Applications & Associated Technologies of Artificial Intelligence

Rajinder Singh¹ Amandeep Singh²

¹,² Department of Computer Science & Engineering, ¹,² Gulzar Institute of Engineering & Technology, Ludhiana, Punjab, India

Abstract— This paper reviews the importance of artificial intelligence and a variety of advantages and disadvantages including its applications. It also considers the current progress of this technology in the real world and discusses the applications of Artificial intelligence in the fields of heavy industries, gaming, weather forecasting, expert systems. The paper concludes by analyzing the future potential of Artificial Intelligence.

Keywords— Turing Test, Intelligence, Human being, Expert System.

I. INTRODUCTION

In the future, intelligent machines will replace or enhance human capabilities in many areas. Artificial intelligence (AI) is defined as intelligence exhibited by an artificial entity to resolve complex problems and such a system is generally assumed to be a computer. Artificial Intelligence is combination of computer science and physiology Intelligence. Artificial intelligence is concerned with making computers that behaves like human and does tasks in much less time than a human. Hence it is called as Artificial Intelligence. It is claimed that artificial intelligence is playing an increasing role in the research of management science and operational research areas. Intelligence is commonly considered as the ability to gather knowledge and reason about knowledge to solve complex problems. Artificial intelligence has the advantages over the natural intelligence as it is more permanent, consistent, and less expensive, has the ease of duplication, can be documented and can perform certain tasks much faster and better than the human.

In the near Future intelligent machines will replace human capabilities in many areas. Artificial intelligence is the study and developments of intelligent machines and software that can reason, learn, gather knowledge, communicate, manipulate and perceive the objects. John McCarthy coined the term in 1956 as branch of computer science concerned with making computers behave like humans. It is the study of the computation that makes it possible to perceive reason and act. Artificial intelligence is different from psychology because it emphasis on computation and is different from computer science because of its emphasis on perception, reasoning and action. It makes machines smarter and more useful. It works with the help of artificial neurons and scientific theorems. AI technologies have matured to the point in offering real practical benefits in many of their applications. Major Artificial Intelligence areas are Expert Systems, Natural Language Processing, Speech Understanding, Robotics and Sensory Systems, Computer Vision and Scene Recognition and so on. Expert System is a rapidly growing technology which is having a huge impact on various fields of life. The various techniques applied in artificial intelligence are Neural Network, Fuzzy Logic, Evolutionary Computing, Genetic algorithm and Hybrid Artificial Intelligence.

Artificial intelligence can be divided into parts according to philosophy of AI. a) Strong AI b) Weak AI

A. Strong AI:

The principle of Strong AI is that the machines could be made to think or represent human minds in the future. Thus Strong AI states that in near future we will be surrounded by such kinds of machine which can completely works like humans and machine could have human level intelligence. Those machines will have the ability to reason, think and do all functions that a human is capable of doing. Current research is nowhere near creating strong AI, and a lively debate is ongoing as to whether this is even possible.

B. Weak AI

The principle of Weak AI is simply the fact that machines can be made to act as if they are intelligent. Weak AI simply states that thinking like features can be easily added to computer to make them useful tools and this already started to happen. For instance, when a human player plays chess against a computer, the human player may think as if the computer is actually making impressive moves. But the chess application is not

Fig. 1. Overview of Artificial Intelligence
thinking and planning at all. All the moves it makes are previously fed in to the computer by a human and that is how it is ensured that the software will make the right moves at the right times. More examples of Weak AI are witness expert systems, drive by wires cars and speech recognition systems.

Artificial Intelligence (abbreviated as AI) is the capability of a device to perform activities, which would otherwise only be expected of the human brain. These activities include the capacity for knowledge and the ability to acquire it. It also comprises of the ability to judge, understand relationships and last but not least produce original thoughts.

Intelligence = perceive + Analyse + React

Also, there is a huge different between short term memory and RAM. Short-term memory holds pointers to the long-term memory where all the information is actually stored while RAM stores data that is isomorphic to data being held on a hard disk. Also, RAM has a memory limit while there seems to be no capacity limit when it comes to short-term memory.

The Turing Test Approach: The Turing test was proposed Alan Turing (1950) .This test was designed to test that whether a particular machine can think or not. The test involves a human interrogator who interacts with a human and with a machine and has to tell who is human and which one is machine. The computer passes the test if an interrogator after posing some written questions, cannot tell whether the written response is coming from human or from the machine.

