SENSOR BASED AUTOMATIC FIRE CONTROL ROBOT

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***ABSTRACT**: There are many fields in which artificial intelligence (AI) may be related to electrical, mechanical, psychology and philosophy. We use this concept in a simpler application of fire detection. In our project, we use a sensor to detect fire, which sends the information to a micro-controller, which is written with a program based on C algorithm, which turns nozzle head of the fire fighter to that direction. One motor is used for the clockwise and anticlockwise rotation. A valve opens in the nozzle, which is controlled by the D.C Motor. C algorithm here used is to sense the fire and to trigger the nozzle in the direction of fire.*

I . INTRODUCTION

There are many fields in which artificial intelligence (AI) may be related to electrical, mechanical, psychology and philosophy. We use this concept in a simpler application of fire detection. In our project, we use a sensor to detect fire, which sends the information to a micro-controller, which is written with a program based on fuzzy logic algorithm, which turns nozzle head of the fire fighter to that direction.

One stepper motor is used for the clockwise and anticlockwise rotation. A valve opens in the nozzle, which is controlled by the D.C Motor.

Fuzzy logic algorithm here used is to sense the fire and to trigger the nozzle in the direction of fire

A.ROBOTICS:

Robotics is the interdisciplinary branch of engineering and science that includes mechanical engineering, electrical engineering, computer science, and others. Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing.

TYPES OF ROBOTICS:

1. INDUSTRIAL ROBOTS **-** Industrial robots are robots used in an industrial manufacturing environment. Usually these are articulated arms specifically developed for such applications as welding, material handling, painting and others. If we judge purely by application this type could also include some automated guided vehicles and other robots.

2. DOMESTIC OR HOUSEHOLD ROBOTS **-** Robots used at home. This type of robots includes many quite different devices such as robotic vacuum cleaners, robotic pool cleaners, sweepers, gutter cleaners and other robots that can do different chores. Also, some surveillance and tele presence robots could be regarded as household robots if used in that environment.

3. MEDICAL ROBOTS **-** Robots used in medicine and medical institutions. First and foremost - surgery robots. Also, some automated guided vehicles and maybe lifting aides.

4. SERVICE ROBOTS **-** Robots that don't fall into other types by usage. These could be different data gathering robots, robots made to show off technologies, robots used for research.

5. MILITARY ROBOTS - Robots used in military. This type of robots includes bomb disposal robots, different transportation robots, reconnaissance drones. Often robots initially created for military purposes can be used in law enforcement, search and rescue and other related fields.

6. ENTERTAINMENT ROBOTS - These are robots used for entertainment. This is a very broad category. It starts with toy robots such as robosapien or the running alarm clock and ends with real heavyweights such as articulated robot arms used as motionsimulators.

7. SPACE ROBOTS **-** I'd like to single out robots used in space as a separate type. This type would include robots used on the International Space Station, Canadarm that was used in Shuttles, as well as Mars rovers and other robots used in space.

8. HOBBY AND COMPETITION ROBOTS - Robots that you create. Line followers, sumo-bots, robots made just for fun and robots made for competition.

BASIC COMPONENTS

- Motor
- Power supply (Battery)
- Gears
- Water tank
- Wheels
- Beam
- Sensor
- Nozzle
- Pump

