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An Overview Report On Application of Artificial Intelligence in Electrical Engineering

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ABSTRACT:

This article begins by recognizing a distinction between mind and cognition, and postulating that cognition is an aspect of the mind, and proposes as a working hypothesis a separability hypothesis that postulates that the architecture for cognition can be factored from a more general architecture for cognition. mind, thereby avoiding a number of philosophical objections that have been raised about the "strong AI" hypothesis. Therefore, the search for an architectural level that explains all the interesting phenomena of cognition is probably futile. Computer-aided engineering has been applied to current electrical engineering, mainly covering the areas of electrical power systems and electrical machines and drives, and is used to demonstrate the potential of the application of artificial intelligence in these areas. There are several interacting levels, unlike the computer model, and this interaction makes the explanation of even relatively simple cognitive phenomena in terms of one level quite incomplete. Because artificial intelligence techniques have permanent and consistent capabilities and the ability to facilitate documentation and reproduction, this characteristic can be imparted in the development of new technologies in high-voltage power supplies and other fields of electrical engineering.

KEYWORDS: Artificial Intelligence (AI), Neural Network, Separability Hypothesis

INTRODUCTION

All Artificial Intelligence (AI) is the intelligence of machines and the branch of computing that aims to create it. Textbooks define this field as "the study and design of intelligent agents," where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. John McCarthy, who coined the term in 1956, defines it as "the science and engineering of making intelligent machines"[1]. The field was based on the claim that a central property of humans, intelligence (the sapience of Homo sapiens) can be described so precisely that it can be simulated by a machine. This raises philosophical questions about the nature of the mind and the limits of scientific arrogance, questions that have been addressed by myth, fiction, and philosophy since ancient times.

Artificial intelligence has been the subject of optimism, but it has also suffered setbacks, and today it has become an essential part of the technology industry, providing the heavy lifting for many of computing's most difficult problems. AI research is highly technical and specialized, deeply divided into subfields that often fail to communicate with each other. Subfields have emerged around particular institutions, the work of individual researchers, the solving of specific problems, long-standing differences of opinion about how AI should be done, and the application of very different tools. The core problems of AI include traits such as reasoning, cognition, planning, learning, communication, perception, and the ability to move and manipulate objects. General intelligence (or “strong AI”) remains a long-term goal of (some) research. The application of AI in electrical engineering can be the solution to the incompetence in finding faults other than the macroscopic level that humans cannot find.

ARTIFICIAL INTELLIGENCE

Artificial intelligence deals with intelligent behavior: the things that make us seem intelligent. Ultimately, what engineers aim to do is recreate a perception of man and build a machine using the human framework [5]. This is a strong statement, but it describes the underlying current of this work. In 1981, Professor Marvin Minsky of MIT, in a casual conversation with me, described how people often explore their own weaknesses and concerns through artificial intelligence. He gave real-life examples: a colorblind man studies computer vision; a person with a speech impediment builds computers that talk. Then he finished with a joke, asking me what he could say about me, being interested in thinking. Professor Minsky's observation highlights the inner desires of many who work in this field and sheds light on true human intentions. Problems arise from human ignorance of thinking, learning and intelligence. It is difficult to define what is not known. This article contrasts intelligent behavior with a stupor, with that of being machines that respond to stimuli consistent with traditional human responses, given the human capacity for contemplation, judgment and intention. Each of these machines must carry out a critical evaluation and a selection of different opinions within it. Produced by human skill and labor, these machines should behave in accordance with life, spirit and sensibility, although in reality they are imitations."[2] Perhaps the validity of this definition can only be determined by time. When We, or those who follow us, are close to producing the ultimate machine of this kind, one that responds intelligently to real-world stimuli comparable to humans.[6] Then, humans can reflect on what was done and better define it. .

PROBLEMS

The general problem of simulating (or creating) intelligence has been broken down into a number of specific sub- problems. These consist of particular traits or capabilities that researchers would like an intelligent system to display. The traits described below have received the most attention.

A.Deduction, Reasoning, Problem Solving

Early AI researchers developed algorithms that mimicked the step-by-step reasoning that humans use when solving puzzles, playing board games, or making logical deductions. By the late 1980s and 1990s, AI research had also developed very successful methods for dealing with uncertain or incomplete information, employing concepts of probability and economics. For difficult problems, most of these algorithms can require enormous computational resources; most experience a "combinatorial explosion": the amount of memory or computer time required becomes astronomical when the problem exceeds a certain size. The search for more efficient problem-solving algorithms is a high priority for AI research. Humans solve most of their problems using quick, intuitive judgments rather than the conscious step-by-step deduction that early AI research was able to model. AI has made some progress in imitating this type of "subsymbolic" problem solving: embodied agent approaches emphasize the importance of sensorimotor skills for higher-order reasoning; Neural network research attempts to simulate the structures within the human and animal brain that give rise to this ability.

ARCHITECTURES FOR INTELLIGENCE

This paper now moves to a discussion of architectural proposals within the information processing perspective. The main goal is to try to place the multiplicity of proposals into perspective. As this paper review various proposals, and will present some judgments of some relevant issues.

A. **Sub-Symbolic**

During the 1960s, symbolic approaches had achieved great success in simulating high-level thinking in small demonstration programs. Approaches based on cybernetics or neural networks were abandoned or relegated to the background. However, in the 1980s, progress in symbolic AI seemed to stagnate and many believed that symbolic systems would never be able to imitate all the processes of human cognition, especially perception, robotics, and robotics. , learning and pattern recognition. Several researchers began studying "subsymbolic" approaches to specific AI problems.

