

Intelligent Fire Extinguishing Vehicle

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Abstract- Fire is the one of the devastating force of nature. This is responsible for most life and property loss around the world. This project will use microcontroller to store and process the data. It has GSM module to get the location of fire. It will use the line follower vehicle to reach the location of fire with the help of array sensor, it will use the fire sensor to sense the fire and spray the chemical or water. It is also provided with camera to give the visual output to control room. This system provides the automation to fire department the manual control option. This will leads to the efficient performance in extinguishing fire with lest loss of life and property. This vehicle is going to extinguish fire by tracking the location, sensing fire and extinguishing it by sprinkling of fire extinguishing agent.

Keywords- Microcontroller, Array sensor , Fire Sensor, GSM module , D.C. Motor ,Pump

I. INTRODUCTION

In now days the fire department use to care fire extinguishing vehicle by fire man and try to extinguish fire by manual ways. This process leads to delay of operation and leads to fire man's life in danger. By using this vehicle we can respond instantly to fire problem without putting fire man's life in dangers, as this vehicle is going to reach the provided fire location automatically, sense and extinguish fire by its own without any human interference. This has also options to control the vehicle from remote location and get the visual output.

II. SYSTEM DESCRIPTION

A. Literature Review

Now days way of extinguishing of fire is done by manual ways, so it is time consuming and also leads to loss fire man's life in this process. By this project we have tried to make the automation in fire extinguishing vehicle which will reduce the response time of fire extinguishing. This vehicle is provided with GSM module so that it can get the location details by message and eliminate the need of vehicle driver. This vehicle is provided with line following capability and obstacle detector so that it can sense any obstacle in the path

of vehicle and stop the vehicle and start the buzzer till the obstacle is cleared.

This vehicle is also having the fire sensor to sense the fire at the location and sprinkle the fire extinguishing agent. So it reduce the casualty and loss of property by extinguishing the fire very quickly and efficiently.

B. Why automatic system concept is required?

- Reduces human efforts.
- Reduce response Time.
- Reduce human casualty.
- Reduce financial loss.
- Automatic operation.
- Reliable.
- Increasing Safety.
- Low cost.

We are going to make the fire extinguishing vehicle automatic, so that it can responder faster and become self-reliant in extinguishing fire . so it also reduce the human effort in extinguishing fire. When the vehicle is automated it can respond faster at any situation as it is always ready to deploy at any hazardous place to extinguish fire. So it reduces the response time.

As this vehicle is automatic it doesn't require any human operator to operate the vehicle, so it reduce human casualty and also by effective operation. This fire extinguishing vehicle reduces the financial losses by extinguishing fire at early stage of starting by its quick response. As this vehicle is microcontroller based operation and it works almost automatic to extinguishing fire, from tracking location to the sensing of fire to extinguishing of fire. All the work are performed automatically according to the program. This vehicle is more reliable compare to other means as it don't have to go for leaves and it don't get injured by fire. It also increase the safety of fire man and people by fast response and automatic function to extinguish fire. As thus vehicle is one time investment it doesn't need salary and perks. So it is also of low cost.

C. Block Diagram

There are two power supply 5v & 12v. 12v require for Motor, Relay, Buzzer and GSM Module. The 5v require for microcontroller and other devices. Micro controller (at mega 16) is the Heart of the vehicle which is use to interface and control all the peripheral devices. DC Motor & Drives The output of microcontroller is given to the dc motor driver circuit. This will control 4 independent dc motor for the movement of vehicle. The IR Array Sensor is use to control the vehicle to following provided line. Object sensor will sense any obstacle on its path to avoid any Accident by stopping the vehicle.

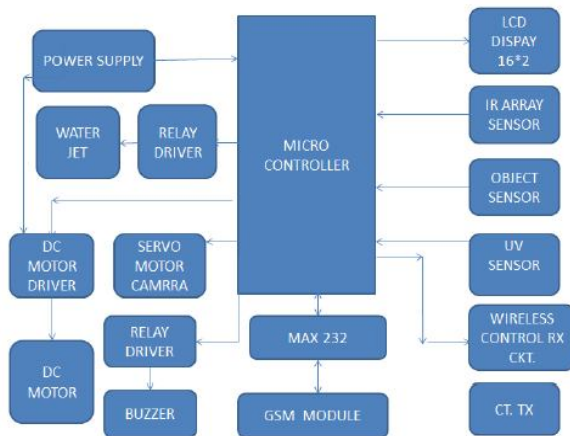


Fig1 : Block Diagram

Relay Drivers are used to make or Break contacts base on the controller output. Buzzer will be used as annunciator. It will start when any obstacle interrupt on the path. Max 232 is use as convertor to convert high to low or low to high voltage. GSM Module is use to provide location of fire to the vehicle through SMS. This wireless control system is use when any external interference is required to control vehicle or fire. Camera is use to get the visual output of hazardous area to control room. This camera can be rotated 180 degree at it axis with help of servomotor. Water jet will be used to sprinkle water at the place of fire, when fire is sensed by the fire sensor. UV fire sensor is use to sense the fire.

