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ROLE OF ARTIFICIAL INTELLIGENCE APPLICATIONS IN POWER SYSTEM

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ABSTRACT
It is necessary that interminable and reliable supply of electricity for the use of nation, human daily needs and industry. Many efforts have been done for the same from past several decades. As the growth of power system increased from last few years therefore to fulfill all the demands at rated and specified ratings co-operation of AI methods have been come into role. This paper originally were studied in artificial intelligence in power system on steady and transient, introducing the most suitable method, which can be used as reference in practical application. AI techniques have become too much in practice for solving different problems in power systems like forecast, control, planning, scheduling, etc. In modern large power systems many difficult tasks are handled by different AI techniques. In this paper the application of AI in power system have been also discussed.
KEYWORDS: *Artificial intelligence, Expert system, ANN, Expert system, Fuzzy logic, Power station.*

INTRODUCTION
POWER SYSTEMS:

An electric power system is a network consists of various electrical apparatus which is used to generate electric supply and transmit and distribute electric power. i.e. Power systems is a part of electrical engineering that is responsible for the generation, transmission, distribution and utilization of electric power and the electrical devices connected to such systems like generators, motors and transformers.

ARTIFICIAL INTELLIGENCE:

Commonly, Artificial intelligence is usually defined as the science of making computers do things that require intelligence when done by humans for example, robots and mobile phones etc. we can say that artificial intelligence is the study of ideas that enables computers to be intelligent. The artificial intelligence comprises of the system having the ability to think, reason, discriminate, generalize, and learn from past events. It generally refers to machines or programs with ability to think on an independent level from their operator to make decisions. Mobile sensing of fault

will play an progressively important role in the monitoring of power system.. Artificial intelligence is essentially a science which are meant to research, develop and simulate of human behavior and its rules. Artificial intelligence techniques including Brain Science, Neurology, and disciplines such as information technology.

ARTIFICIAL INTELLIGENCE TECHNIQUES:

Following AI techniques are used in modern power system

1. Expert system techniques
2. Artificial neural networks
3. Fuzzy logic system

- **Artificial Neural Networks**:

Artificial Neural Networks are systems designed based on organic thought processes which convert a set of inputs into a set of outputs by a network of neurons. Each neuron produces one output as a function of inputs.

Input Layer: The nodes are input units which do not process the data and information but distribute this data and information to other units. Hidden Layers: The nodes are hidden units that are not directly evident and visible. They provide the networks the ability to map or classify the nonlinear problems. Output Layer: The nodes are output units, which encode possible values to be allocated to the case under consideration. Artificial neural networks operate on biological institutes and perform biological evaluation of real world problems, the problems in generation, transmission and distribution of electricity can be fed to the artificial neural networks so that a suitable solution can be obtained.
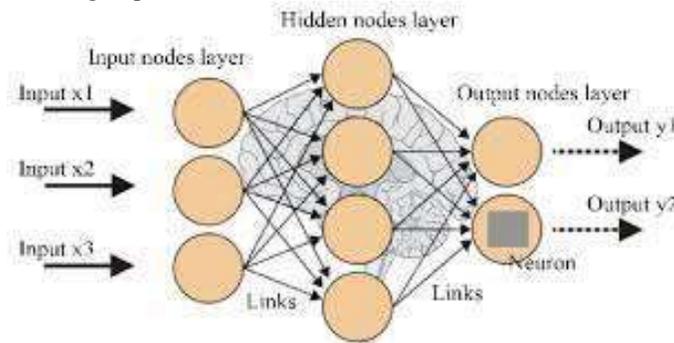

Fig : Structure of an Artificial Neural Networks

Advantages of artificial neural networks :	Disadvantages of artificial neural networks :
high operation speed	Large dimensionality.
It do not requires additional apprehension of the system module.	It has the tendency of generating outcomes no matters the input values are significant or not.
The ANN can manage the processing if the feed data is improper or missing.	The artificial neural network cannot do perform other new task until reconditioning of network is done.
They are fault tolerant.	
They are fast and rugged in design.	

Application in Power Systems:

ANN are designed to perform biological based evaluation of problems due to their inherent design and they are suitable for obtaining solutions of problems arising in power generation, distribution and transmission. Based on the constraints of a practical transmission system, ANN's is able to determine the solution and hence various problems of transmission and distribution of electrical power easily sort out by using artificial intelligence. For example in differential current transformer protection scheme ANN makes the easy discrimination among various fault currents so that appropriate protective part of the section will tends to operate as soon as possible without disturbing other zone.

- . **FUZZY LOGIC:**

Fuzzy logic or fuzzy system is the type of system which is able to understand the physical system and control requirement. Fuzzy system design the control for system using fuzzy rules for simulation of models and hence by introducing fuzzy logic in the system any machine will attain the ability to produce the same solutions like human reasoning .Fuzzy logic has expert knowledge in the form of protection

