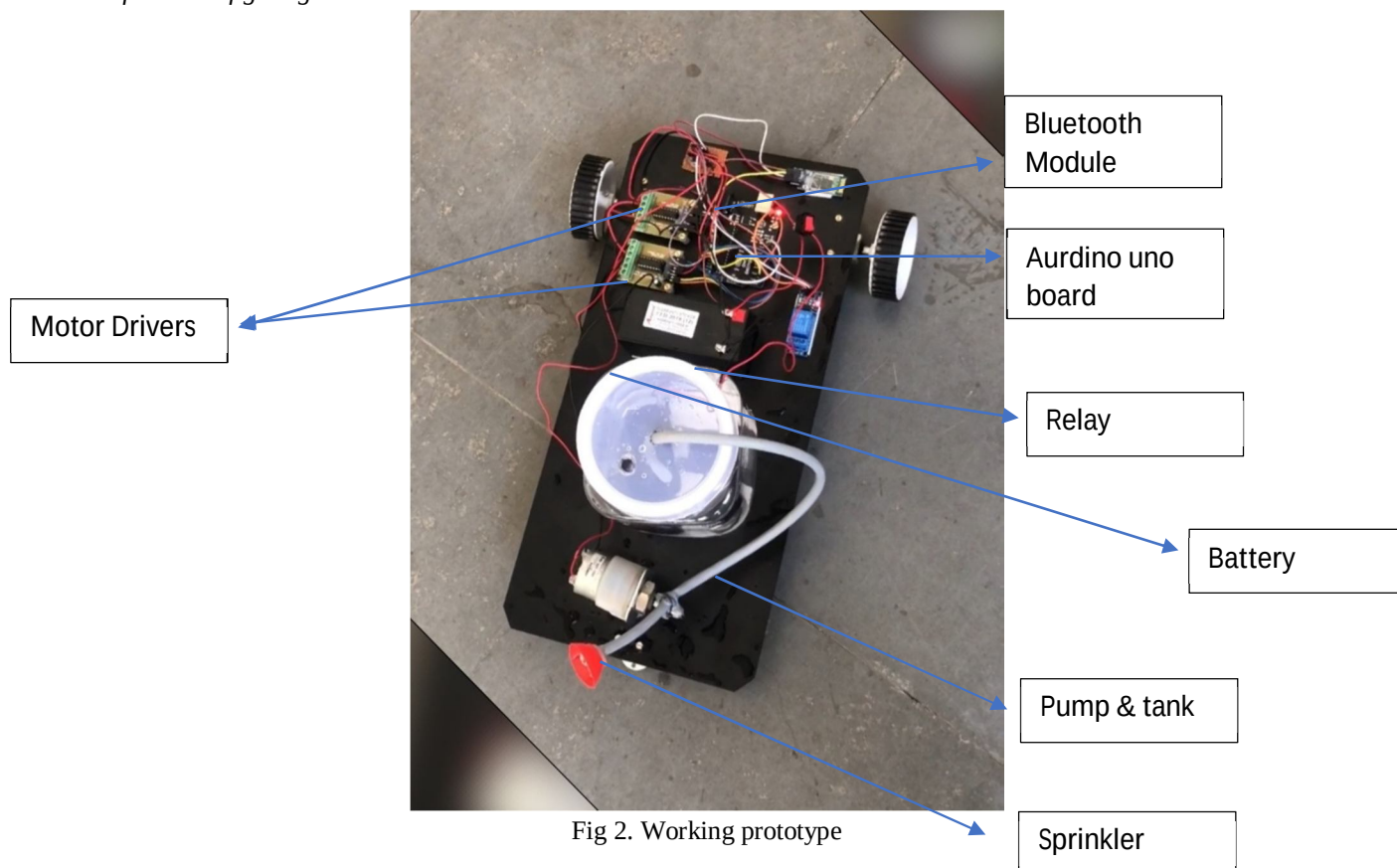


Fig 2. Working prototype

Water tank is of capacity 1.2L and the range of sprinkler at top notch speed is 2M. The sprinkler motor can be rotated about 180° in pan and tilt because it is located at lower elevation than that of tank thus it cannot function in whole revolution for this range of setup. The total load of the body acting on the wheels is 2.5kg thus selected wheels have a torque of about 2.6N-mm² which can bare upto 7.2W power.

