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Application of Fuzzy-Logic Method to Control Intelligent Robots

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Abstract: *Fuzzy-logic method can be used to control intelligent robots. It is a logical control system for making an intelligent system or robot perform actions based on instructions specified in different contexts. Its purpose is to assist in carrying out directed activities and achieving anticipated results. The fuzzy-logic method often uses predicted conditions and enables the robot to take actions according to freely specified instructions. As a result, robots are capable of adapting to different situations and can take actions according to the context, which helps meet the user's needs.*

Keywords: GA, Logic, Robot, Direct etc

I. INTRODUCTION

The development of intelligent robots is an important field that is playing an important role in social, industrial, and statistical development. Various technologies are being used to control these robots accurately and safely. Fuzzy-logic method is one such ancient technique that can be suitable to operate robotic systems through logical control. In this study, we will focus on various applications of controlling intelligent robots using fuzzy-logic method.

The fuzzy-logic method can be applied in many ways in controlling intelligent robots. This method helps prepare robots for appropriate and independent action in environmental contexts. Here is an introduction to some of the major underlying usage areas:

Automated navigation: Intelligent robots can use fuzzy-logic method to navigate in different contexts. This helps robots make sense of the information they have and gives them the ability to independently reach their goals.

Developing functionality: Robots can be motivated to improve their functionality by using fuzzy-logic method. This helps them make decisions based on context, dynamics, and other primary elements.

Adapting actions to context: Fuzzy-logic methods can be used to adapt robots to different contexts. It helps robots understand the environment around them and gives them the ability to take action accordingly.

Collaborative action: Robots can work together and cooperate with other robots by using fuzzy-logic method. This enables them to become part of an organized and integral organizational plant.

In these application areas, fuzzy-logic method can help intelligent robots take actions according to their context and make them helpful for independence and advancement.Although the wheel governor has proved to be a very practical means of regulating speed, it suffers from the inability to control frequency after disturbance without supplementary control action. This is also true of modern digital governing systems where good disturbance rejection properties require complementary control action following the frequency event. This has led to a major study known as automatic generation control, which is strongly concerned with frequency control and power regulation on electrical networks and the control of their associated generating units.

Genetic algorithm applications

Genetic algorithms are motivated to provide solutions to real world problems and are based on the process of evolution by natural selection. In particular, genetic algorithms are applied to solve many optimization problems, such as problems where the objective function is discontinuous, non-differentiable, stochastic, or highly non-linear. Genetic algorithms can solve mixed-integer programming problems, where many components are limited to integer-valued (Almeida, Oliveira, & Pinto, 2015).

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For example, GA searches through different combinations of materials and designs to find the best combination to achieve the best overall result. Additionally, they are used for designing computer algorithms, scheduling tasks, and solving many optimization problems.

Fuzzy logic

Fuzzy logic provides inference morphology to enable approximate human reasoning abilities to be applied to knowledge-based systems. The traditional approach to knowledge representation lacks a means of representing fuzzy concepts. Fuzzy logic is an approach to computing based on "degrees of truth" rather than the "true or false" (1 or 0) upon which modern computer functions are based. Fuzzy logic includes 0 and 1 as extreme cases of truth, yet also includes different states of truth.

Fuzzy theory

Essential research areas in fuzzy theory are fuzzy sets, fuzzy logic, and fuzzy measurement. Fuzzy Reasoning is an application for knowledge processing of fuzzy logic. Fuzzy systems have the ability to realize a complex non-linear input-output relationship as a synthesis of many simple input-output relationships, similar to neural network functions. This is the essential idea of fuzzy systems and the origin of the word 'fuzzy'. Fuzzy control is an application of fuzzy reasoning for control.

Fuzzy logic controller

A fuzzy logic controller is a system that has a knowledge base, consisting of information provided in the form of linguistic control rules, and a fuzzification interface, which has the effect of turning crisp data into a fuzzy set. Additionally, includes an estimation system that works in conjunction with a knowledge base to provide estimations with the use of a logic method, and a diffusion interface, which converts fuzzy control action to real control action by diffusion method. (Abraham, Hass-Saini, Siari, & Engelbrecht, 2009).

Result Analysis

For many years, classical control engineers began their work with mathematical models and did not acquire much knowledge of the system. Today, control engineers use all of the above sources of information. Although a relatively new concept, FL is being used in many engineering applications because it is considered by designers to be the simplest solution available to a specific problem. Another advantage of fuzzy controllers is that they are inherently non-linear, and by carefully adjusting their parameters they are effective enough to provide desired non-linear control actions.

Application 1: Autonomous Navigation:

This application is for robots that have the ability to navigate freely in their surrounding environment. Using the fuzzy-logic method, the robot understands its context and makes appropriate decisions for navigation.

Application 2: Developing Automated Functionality:

In this application, the robot is motivated to improve its efficiency using the fuzzy-logic method. This gives robots the ability to create solutions in new contexts.

Application 3: Taking action in context:

In this application, the fuzzy-logic method is used to adapt the robot to different contexts. This provides the robot with the ability to take action automatically in the changing contexts of the environment.

Application 4: Collaborative Action:

In this application, robots can work together and cooperate with other robots by using the fuzzy-logic method. This allows them to represent various functions as a planted and integral organizational structure.

The fuzzy-logic method is based on the following steps:

Understanding context: First, the robot is given the ability to understand the context of the environment. This means that the robot must have the ability to understand location, thought, and information it comes into contact with in context.

Information collection: Robots must have the ability to collect information from their surrounding environment. This collected information is then analyzed and used in combination with fuzzy-logic techniques.

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Decision Making: Under the fuzzy-logic method, the robot must have the ability to make the right decision based on the context. This decision can be made in a variety of contexts, such as through safety, functionality, and potential destructive consequences.
Execution: After a decision, the robot must have the ability to execute the specified action. This may occur independently or under human-specified controls.

The fuzzy-logic method can be applied in a variety of ways to control intelligent robots. Here are some examples:
Autonomous Decision Making: An intelligent robot has the ability to understand the environment around it and is empowered to make the right decisions for itself. If the robot encounters a new situation in a context, it can use its fuzzy-logic method to analyze the context and determine the appropriate action.
Automaticity of action: Intelligent robots can achieve automaticity to reach their set goals by using fuzzy-logic method. This may include directing the robot to sensitive contexts, automated navigation, and sensitive sensing.
Predicting and predicting: Using fuzzy-logic method the robot can predict and anticipate possible situations. This allows the robot to adjust its actions in time and accurately.
Collaborative action: Using the fuzzy-logic method, the robot can take actions as a collaborator, such as collaborating with humans or coordinating with other robots.
In these examples, fuzzy-logic methods can help make robotic control smooth, intelligent, and effective. It helps robots perform actions successfully in a variety of situations, such as heightened thoughtfulness, automaticity, and collaboration.

II. CONCLUSION

Fuzzy-logic method can be an effective and suitable technique to control intelligent robots with sensitivity and autonomy. In this study, its effect and importance have been analyzed through various applications, due to which the use of this method can be encouraged more in the development of robotic systems. Fuzzy-logic method helps to control intelligent robots with sensitivity and autonomy. It gives robots the ability to think and take decisions in the context of their surrounding environment. By using this, the robot can improve automaticity, sensitivity, and potency, so that it can perform actions successfully in different contexts. Through this method, the robot is able to take action according to the context in time, thereby increasing its efficiency and effectiveness. As a result, intelligent robots can collaborate with humans on related tasks and automatically adjust themselves to new contexts.

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