criteria. For instance, consider the announcement "It is warm." The variable warm is a fuzzy variable, and reality of the announcement depends somehow or another on the connection between the real numerical temperature and the individual putting forth the expression, and results in some fact level between 0% (it's not in any way warm) and 100% (it's certainly warm, that is for sure).
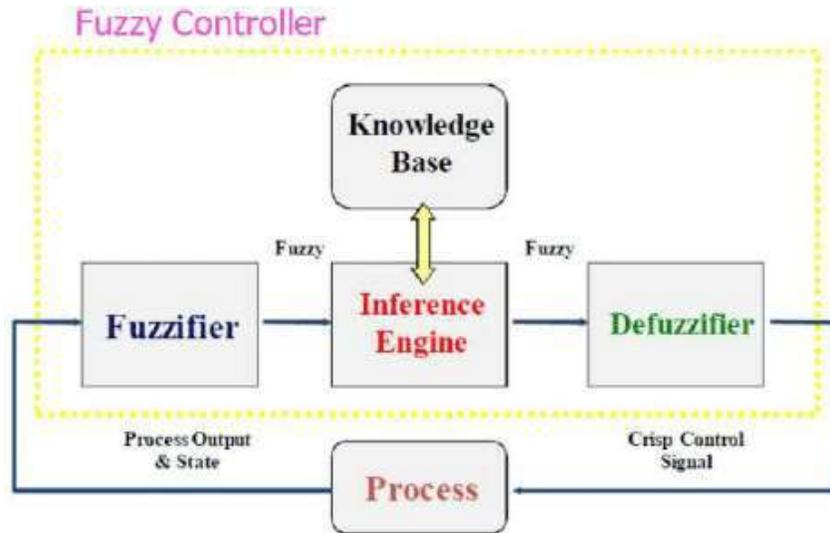

Fig : Fuzzy Logic Controller

Advantages of fuzzy logic	Disadvantages of fuzzy logic
• Self learning is possible.	lake of real time response
• Troubleshooting is convenient	Highly complex system
• Robustness is not critical	Formation of rules is too tedious
• Easy handling of unclear situations.	Difficult to estimate membership function

Application in Power Systems:

Numerous regions of utilizations in power frameworks coordinate the capacities of expert frameworks like basic leadership, chronicling information, and taking care of issues by thinking, heuristics and judgment. Master frameworks are particularly helpful for these issues when a lot of information and data must be prepared in a brief timeframe. Fuzzy system can reduce the tedious calculations in power system, which will ultimately save the time and rapid estimation of the value of parameters used in generation, transmission and distribution.

• **EXPERT SYSTEMS:**

An Expert system is a computer program that contains some of subject explicit information of at least one human specialist. To make a program smart, give it part of astounding, explicit information about some issue region. In short expert system is an intelligent computer program that can execute tremendous and special task in some fields at the level of human experts.
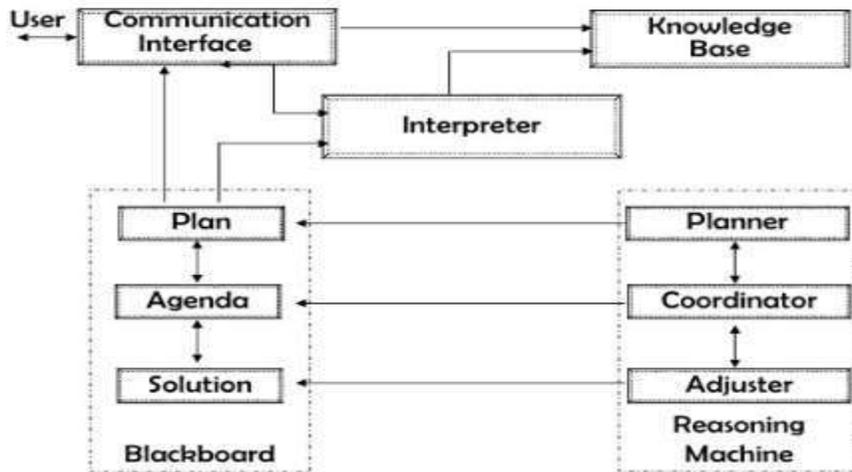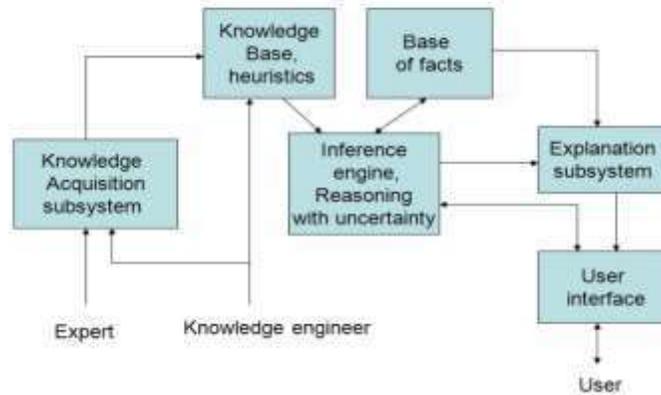
Structure of Expert System

Fig ; Architecture of an ideal expert system

Advantages of Expert system	Disadvantages of Expert system
• Increased timeliness in decision making	• Absence of common sense
• Rapid and easy transfer of knowledge	• Expensive to produce
• Easy to develop and modify	• Difficult to maintain
• Increased reliability	• It may have high development cost
• Reduced employ training cost	• No adaptable without human intervention
• Easy to document the knowledge	
• Cheaper than human experts	

Application in Power Systems:

By using expert system it becomes very easy to calculate and estimate the value of parameters used in generation, transmission and distribution. As expert system is computer program so it is very easy to modify the design. Now a days expert system are widely used for power quality monitoring.

Recent application Of Ai In Power Systems:
1. Alarm processing
2. Equipment testing
3. Fault analysis

4. Planning
5. Restoration
6. Voltage control
7. Automation
8. Design
9. Substation control
10. Load allocation
11. Substation design
12. Load forecasting
13. Outage scheduling
14. Load frequency control
15. Contingency analysis
16. State estimation
17. Unit commitment
18. Dynamic security
19. Emergency control

CONCLUSION

A reliable, continuous supply of electrical energy is essential for the functioning of today's modern complex and advanced society. A lot of research is performed to utilize the current interest AI for power power system applications. This paper reviews all the AI techniques which makes power system more reliable and continuous. In a short, the coordination of AI is major trend in future improvement of electric supply.

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