III.HARDWARE DISCRPTION

A. Microcontroller ATMEGA16

The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

B.Power Supply

Adjustable power supplies allow the output voltage or current to be programmed by mechanical controls (e.g., knobs on the power supply front panel), or by means of a control input, or both. An adjustable regulated power supply is one that is both adjustable and regulated. An isolated power supply has a power output that is electrically independent of its power input; this is in contrast to other power supplies that share a common connection between power input and output.

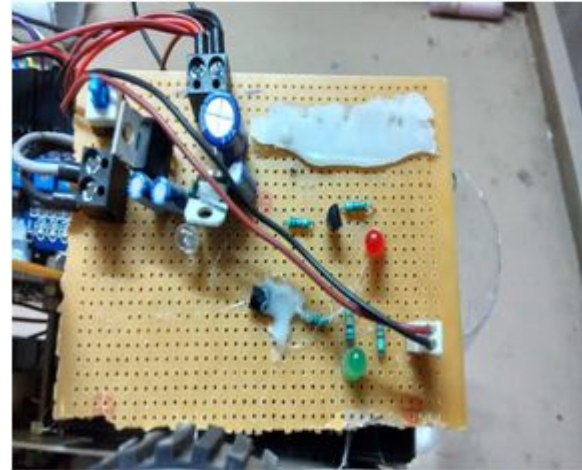


Fig 2 : Power Supply

C. DC Relay

Here 12V dc relays are used. Forward and reverse operation motor is done with help of relays. The terminals are COIL, COIL, COM, and NO, and NC. Now that we know what each terminal pin represents, we now wire it to a circuit for it to do a real-world function. We're going to connect a single pole double throw relay to a circuit to light up a LED. When the relay isn't powered, the red LED is lit and stays on. When the relay is powered, the red LED shuts off and the green LED lights up.

D. Dc Motor

Workings of a brushed electric motor with a two-pole rotor (armature) and permanent magnet stator. "N" and "S" designate polarities on the inside faces of the magnets; the outside faces have opposite polarities. The + and - signs show where the DC current is applied to the commutator which supplies current to the armature coils.

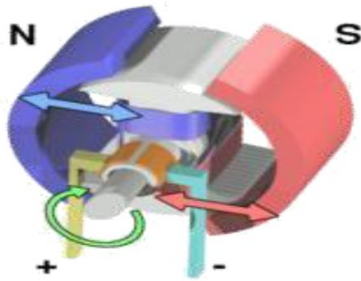


Fig3: .DC Motor

E. UV Fire Sensor

Ultraviolet (UV) detectors work by detecting the UV radiation emitted at the instant of ignition. While capable of detecting fires and explosions within 3–4 milliseconds, a time delay of 2–3 seconds is often included to minimize false alarms which can be triggered by other UV sources such as lightning, arc welding, radiation, and sunlight. UV detectors typically operate with wavelengths shorter than 300 nm. The solar blind UV wavelength band is also easily blinded by oily contaminants.

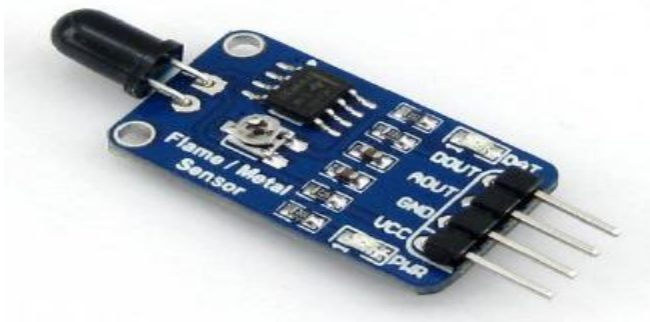


Fig4: UV fire Sensor

F. IR Array Sensor

IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

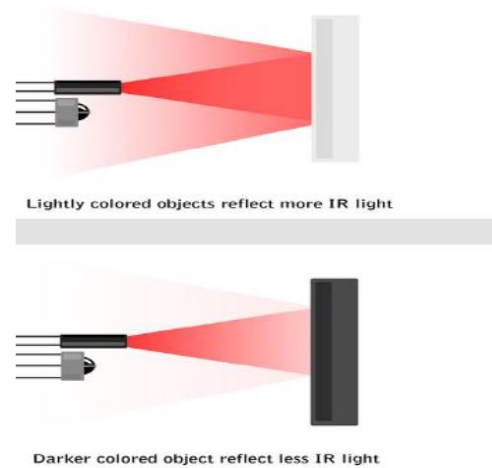


Fig 5 :.operation of IR Sensor to measure brightness

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it.