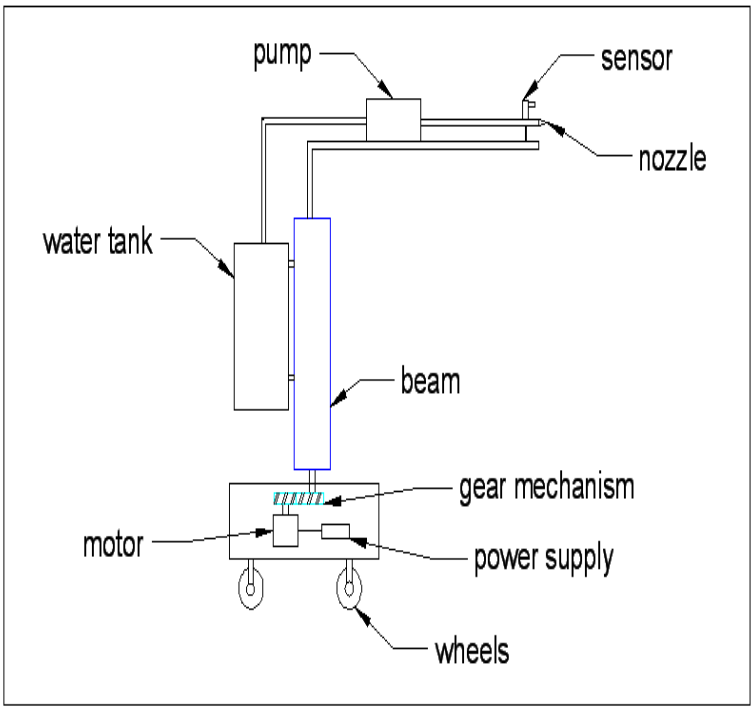

Fig.1.Block Diagram For a Fire Fighting Robot

A.MOTOR:

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator.

In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force within the motor. In certain applications, such as in the transportation industry with traction motors, electric motors can operate in both motoring and generating or braking modes to also produce electrical energy from mechanical energy.

Found in applications as diverse as industrial fans, blowers and pumps, machine tools, household appliances, power tools, and disk drives, electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as from the power grid, inverters or generators. Small motors may be found in electric watches. General-purpose

motors with highly standardized dimensions and characteristics provide convenient mechanical power for industrial use. The largest of electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors may be classified by electric power source type, internal construction, application, type of motion output, and so on.

Electric motors are used to produce linear or rotary force (torque), and should be distinguished from devices such as magnetic solenoids and loudspeakers that convert electricity into motion but do not generate usable mechanical powers, which are respectively referred to as actuators and transducers.

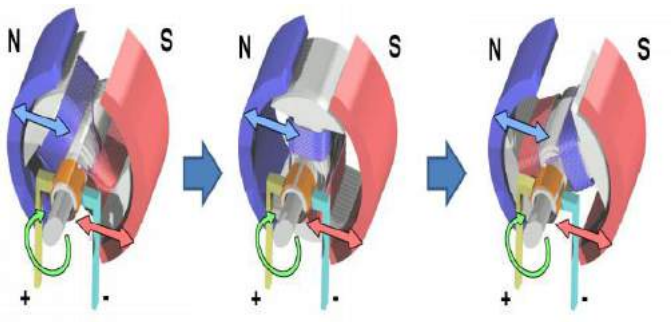

Fig.2.Stator Magnet

DC MOTORS

Shunt motor,

Separately Excited,

Series Motor,

Permanent Magnet DC (PMDC),

Compounded motor.

AC MOTORS

Induction motor,

Synchronous motor.

OTHER MOTORS

Stepper motor ,

Brushless DC motor,

Hysteresis motor,

Reluctance motor,

Universal motor

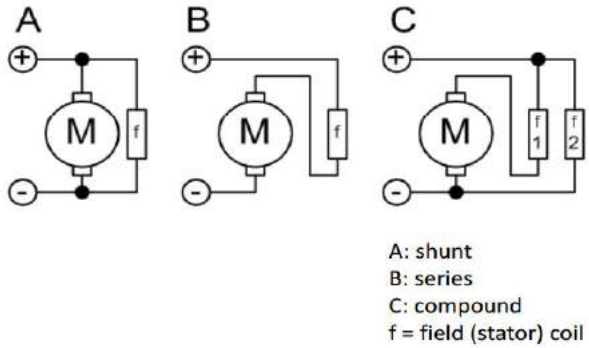

Fig.3

B.PUMP:

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps.

Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps. Mechanical pumps serve in a wide range of applications such as pumping water from wells, aquarium filtering, pond filtering and aeration, in the car industry for water-cooling and fuel injection, in the energy industry for pumping oil and natural gas or for operating cooling towers. In the medical industry, pumps are used for biochemical processes in developing and manufacturing medicine, and as artificial replacements for body parts, in particular the artificial heart and penile prosthesis.

Single stage pump - When in a casing only one impeller is revolving then it is called single stage pump.

Double/ Multi stage pump - When in a casing two or more than two impellers are revolving then it is called double/ multi stage pump.

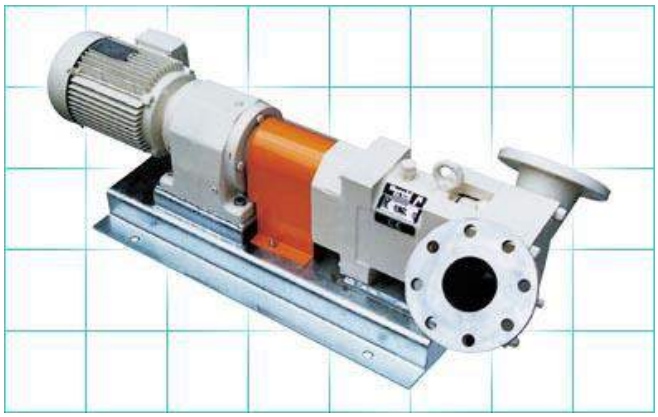

Fig.4.Drive Shaft Bearing

C.SENSOR:

In the broadest definition, a sensor is an electronic component, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics, whether as simple as a light or as complex as a computer.

CLASSIFICATION OF MEASUREMENT ERRORS

A good sensor obeys the following rules.

it is sensitive to the measured property

it is sensitive to the m it is insensitive to any other property likely to be encountered in its application, and

it does not influence the measured property.

Most sensors have a linear transfer function. The sensitivity is then defined as the ratio between the output signal and measured property.

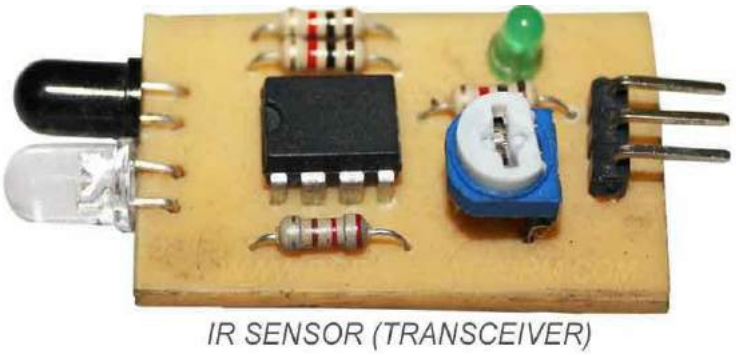

Fig.5.An Infrared Sensor

SENSORS IN NATURE :

All living organisms contain biological sensors with functions similar to those of the mechanical devices described. Most of these are specialized cells that are sensitive to:

- Light, motion, temperature, magnetic fields, gravity, humidity, moisture, vibration, pressure, electrical fields, sound, and other physical aspects of the external environment
- Physical aspects of the internal environment, such as stretch, motion of the organism, and position of appendages (proprioception)
- Environmental molecules, including toxins, nutrients, and pheromones
- Estimation of bimolecular interaction and some kinetics parameters
- Internal metabolic indicators, such as glucose level, oxygen level, or osmolality
- Internal signal molecules, such as hormones, neurotransmitters, and cytokines

Differences between proteins of the organism itself and of the environment or alien creatures.

D.NOZZLE:

A nozzle is often a pipe or tube of varying cross sectional area, and it can be used to direct or modify the flow of a fluid (liquid or gas). Nozzles are frequently used to control the rate of flow, speed, direction, mass, shape, and/or the pressure of the stream that emerges from them. In a nozzle,

the velocity of fluid increases at the expense of its pressure energy.