BLOCK DIAGRAM

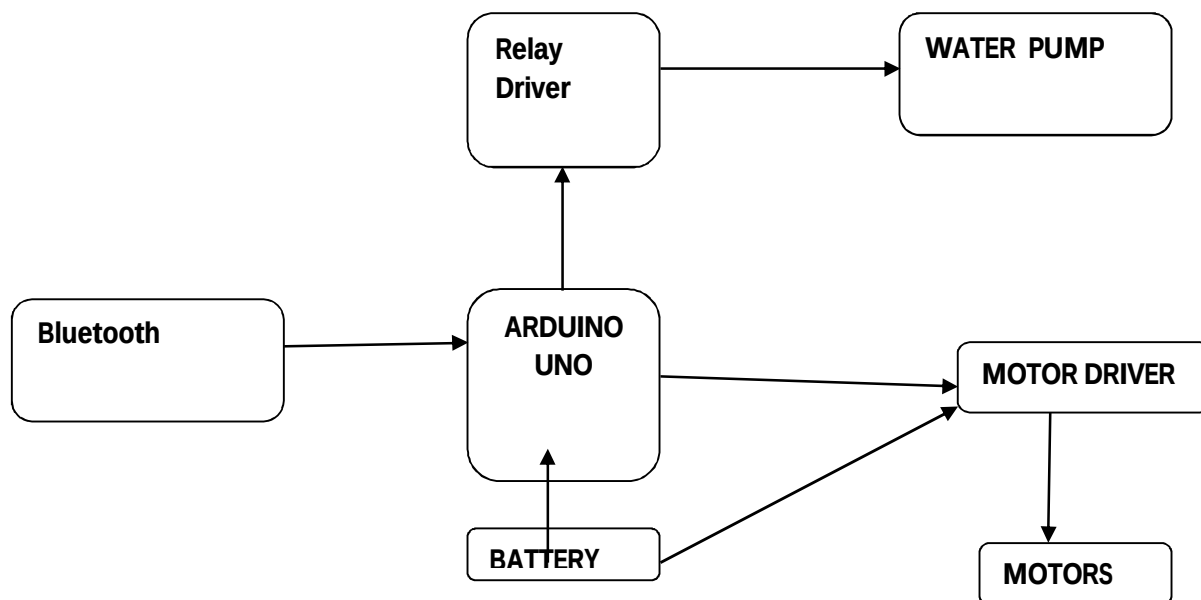


FIG 3. Block diagram of Robot

C. Working

To drive the total segment it requires a min voltage of 6.8V ranging till 11.4V- Power Supply.

A separate Battery is separately installed to the fire sensor which is ON even when the setup is switched off. – Power Supply.

The camera mounted is rechargeable thus comes with a backup live feedback and recording of upto 8hours. -Power Supply.

The microcontroller is of 8bit, which is of 2kb RAM and 64kb ROM which is feed with the programming required to function the movement and tilt of the robotic vehicle -Setup.

The programming is installed by using aurdino Setup software and installed using a USB drive- Setup.

The microcontroller is connected to Motor Driver 1293L and relay -Setup.

Two motor drivers are installed for the functioning of linear, tilt and pan motion of the sprinkler- Setup.

Relay is connected to the high speed jet pump is the water tank which regulates the switch ON/OFF of the pump – Setup.

A roller ball is installed in the front of the setup for free movement of perpendicular direction of the wheels on rear -Setup.

The whole setup is however inter linked to the aurdino uno board, thus battery is connected at the microcontroller and whole setup functions – Setup.

An android app is developed which is connected via Bluetooth to the robotic setup where a Bluetooth module hc 05 is installed – Working.

Commands are given as per requirement in the application, thus which received by Bluetooth module – Working.

Bluetooth module transfers the data to the aurdino board and it regulates the voltage flow to the respective parts and activates the command – Working.

The Aurdino uno board a artificial intelligence controller propogates the commands to the motor drivers for the movement of the robot vehicle – Working.

On parallel scale relay gets ON/OFF to the commands given- Working.

H bridge concept is used to drive the motion of vehicle in linear and perpendicular motion – Working.

D. Application

Can be applied in high scale industries, fire accidents.

Can be used in hazardous places.

Can be used in places where humans cannot work due to high grades of temperatures.