G.GSM Module

When a GSM modem A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.



Fig6: .GSM Module

A GSM modem could also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer. Any phone that supports the “extended AT command set” for sending/receiving SMS messages, as defined in ETSI GSM 07.05 and/or 3GPP TS 27.005, can be supported by the Now SMS & MMS Gateway. Note that not all mobile phones support this modem interface.

H.Motor Driver Circuit

In electronics, a driver is an electrical circuit or other electronic component used to control another circuit or component, such as a high-power transistor, liquid crystal display (LCD), and numerous others. They are usually used to regulate current flowing through a circuit or is used to control the other factors such as other components, some devices in the circuit. The term is often used, for example, for a specialized integrated circuit that controls high-power switches in switched-mode power converters. An amplifier can also be considered a driver for loudspeakers, or a constant voltage circuit that keeps an attached component operating within a broad range of input voltages.

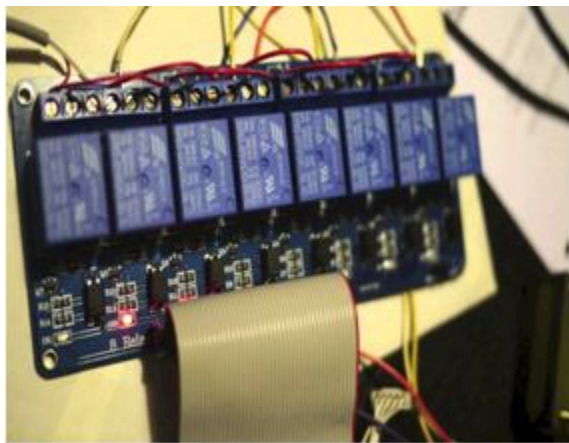


Fig7.: .motor driver circuit

I. Serial Interface (Rs232)

Almost nothing in computer interfacing is more confusing than selecting the right RS232 serial cable. These pages are intended to provide information about the most common serial RS232 cables in normal computer use, or in more common language "How do I connect devices and computers using RS232". Also on a number of Telepath modem models the secondary channel is present.

IV.SOFTWARE DISCRIPTION

A. Proteus

Proteus Virtual System Modelling (VSM) combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs. For the first time ever, it is possible to develop and test such designs before a physical prototype is constructed. This is possible because you can interact with the design using on screen indicators such as LED and LCD displays and actuators such as switches and buttons. The simulation takes place in real time (or near enough to it): a 1GMHz Pentium III can simulate a basic 8051 system clocking at over 12MHz. Proteus VSM also provides extensive debugging facilities including breakpoints, single stepping and variable display for both assembly code and high level language source.

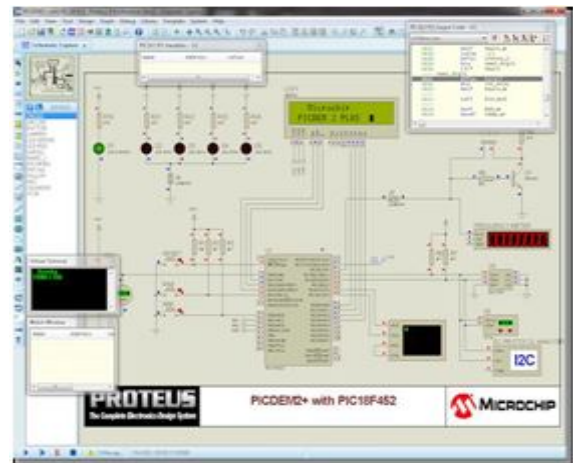


Fig.8: screen shot of the schematic editor showing a fully functional virtual representation of the Microchip™ PICDEM2+ Evaluation Board, containing PIC18F452,Alpha LCD, TC74 temp sensor, 24LC256 I2C EEPROM, RS232 terminal and various buttons, pots, LED's etc.

B. BASCOM-AVR

Proteus was initially created as a multiplatform (DOS, Windows, Unix) system utility, to manipulate text and binary files and to create CGI scripts. The language was later focused on Windows, by adding hundreds of specialized functions for: network and serial communication, database interrogation, system service creation, console applications, keyboard emulation, ISAPI scripting (for IIS). Most of these additional functions are only available in the Windows flavour of the interpreter, even though a Linux version is still available.