II. ADVANTAGES AND DISADVANTAGES

One of the major advantages of artificial intelligence is that its decisions are based on facts rather than emotions. Advantages of artificial intelligence include the operation of machines without tiring and losing memory and the ability to improve communications, while disadvantages include the breakdown of critical components and widespread use of AI, which raises cyber safety concerns worldwide. Artificial intelligence refers to the productivity of non-human machines, computers and software. It facilitates human studies in certain areas, such as research collection and analysis and mathematical computation. Machines using artificial intelligence makes them useful in many fields, including medicine, computer science and the military. These machines engage in complex tasks and processes, performing many of the same roles as humans without requiring training time. This improves workplace efficiency and reduces downtime.

All this being said, one of the most concerning problem with the development of AI is that it will soon start substituting humans in every field thus causing a high rate of unemployment, which would lead to depression, crime and poverty. Also, there are some fields that require the human touch and there is a growing sense of belief that machines will quite possibly never be able to replace humans. The caring behavior of nurses in hospitals is one example of a job that humans feel machines will never be able to do justice to.

III. CURRENT PROGRESS

Artificial Intelligence was created with the sole aim of outperforming human minds. Thus it is very important we question the fact whether it has actually been able to do so. It cannot be ignored that the fact of AI is being used all around us especially in the fields of medicine, robotics, law, stock trading etc. It is being used in homes and big establishments such as military bases and the NASA space station. NASA has sent out artificially intelligent robots to planets so as to learn more about their habitat and atmosphere, with the intention of investigating if there is a possibility of humans living on these planets. Expert systems have been used by Mercedes Benz and other auto manufacturers in the design of vehicle components, subway systems in Washington, D.C. use expert system software controllers to cause subway trains to stop within 3 inches of the right spot on the platform. These trains have motormen primarily to reassure passengers. AI has filtered into general applications in these fields and has become so common that it is not referred to as Artificial Intelligence anymore. Blind supporters of AI would point to the time when AI Deep Blue II defeated chess master Garry Kasparov to prove that Artificial Intelligence can in fact be smarter than humans. Though there is no doubt that the AI Deep Blue II won that game, it is still probably one of the dumbest software alive. The operators were programming the AI in every round depending on the opposition’s last move. Also, the Deep Blue II had studied all of Kasparov’s previous games while the latter was not given the same benefit. One can safely say that even though the Deep Blue II AI defeated Kasparov, it was never a fair fight to begin with.

Latest technologies like Xbox 360’s Kinect and iPhone’s Siri use algorithms based on Artificial Intelligence, but it is a well-known fact that these technologies are a long way from being perfect. Thus we can safely conclude that though Artificial Intelligence has made a lot of progress in the past few decades, it is not at a level where in one can confidently state that it is now ready to completely replace the human mind. That being said, large-scale research is now being conducted into the field of proper simulation of the human brain. Cortex is a project by Artificial Development Inc. and Swiss government’s IBM sponsored Blue Brain Project, are two main ventures, whose goal is to simulate the human brain.

Artificial intelligence (AI) has the ability to deal with the high non-linearity of practical Systems. The various technologies that are used in PSSs optimization problems are ANN, FL, ES etc. Application of Artificial Intelligent Techniques in Power system stabilizers (PSSs) Design are discussed below.

A. Artificial Neural Network (ANN) in PSS:

In the power systems the most applications of the artificial neural network use a multilayer feed forward network. In the neural adaptive PSS, a feed-forward neural network with a single hidden layer is proposed which includes two sub networks: adaptive neuro-identifier, in which the dynamic characteristics of the plant are tracked and adaptive neurocontroller to damp the low frequency oscillations. Radial basis function network (RBFN) has three layers: input layers, hidden layers, and output layers. The hidden layer find centers
and widths of the radial basis functions for individual pattern units and the output layer finds the weights between the pattern units and the output units using an unsupervised learning algorithm. A recurrent neural network (RNN) stabilization controller is proposed to improve the transient stability of power systems in which both the governor and AVR is used. The weight of the proposed controller is adjusted on-line. The signal output of the first RNN is added to the PSS signal output for excitation control. The signal output of the second RNN is used as a stabilizing signal for the governor system. ANNs are intelligent controllers to control nonlinear, dynamic systems through learning, which can easily accommodate the nonlinearities and time dependencies.