E. Circuit Diagram

Arduino Uno Schematic Diagram



Fig 5. Motor connection

Fig 6. UNO Board

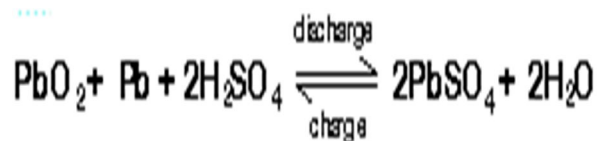
The microcontroller of the robot with intelligence given at prior, the language used is PYTHON for functional movement of robot. From the USB Interface via USB cable the board is connected to PC and using aurdino uno software the programming is done. It is the median and core of the working of the robot, the fire fighting robot.

D. Battery

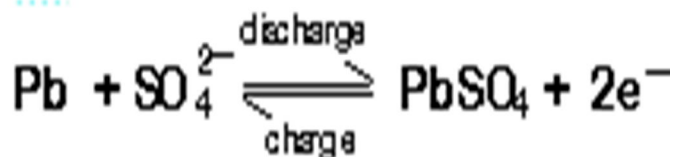


Fig 7. Battery

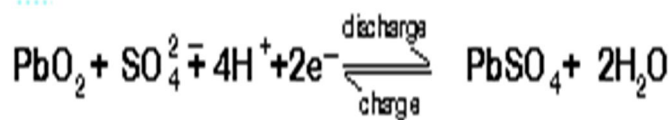
The overall chemical reaction is:



At the negative terminal the charge and discharge reactions are:



At the positive terminal the charge and discharge reactions are:



E. Bluetooth Module

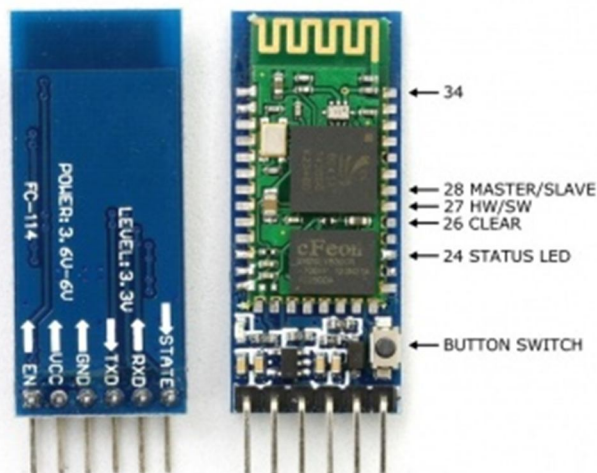


Fig 8. Bluetooth Module

F. Hardware Features

- 1) Typical $\square$ 80dBm sensitivity.
- 2) Up to +4dBm RF transmit power.
- 3) 3.3 to 5 V I/O.
- 4) PIO(Programmable Input/Output) control.
- 5) UART interface with programmable baud rate.
- 6) With integrated antenna.
- 7) With edge connector.

G. Motor Driver L293D

The driver L293D is an integrated circuit chip which is used to control motors in directional movement of robots. Motor driver act as an interface between Arduino and the motors for their functioning. The most used driver Integrated Circuits are the L293 series such as L293D, L293NE and L293EM etc. These Integrated Circuits are designed and developed to control 2 Direct Control motors simultaneously. L293D consist of two H-bridge used to control the directional movement. L293D has 16 pins for it connections.



- (1) IN1,2 & IN3,4 are controll signals from controller use for Direction control of Motor.
- (2) If IN1,2 signal is logic(1,0) then Motor 1 Rotates in One Direction.
If IN1,2 signal is logic(0,1) then Motor 1 Rotates in Opposite Direction.
- (3) EN1 & EN2 are Enable pins. Connect 5V DC to EN1 & EN2 pin to operates Motor its normal rated Speed .
if Speed Control needed. then give PWM on EN1 and EN2 from Microcontroller
- (4) Power for Motor.if 12V DC Gear Motor is Used Then apply 12V.
- (5) Make sure to make GND common for all Circuit



