AUTONOMOUS FIRE FIGHTING ROBOT WITH SELF POWER MANAGEMENT

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Abstract*----** ***Fire are the accidents which occur most frequently,whose causes are most diverse and require intervention methods and techniqiues adapted to the conditions and needs of each incident. In this paper a new fire fighting robot with fire extinguisher is proposed for intelligent buildings. The fire fighting robot is supposed to reduce the exposure of human fire-fighters to extreme fires,The kind with additional complexities such as fuel explosions,chemical leaks and nuclear meltdowns. Fire fighting robot fights the kind of fire that unexpectedly ball out of control or when there might be an explosion at any minute; airplane fires ,derailedtrains,chemical fires- The kind of fire that no human should be near, whether professional or not. Here, The Multisensor Fire Detection Algorithm(MSFDA) and adaptive fusion method is used to detect the fire. If the fire accident is true the robot will find the fire source using indoor mapping and move to the fire source to fight the fire using extinguisher. The fire fighting robot used here is constructed using pic microcontroller(16F877A). The sensor control unit(SCU) used here converts the analog signal received from other sensors and convert it to digital signal which would be read by the micro controller. This paper also proposes a new energy management method for fire fighting robot based on wireless charging as well as a method to avoid obstacle.This model might be a key structure towards self assessment.

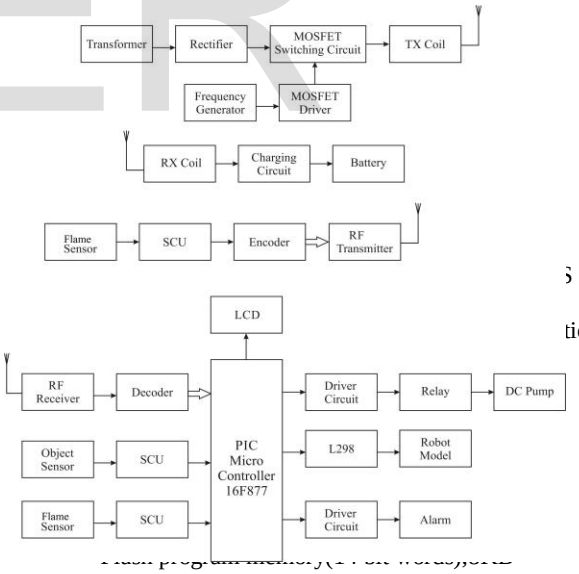
I. INTRODUCTION

Life is the most priceless gift of the universe, which cannot be substituted or replaced. As generations have passed by, complexity of life has increased to such an extent that populaces are certainly not as concerned about the safety processes. In the present day scenario, fire accidents are on the rise due to sheer negligence and hence resulting in the loss of countless lives to which no effective procedures are being undertaken. This paper presents an effective and efficient method to tackle fire accidents. The paper proposes an autonomous robot that detects any fire in its surrounding using Fire Sensor and extinguishes it at the ground level. The robot also has the capability to avoid obstacles and upon detection of fire, it forwards a message to a predefined number(s) and can help in rescue operations and also in securing vital documents. The robot moves through a model structure or an oilfield and if a fire still exists, it can be extinguished with the help of blowers and sprays.This is meant to simulate the real world operation of a machine performing a fire extinguishing function at a workplace environment. In critical conditions, wherein the machine gets deployed in a battlefield, it can detect the presence of a live bomb as well.

II. RELATED WORK

In the first method the robot does not have the knowledge about the infrastructure of the building.so sometimes fire accidents cannot be extinguished by the robot.this can be overcome by using indoor mapping.In the second method the robot is needed to charged once the battery power gets low.hence and a person is also needed to check the condition of the robot regularly.this led to involvement of manpower.In this paper the objectives are This paper mainly proposes a new energy management method for fire fighting robot based on wireless charging as well as a method to avoid obstacle.This model might be a key structure towards self assessment.and also fire extinguisher is proposed for intelligent buildings which are affected by fire where no human should be near, whether professional or not.

III. BLOCK DIAGRAM



5 8-bit RISC tions

8-bit

- Fully static design
- Power saving SLEEP mode
- Selectable oscillator options
- 10-bit multi-channel Analog-to-Digital converter
- Peripheral Features
- Special Microcontroller Features
- I/O and Packages
- Operating Voltages
- Speed Grades

B. FLAME SENSOR *:*

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire. Responses to a detected flame depend on the installation, but can include sounding an alarm, A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame. In some detectors, a sensor for visible radiation (light) is added to the design in order to better discriminate against false alarms or to improve the detection range. Flame detectors responds to the production of one or combination of ultraviolet or infrared spectrums of electromagnetic radiations.these detectors are often used in situations where there is the potential for the rapid development of fires.these detector comprises an electronic circuit with an electromagnetic radiation receiver.flame detectors are actuated when they receive electromagnetic radiation from one or more defined wavelength are received according to their design in the ultraviolet or infrared radiations.One of the methods to improve the performance of flame detectors and reduce the effect of deceptive phenomena and false alarms has been to combine both ultraviolet and infrared technologies into the one system or more separate wavelength in the infrared spectrum.