Fig.6.Water Nozzle

E.POWER SUPPLY:

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another and, as a result, power supplies are sometimes referred to as electric power converters. Some power supplies are discrete, stand-alone devices, whereas others are built into larger devices along with their loads. Examples of the latter include power supplies found in desktop computers and consumer electronics devices.

Fig.7.Battety

F.GEAR MECHANISM:

A mechanism for transmitting motion for some specific purpose (as the steering gear of a vehicle)

Fig .8.Worm Gear

G.BEAM:

A beam is a structural element that primarily resists loads applied laterally to the beam's axis. Its mode of deflection is primarily by bending. The loads applied to the beam result in reaction forces at the beam's support points. The total effect of all the forces acting on the beam is to produce shear forces and bending moments within the beam, that in turn induce internal stresses, strains and deflections of the beam. Beams are characterized by their manner of support, profile (shape of cross-section), length, and their material**.**

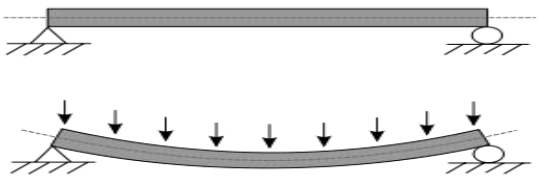

Fig .9.A Statically Determinate Beam

III. LITERATURE SURVEY

Tushar Nandkishor Satbhai, describe the main goal of this project is to develop a robotic vehicle which is used to find and fight fire remotely through RF application in an event of any major fire hazard particularly in industries. Major fire accidents do occur in industries like nuclear power plants, petroleum refineries, gas tanks, chemical factories and other large-scale fire industries resulting in quite serious consequences.

Thousands of people have lost their lives in such mishaps. Therefore, this project is enhanced to control fire through a robotic vehicle With the advancement in the field of Robotics, human intervention is becoming less everyday and robots are used widely for purpose of safety. In our day to day life fire accidents are very common and sometime it becomes very difficult for fireman to save human life. In such case fire fighting robot comes in picture.

The fire extinguishing robotic vehicle can be controlled wirelessly through RF communication. The vehicle is controlled through connected remote key input. The language input allows a user to interact with the robot which is familiar to most of the people. The medium of interaction between human sand computers is on the processing of speech. 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..

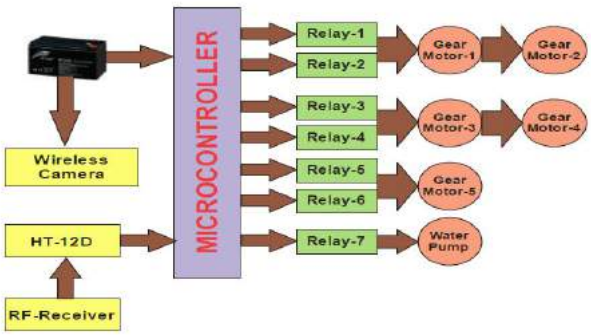

Fig .10.Block Diagram

A.AUTONOMOUS FIRE FIGHTING ROBOT :

Sahil S.Shah, describe there are many possibilities a fire can start in an industry or in any remote area. For example, in cotton mills, garments, fuel storages, etc., electric leakages can lead to huge damage. Also it's a worst-case scenario, causing heavy losses not only financially but also destroying areas surrounding it. Robotics is the emerging solution to protect human lives and their wealth and surroundings. The aim here is to design a FIRE FIGHTING ROBOT using embedded system.