II. CONCLUSION

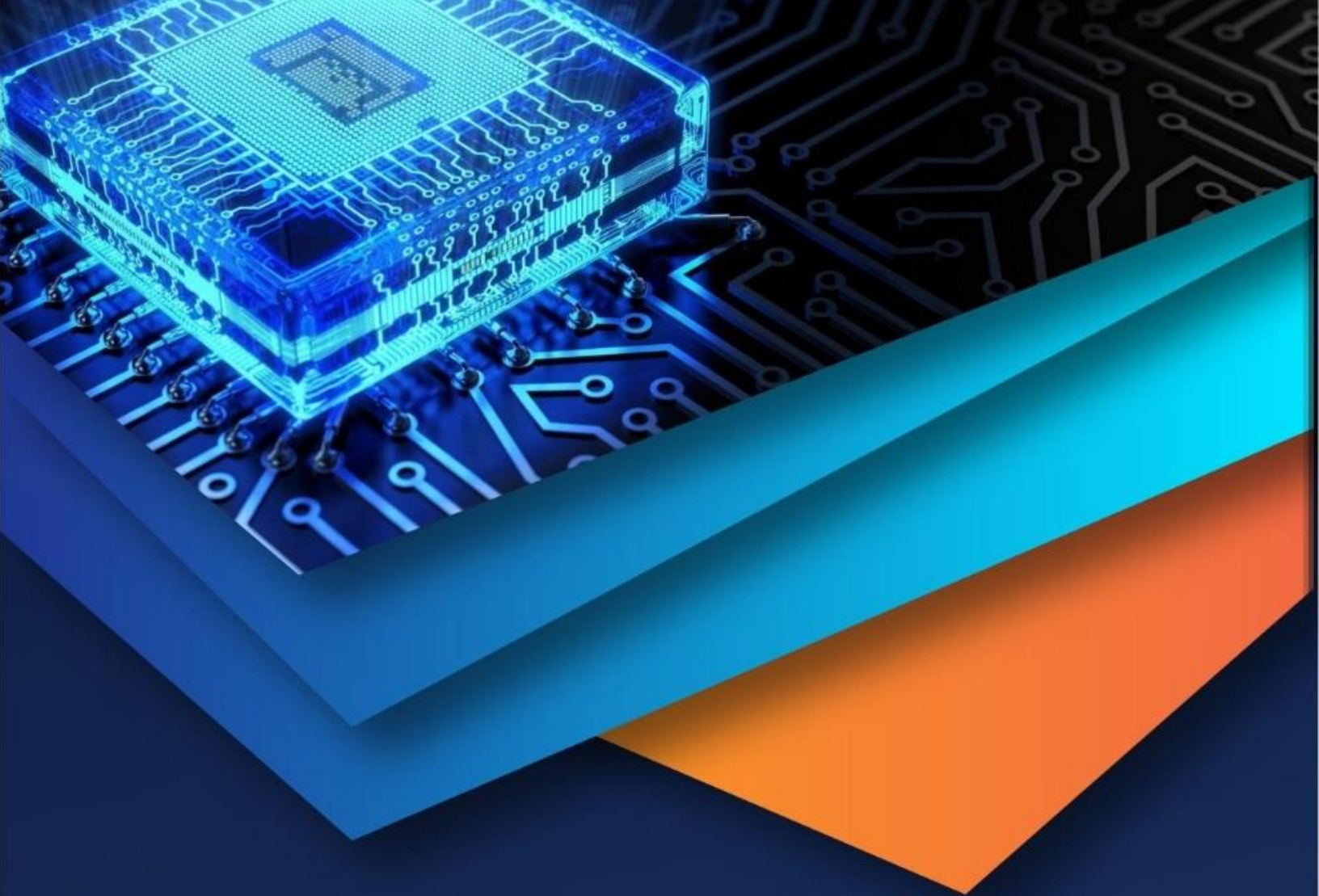
We have created a live video which is wireless controlled fire extinguisher. The security of the home contains firefighting robot vehicle, RF module. The controller of the firefighting robot is a Aurdino uno board, the microcontroller. Once the fire is detected by fire sensor, buzzer is activated. The water pump is activated in using the commands given by the application in the device.

III. FUTURE SCOPE

In the upcoming decade it's very hard to find human being worked where utmost positions are occupied by the robots, thus it is an essential for robots to occupy the safety positions at prior, the major safety precaution is fire fighting, thus the robot vehicle created is wireless live human intervention is not necessary thus it is much helpful and useful in localities where human cannot work at higher grades of temperatures for hours of time.

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