Fig.2.B. Flame Sensor

C. OBJECT SENSOR *:*

The basic concept of IR(infrared) obstacle detection is to transmit the IR signal(radiation) in a direction and a signal is received at the IR receiver when the IR radiation bounces back from a surface of the object

Fig 3. C. Object Sensor

Here in the figure the object can be any thing which has certain shape and size, the IR LED transmits the IR signal on to the object and the signal is reflected back from the surface of the object. The reflected signals is received by an IR receiver. The IR receiver can be a photodiode / phototransistor or a ready made module which decodes the signal.

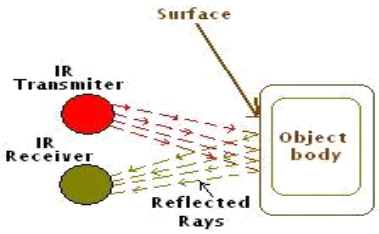


Fig4.C. Working Of Object Sensor

An infrared sensor measure the IR light that is transmitted in the environment to find objects by an IR LED. This type of sensor is very popular in navigation for object avoidance. This sensor is very sensitive to IR lights and sunlight, and this is the main reason that an IR sensor is used with great precision in spaces with low light.

D. RF TRANSMITTER AND RECEIVER :

An RF module (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices.This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter or receiver.

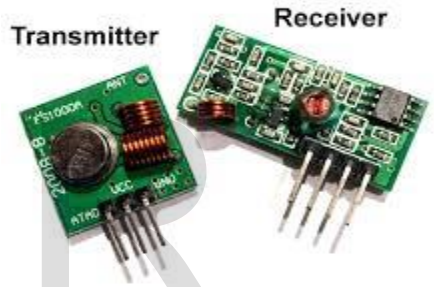


Fig 4.D. RF Transmitter & Receiver

RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency. reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected.

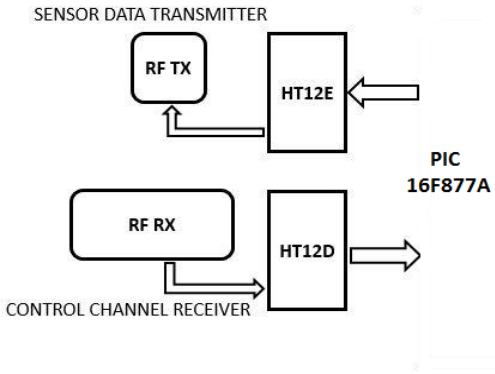
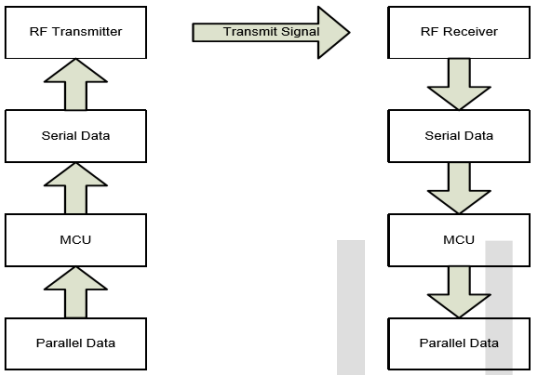


Fig 4.D.

RF with encoder decoder Blockdiagram

This radio frequency (FR) transmission system employs Amplitude Shift Keying (ASK) with transmitter/receiver (Tx/Rx) pair operating at 434 MHz. The transmitter module takes serial input and transmits these signals through RF. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter [3]. The maximum baud rate is 9600 bps. But, to get less error, 300 bps is used. There are two parts; transmitting and receiving. For motor control, in transmitting part, seven push buttons are used to input the data with defined password for the RF transmitter. In receiving part, RF module receives data only when the configured password for this module is read and sent signal to the controller to drive the motors as shown in Fig.4. For Humidity sensor, the temperature and humidity data are read and transmitted by RF module with defined password for this module. Then, the receiver accepts the data and sends these data to the microcontroller. These data are displayed on LCD.



E. MOTOR DRIVER :

The L298 is an integrated monolithic circuit in 15-lead Multiwatt packages. It is a high voltage, high current dual full-bridge driver and drives inductive loads such as relays, solenoids, DC and stepping motors as shown in Fig.5. Two enable inputs are provided to enable or disable the device of the input signals independently.