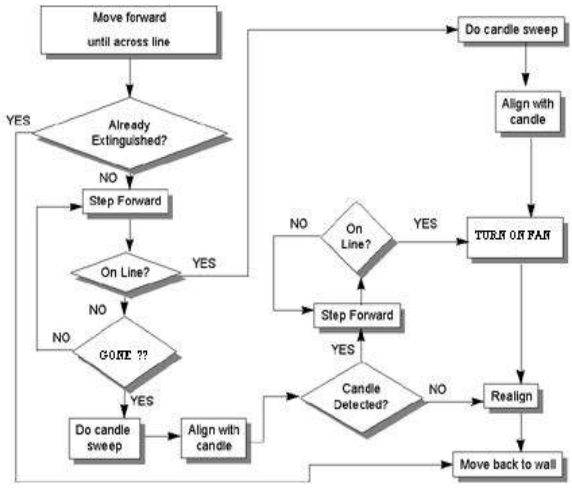

Fig .11.Algorithm

A robot capable of fighting a simulated household fire will be designed and built. It must be able to autonomously navigate through a modeled floor plan while actively scanning for a flame.

B.AUTOMATIC FIRE FIGHTING ROBOT :

Abhilash Dhumatk ,describe a industrial and domestic world, Automation plays an important role, it is actually an arrangement of different elements in order to regulate, direct, sense and command itself to achieve a desired result. "Automatic Fire Fighting Robot" project employs the electrical thermostat technology for the controlling the fire 24

hrs. The system is cost effective, has a wide applications which when implement can show good and effective result. It can be use deliberately in industrial applications, commercial and in domestic sectors where the requirement of automatic work demands. Synchronization of various equipment involve in the system i.e Thermostat Sensor, water jet, wireless remote and wireless android device WiFi enabled Camera. This is mean to simulate the real world operation of Robot performing a fire extinguishing function. Fuzzy logic provided an appropriate solution to the otherwise complex task of mathematically deriving an exact model for the non-linear control system upon which conventional control techniques could then be applied. Making Robot wireless increases the effective area of operation, thereby making it possible to control the robot from remote location.

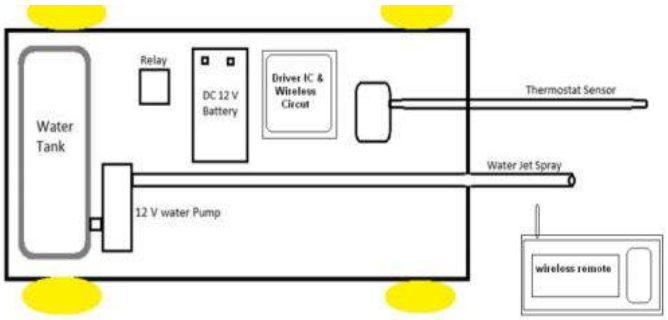

Fig .12.System Architecture

IV. WORKING PRINCIPLE

The block diagram explains the working of the fire fighter in the represented order.

STEP 1

Fire is detected by the flame sensor. The direction of the fire will also be detected by the sensor.

STEP 2

The signal obtained by the sensor is sent to the amplifier which is the basic information for the micro controller.

STEP 3

After receiving the amplifier signal, based on the signal the Micro Controller executes the program. Such as

- Stepper motor activation
- Nozzle activation

V.MERITS AND LIMITATIONS

A.MERITS

- The intelligence of the fire fighter can detect fire for about one feet square area.
- The range of detection of fire is 360º, in all directions.
- The nozzle adjustments are such that water or any chemicals, which are used to extinguish fire, can be used here.
- Since the project is based on the Micro controller, it is compact and swift and response.
- No external devices are used here to control it.

B.LIMITATIONS

- The nature of the fire cannot be found out.
- Huge fires cannot be extinguished.
- The stepper motor used works only on 12V supply, hence applications are limited.

VI . CONCLUSION

Fire control robot are very useful in many places ,by using these types of robot we can prevent the damages causes by the fire .It can be used in any places by carring to any where as we need. . This is mean to simulate the real world operation of Robot performing a fire extinguishing function .The medium of interaction between human sand computers is on the processing of speech.

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