C. Program

Program of fire extinguishing vehicle

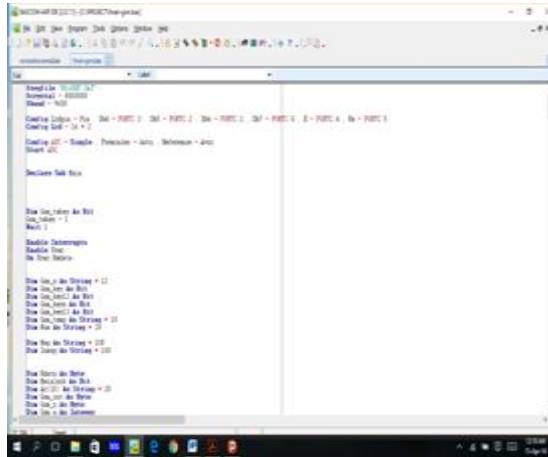


Fig.9: .program

V.RESULT

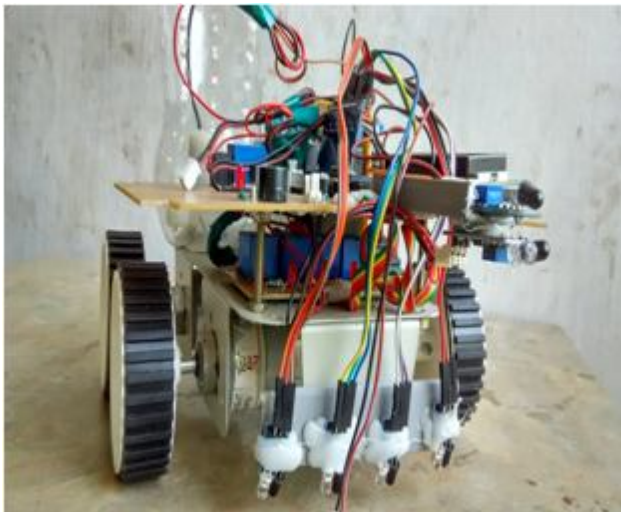


Fig10: Hardware Implemented

This fire extinguishing vehicle is able to reach the destination provide by SMS, also can sense the fire at that place and extinguish it by spraying the chemical on it can also sense the obstacles in its path start alarm & wait for obstical to be clear to go.

In this way this vehicle fulfill the net of automated fire extinguishing vehicle.

VI. FUTURE SCOPE

When the tracking of GPS location become accurate and reliable then this vehicle can be used at any place.. In future when this vehicle will be self-reliant it can be time and cost for fire department. It can use for city and also

VII. CONCLUSION

Hence we can conclude that concept of automation that the scope of automation in fire extinguishing vehicle is very wide, as fire is very disasters nature when become uncontrolled. It leads to loss of life and property. This vehicle will prevent the loss of fire mans and normal citizens life and also prevent financial loss due to fire, by its quick response and automatic working.

REFERENCES

- [1] Boo Siew Khoo, SiewWen Chin, Leong Yee Soo, Edwin Chuah, " FireDroid- An Automated Fire Extinguishing Robot", 2013 IEEE International Conference on Control System, Computing and Engineering, 29 Nov. - 1 Dec. 2013, pp: 356 – 360.
- [2] Su, K.L et al., "Automatic Fire Detection System Using Adaptive Fusion Algorithm for Fire Fighting Robot", Systems Man and Cybernetics, 2006.SMC '06.IEEE International Conference Publications, vol.2, no.7, Oct.2006, pp: 966-971.
- [3] Sang-Uk Park et al., "Wireless image communication system for firefighting robots", Computer and Automation Engineering (ICCAE), IEEE International Conference Publications, vol.3, Feb.2010, pp: 254-256.
- [4] Tong feng et al., "An ultrasonic obstacle avoidance system for fire fighting robot", Intelligent Control and Automation, IEEE International Conference Publications, vol.2, 2002, pp: 1219-1222.
- [5] Avanzato et al., "Fi re-fighting mobile robotics and interdisciplinary design-comparative perspectives Pack", IEEE Trans. Education., vol. 47, no. 3, Aug. 2004, pp. 369-376.
- [6] Sampath, B.S., "Automatic fire extinguisher robot", Ubiquitous Robots and Ambient Intelligence (URAI) 2011, 23 Nov.-26 Nov. 2011, pp: 215 - 218