B. Fuzzy Logic (FL) in PSS:

In 1964, Lotfi Zadeh developed FL to address inaccuracy and uncertainty which usually exist in engineering problems [10]. A design process for a fuzzy logic based PSS (FLPSS) was proposed for a multi-machine power system. The input signal to FLPSS is the speed deviation of the synchronous generator and its derivative. For the robustness of the FLPSS, five generator power systems were used and for designing a normalized sum-squared deviation index were used. This A novel input signal based FLPSS was applied in the multi-machine environment.

IV. APPLICATIONS

Artificial Intelligence in the form of neural networks and expert systems has applications in almost all human activities. The combination of high precision and low computation time makes AI a cutting edge technology. Robot ES” s is already taking over workshop level jobs in large industries, thus side lining humans into a more supervisory role. Stock brokerage firms are now using Artificial Intelligence to analyze data, make analysis and buy or sell stocks without the interference of any human beings. Some of the applications of Artificial Intelligence are as follows-

A. Gaming Industry-

One of the most commonly known applications of AI in the gaming industry is its use in chess. Even though these machines are not as intelligent as humans, they use brute force algorithms and scan 1007 s of positions every second so as to determine the next move. As stated earlier, AI is also being used in Microsoft Xbox 360” s Kinect for body motion detection. But it is still in its infancy and requires a lot more advancement for it to be used in day-to-day applications.

B. Heavy industries-

Artificial Intelligence robots have become very common in heavy industries and are employed in jobs that are otherwise considered dangerous for humans. These robots also increase the efficiency, as they do not need any break while working thus overcoming the inherent disadvantage of tiredness in humans.

C. Weather Forecasting-

Neural networks are nowadays being used for predicting weather conditions. Past data is provided to the neural network, which then analyses the data for patterns and predicts the future weather conditions.

D. Expert Systems-

Expert Systems are machines that are trained to have total expertise in specific areas of interest. They are developed to solve the problems in niche areas. These systems use statistical analysis and data mining to solve these problems by deducing the solutions through a logical flow of yes-no questions. An expert system stores all the information, rules, data and relationships that are needed by the expert system to have total expertise in its area of interest. Inference engine- It seeks information from the knowledge base on being presented with a query, analyses it and responds with a solution or recommendation in the way a human expert would Rule- It is a conditional statement that links the given conditions to the final solution.

E. Data Mining or Knowledge Extraction:

Data mining is a fast-growing area. Data mining is a part of a process called KDD knowledge discovery in databases. This process consists basically of steps that are performed before carrying out data mining such as data selection, data cleaning, pre-processing of data, and data transformation. "Data Mining is the use of computer algorithms to discover hidden patterns and unsuspected relationships among elements in a large data set. AI is a broader area than machine learning. AI systems are knowledge processing systems. Knowledge representation, knowledge acquisition, and inference including search and control, are three fundamental techniques in AI.

F. Knowledge representation:

Data mining seeks to discover interesting patterns from large volumes of Data. These patterns can take various forms, such as association rules, classification rules, and decision trees, and therefore, knowledge representation becomes an issue of interest in data mining.

V. CONCLUSION

The computing world has a lot to gain from various AI approaches and their ability to learn by example makes them very flexible and powerful. Moreover, there is no need to devise an algorithm in order to perform a specific task i.e. there is no need to understand the internal mechanisms of that task. They are also very well suited for real time systems because of their fast response and computational. The goal of artificial intelligence is to create computers whose intelligence equals humans. Achieving this goal is the famous “AI problem from last decade researchers are trying to close the gap between human intelligence and artificial intelligence.

VI. FUTURE ASPECTS

The use of artificial intelligence will lead to production of machines, which are more advanced than what we have today.
Speech recognition systems will reach higher levels of performance and will be able to communicate with humans, using voice. There will be a great future some day for expert system applications in all aspects of health care, in both clinical and administrative areas, in improving patient care and in allocation of social, financial and other resources. Also, even if it is possible, the amount of time it will take cannot be predicted. And it is also expected to have human brain features like learning from experience, cognition and perception. Robots in the future will be able to do everybody’s work and will be faster and more efficient as compared to human beings in doing it. Thus, it can be said that Artificial Intelligence is still in its developing stage and its future depends only and only upon the scientists solving the mystery of the human brain.

References