

Design and Fabrication of a Fire Fight Robot

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Abstract: There are many fields in which artificial intelligence (AI) may be related to electrical, mechanical lingistres, 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.

Two-stepper motors are provided, one for the up and down movement and the other for the clockwise and the anticlockwise rotation. A valve opens in the nozzle, which is controlled by the same. Fuzzy logic algorithm used here is to sense the fire and to trigger the nozzle in the direction of fire.

Keywords: Fire fight robot, Fuzzy.

1. Introduction

AI as we know it today is a relative field. Even though some ground work had been laid earlier. AI began during the years of 1940's and 1950's. AI is a branch of computer science concerned with the study and creation of computer system that exhibit some form of intelligence. AI system is the system that learns new concepts and tasks, system that reason and draw useful conclusion about the world around us. Also this is the system that can understand a natural language or perceive and comprehend a visual scene and system that performs other types of feast that require human type of intelligence.

Fuzzy logic algorithm is used for performing AI functions. Fuzzy is a term that is related to the word vague or not clear forming logical or meaningful functions based on the unclear term is the concept. We use this concept for project 'Fire Fighting Robot', with micro controllers and sensors.

2. 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,

- Permanent motor D.C motor – from ON stage to

OFF Stage

- D.C pump activation

The rotary motion of sensor and nozzle is provided by the DC motor fixed at the rotating shaft of firefighting robot. The supply of the current is given by the battery. The already energy stored in battery is sent to D.C motor control circuit. The D.C motor works according to the program written on the microcontroller chip. (i.e.) rotating motor is ON and D.C water pump is in OFF condition.

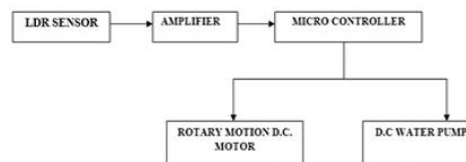


Fig. 1. Block diagram

In this project lead-acid battery is used. The lead-acid batteries output is given to the control unit. Control unit having three relays, they are connected to the D.C motor in Forward and reverse rotation of operation and D.C. water pump.

- Relay 1 - Forward Direction of Rotating Motor
- Relay 2 - Reverse Direction of rotating Motor
- Relay 3 - D.C water Pump

3. What is fuzzy logic?

Fuzzy logic is an innovative technology that enhances conventional system designs with engineering expertise. The use of fuzzy logic can help to circumvent the need for rigorous mathematical modeling. Fuzzy logic is a true extension of conventional logic, and fuzzy logic controllers are a true extension of linear control models. Hence anything that was built using conventional design methods would have been overly complex and, in many cases, might prove simpler, faster and more efficient. The key to successful use of fuzzy logic is clever combination with conventional techniques. Also, a fuzzy system is time-invariant and deterministic. Therefore, any verification and stability analysis method can be used with fuzzy logic, too.

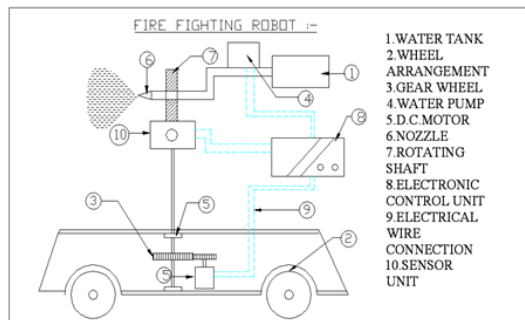


Fig. 2. Components of Robot

4. 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 360°, 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 D.C motor used works only on 12V supply, hence applications are limited.

5. Scope for improvement

The A.I. fire fighter which can detect fire and extinguish the fire this is the main purpose. In this project, the use of water (or) other extinguisher to extinguish the fire is not fabricated.

The scope of improving this fire extinguisher is the fabrication of water (or) other extinguishes. The electromagnet (A) is connected to sensor which senses the fire. When the fire is sensed, the electromagnet (A) is magnetized i.e., current is allowed to pass through the coils hence, the electromagnet (A) gets activated which attracts electromagnet(B). This results in valve opening which trigger the water, the opening of valve which leads water expulsion through the nozzle. This mechanism can be employed for water expulsion. Water connection is given to nozzle by a high pressure cylinder where the water is stored.

6. Conclusion

The fire fighter who is designed and fabricated is based on artificial intelligence, which is a branch of computer science involved with the study and creation of computer system, which resembles human intelligence. The ability to understand a natural language accordingly and perform various tasks similar to human intelligence. The fire fighter recognizes the fire, the direction in which the fire occurs and acts accordingly to extinguish the fire is artificial intelligence of the fire fighter here used is fuzzy logic.

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