B. **Bottom-up, Embodied, Situated, Behavior-based or Nouvelle AI**

Researchers from the related field of robotics, such as Rodney Brooks, rejected symbolic AI and focused on the basic engineering problems that would allow robots to move and survive Their work revived the non-symbolic viewpoint of the early cybernetics researchers of the 50s and reintroduced the use of control theory in AI. These approaches are also conceptually related to the embodied mind thesis.

C. Computational Intelligence

Interest in neural networks and "connectionism" was revived by David Rumelhart and others in the middle 1980s. These and other sub-symbolic approaches, such as fuzzy systems and evolutionary computation, are now studied collectively by the emerging discipline of computational intelligence.

D. Learning

Machine learning has been a central to AI research from the beginning of 21st century. Unsupervised learning is the ability to find patterns in the stream of input. Supervised learning includes both the classification and numerical regression. Classification is used to determine, what category something belongs in, whereas after seeing a number of examples of things from several categories. Regression takes a set of numerical input/output examples and attempts to discover.

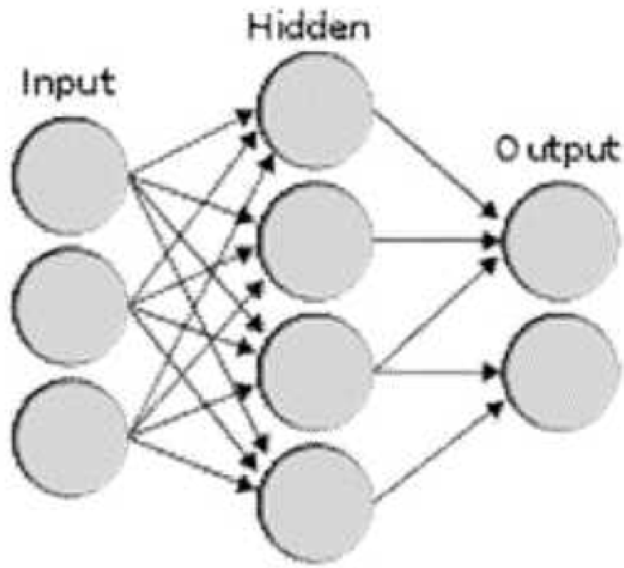

Fig. 1: neural network is an interconnected group of nodes, akin to the vast network of neurons in the human brain.

The study of artificial neural networks began in the decade before the founding of AI field research, in the work of Walter Pitts and Warren McCullough. Other important early researchers were Frank Rosenblatt, who invented the perceptron, and Paul Werbos, who developed the backpropagation algorithm. The main categories of networks are acyclic or feedback neural networks (where the signal passes in only one direction) and recurrent neural networks (which allow feedback). Popular feedforward networks include perceptrons, multilayer perceptrons, and radial basis networks. Among recurrent networks, the most famous is the Hopfield network, a form of attractor network, which was first described by John Hopfield in 1982. Neural networks can be applied to the problem of intelligent control (for robotics) or learning, using techniques such as Hebbian. learning and competitive learning.

APPLICATIONS

A. Application in Electrical Engineering

Many application areas in energy systems match the capabilities of expert systems, such as decision making, knowledge archiving, and problem solving through reasoning, heuristics, and judgment. Expert systems are especially useful for these problems when a large amount of data and information must be processed in a short period of time.

1) How expert systems can be used in power systems Since expert systems are basically computer programs, the process of writing codes for these programs is simpler than calculating and estimating the value of parameters used in generation, transmission and distribution. Any modifications, even after design, can be done easily because they are computer programs. Virtually, an estimate of these values can be made and further research can also be done to increase the efficiency of the process.

2) How genetic algorithms can be used in energy systems 1) Planning: positioning of the wind turbine, optimization of reactive power, routing of grid feeders and placement of capacitors. 2) Operation – Coordination of hydrothermal plants, maintenance scheduling, loss minimization, load management and control.

3) Analysis: harmonic distortion reduction, filter design, load frequency control, load flow. As genetic algorithms are based on the principle of survival of the fittest, various methods can be proposed to increase the efficiency of power system processes and increase energy production. From these methods, using genetic algorithms, the best method that resists all constraints can be selected, as it is the best method among the proposed methods (survival of the fittest).

4) Practical application of AI systems on transmission lines Consider a practical transmission line. If any fault occurs in the transmission line, the fault detector detects the fault and sends it to the diffuse system.[4] Only three line currents are sufficient to implement this technique and the angular difference between the fault and pre-fault current phasors are used as inputs to the fuzzy system. The fuzzy system is used to obtain a clear output of the fault type. Fuzzy systems can generally be used for fault diagnosis.

B. Applications in Other Fields

1) Game You can buy machines that can play master level chess for a few hundred dollars. They have some AI, but they work well against people, mainly through brute force calculations analyzing hundreds of thousands of positions. To beat a world champion through brute force and with reliable and known heuristics, you need to be able to observe 200 million positions per second. [7]

2) Speech Recognition In the 1990s, computer speech recognition reached a practical level for limited purposes. Thus, United Airlines has replaced its flight information keyboard tree with a system that uses voice recognition of flight numbers and city names. It's quite convenient. On the other hand, while it is possible to instruct some computers by voice, most users have returned to the keyboard and mouse as even more convenient.

3) Understanding natural language It is not enough to enter a sequence of words into a computer. Analyzing sentences is not enough either. The computer must be given an understanding of the domain the text is about, and this is currently only possible for very limited domains.

CONCLUSION

This paper concludes that the Artificial intelligence can be a major breakthrough in Electrical Engineering that can be implemented all electrical fields like in power systems, power generation and transmission and can also be use-full in ecologically and economically.

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