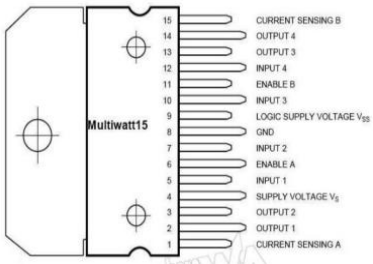
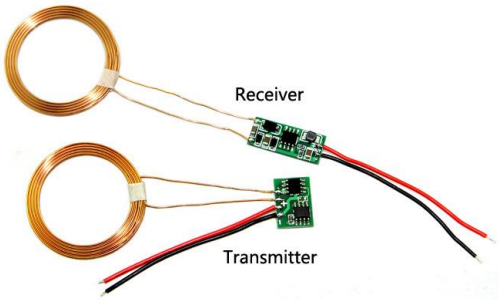


Fig.4.E. Pin Diagram of L298

The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage [4]. The robot motion is controlled by wireless remote. Microcontroller is connected with all drivers to control the rotation of the motors. L298 is used to drive the two right/left DC motors simultaneously.

F. WIRELESS CHARGER MODULE

Concept of transfer charges between two objects using electroma gnetic fields. These charges
known as energy, thisconcept perform normally with a charging station. These charges use lateron charge batteries or drive the devices



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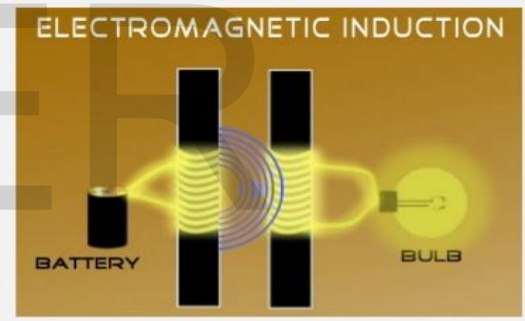


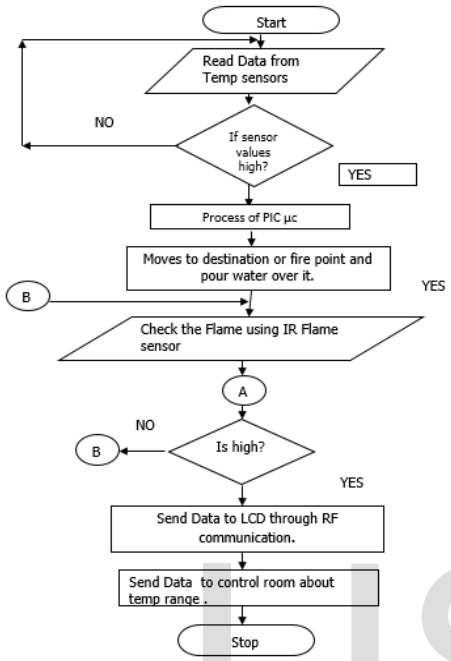
Fig 4.F.Working of Wireless Charger Module

F. Algorithm :

- The robot is placed on the standstill position.once accident is happened the transmitter sends the signal to the robot.
- The robot then moves towards the fire.;once the flame sensor in the robot detects the fire and extingush the fire.
- If the robot is obstructed by an object.it avoids the object and move towards its path by using object sensor
- Otherwise it moves towards its predefined path.
- After the robot extingushes the fire its return back to its position.

- By using mutual induction,the battery of the robot is charged automatically.

F. Flowchart :



IV.RESULT :

From the proposed system the intelligent buildings are fully survellienced by automated fire fighting robots with the help of pic microcontroller.the flame sensor senses the fires and transmit the signals to the robots.The robot starts to move and sense the fire and extinguish the fire with the help of pump or fire extinguisher.it also avoids the obstacle in the path of the robot.It also has wireless charging circuit for charging the batteries by using mutual induction.hence the error rate is reduced wisely.Hence this is a fully automated system which does not require any human interference and also the chances for error is very less.

V. CONCLUSION :

This paper has presented a unique vision of the concept which are used in this particular field. It aims to promote technology innovation to achieve a reliable and efficient outcome from the various instruments. With a common digitalized platform, these latest instruments will enable increased flexibility in control, operation, and expansion; allow for embedded intelligence, essentially foster the resilience of the instruments; and eventually benefit the customers with improved services, reliability and increased convenience. The nineties witnessed quantum leaps interface designing for improved man machine interactions. The day is not far when this technology will push its way into your house hold, making you more lazy .Since this initial work cannot address everything within the proposed framework and vision, more research and development efforts are needed to fully implement the proposed framework through a joint effort ofvarious entities. This autonomous robot successfully performs the task of a firefighter in a simulated house fire. Benefited from this technology, since the expense of activating other types of fire extinguishers may outweigh that of a robot, where product stock could be damaged by imprecise fire control Methods

VIII. REFERENCES :

[1].Sousuke Nakamura,Taito Suzuki,Yoshinori Kakinuma,"Prototype system for energy management of mobile device via wireless charging robot,"IEEE international conference on advanced intelligent Mechatronics(AIM) july 12-15,2016
[2].Kuo L.Su,"Automatic fire detection system using adaptive fusion algorithm for fire fighting robot," IEEE international conference on systems,man and cybernetics
[3].Mohammed Rahmoun,Mohammed Saber "Mobile robot unknown indoor environment exploration using self-localization and grid map building"