ISSN: 2277-3754
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 1, Issue 5, May 2012

Exploring into the Fundamentals of Artificial Intelligence

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Abstract- Artificial intelligence (AI) is the intelligence of machines and the branch of computer science that aims to create it. AI textbooks define the 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." AI research is highly technical and specialized, deeply divided into subfields that often fail to communicate with each other. Some of the division is due to social and cultural factors: subfields have grown up around particular institutions and the work of individual researchers. AI research is also divided by several technical issues. There are subfields which are focused on the solution of specific problems, on one of several possible approaches, on the use of widely differing tools and towards the accomplishment of particular applications. The central problems of AI include such traits as reasoning, knowledge, planning, learning, communication, perception and the ability to move and manipulate objects. General intelligence (or "strong AI") is still among the field's long term goals. Currently popular approaches include statistical methods, computational intelligence and traditional symbolic AI. There are enormous number of tools used in AI, including versions of search and mathematical optimization, logic, methods based on probability and economics, and many others.

I. INTRODUCTION

Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent. The ability to create intelligent machines has intrigued humans since ancient times and today with the advent of the computer and 50 years of research into AI programming techniques, the dream of smart machines is becoming a reality. Researchers are creating systems which can mimic human thought, understand speech, beat the best human chess player, and countless other feats never before possible. Find out how the military is applying AI logic to its hi-tech systems, and how in the near future Artificial Intelligence may impact our lives.

A.HISTORY:

Evidence of Artificial Intelligence folklore can be traced back to ancient Egypt, but with the development of the electronic computer in 1941, the technology finally became available to create machine intelligence. The term artificial intelligence was first coined in 1956, at the Dartmouth conference, and since then Artificial Intelligence has expanded because of the theories and principles developed by its dedicated researchers. Through its short modern history, advancement in the fields of AI have been slower than first estimated, progress continues to be made. From its birth 4 decades ago, there have been a variety of AI programs, and they have impacted other technological advancements.

B.The Beginnings of AI:

Although the computer provided the technology necessary for AI, it was not until the early 1950's that the link between human intelligence and machines was really observed. Norbert Wiener was one of the first Americans to make observations on the principle of feedback theory feedback theory. The most familiar example of feedback theory is the thermostat: It controls the temperature of an environment by gathering the actual temperature of the house, comparing it to the desired temperature, and responding by turning the heat up or down. What was so important about his research into feedback loops was that Wiener theorized that all intelligent behavior was the result of feedback mechanisms. Mechanisms that could possibly be simulated by machines. This discovery influenced much of early development of AI. In late 1955, Newell and Simon developed *The Logic Theorist*, considered by many to be the first AI program. The program, representing each problem as a tree model, would attempt to solve it by selecting the branch that would most likely result in the correct conclusion. The impact that the logic theorist made on both the public and the field of AI has made it a crucial stepping stone in developing the AI field.

II. APPLICATIONS

What we can do with AI?

We have been studying this issue of AI application for quite some time now and know all the terms and facts. But what we all really need to know is what can we do to get our hands on some AI today. How can we as individuals use our own technology? We hope to discuss this in depth (but as briefly as possible) so that you the consumer can use AI as it is intended.

First, we should be prepared for a change. Our conservative ways stand in the way of progress. AI is a new step that is very helpful to the society. Machines can do jobs that require detailed instructions followed and mental alertness. AI with its learning capabilities can accomplish those tasks but only if the worlds conservatives are ready to change and allow this to be a possibility. It makes us think about how early man finally accepted the wheel as a good invention, not something taking away from its heritage or tradition.

Secondly, we must be prepared to learn about the capabilities of AI. The more use we get out of the machines the less work is required by us. In turn less injuries and stress to human beings. Human beings are a species that learn by trying, and we must be prepared to

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give AI a chance seeing AI as a blessing, not an inhibition.

Finally, we need to be prepared for the worst of AI. Something as revolutionary as AI is sure to have many kinks to work out. There is always that fear that if AI is learning based; will machines learn that being rich and successful is a good thing, then wage war against economic powers and famous people? There are so many things that can go wrong with a new system so we must be as prepared as we can be for this new technology.

However, even though the fear of the machines are there, their capabilities are infinite Whatever we teach AI, they will suggest in the future if a positive outcome arrives from it. AI are like children that need to be taught to be kind, well mannered, and intelligent. If they are to make important decisions, they should be wise. We as citizens need to make sure AI programmers are keeping things on the level. We should be sure they are doing the job correctly, so that no future accidents occur.

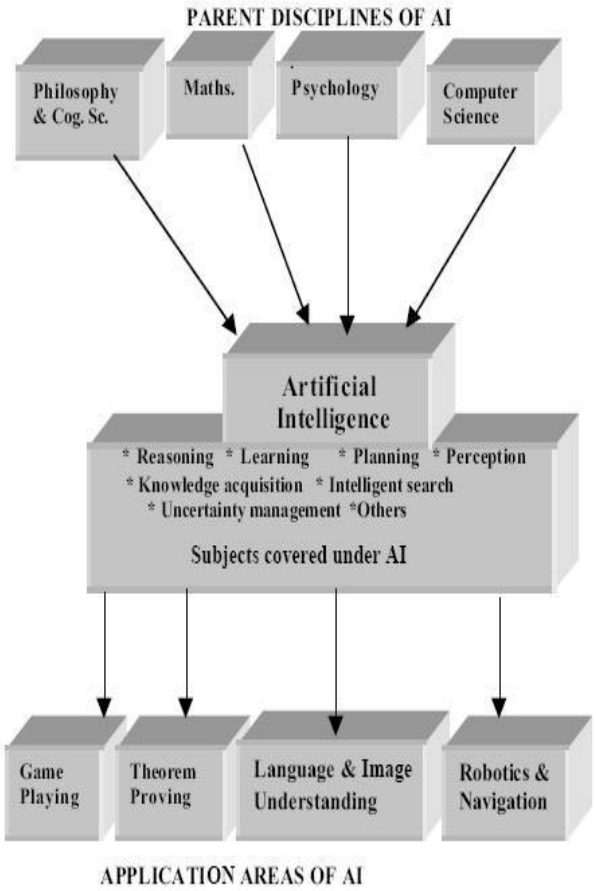

Fig: 1.Architecture of AI

III. METHODOLOGY

In the quest to create intelligent machines, the field of Artificial Intelligence has split into several different approaches based on the opinions about the most promising methods and theories. These rivaling theories have lead researchers in one of two basic approaches; bottom-up and top-down. Bottom-up theorists believe the best way to achieve artificial intelligence is to build electronic replicas of the human brain's complex network of neurons, while the top-down approach attempts to mimic the brain's behavior with computer programs.

A. Neural Networks and Parallel Computation

The human brain is made up of a web of billions of cells called neurons, and understanding its complexities is seen as one of the last frontiers in scientific research. It is the aim of AI researchers who prefer this bottom-up approach to construct electronic circuits that act as neurons do in the human brain. Although much of the working of the brain remains unknown, the complex network of neurons is what gives humans intelligent characteristics. By itself, a neuron is not intelligent, but when grouped together, neurons are able to pass electrical signals through networks.

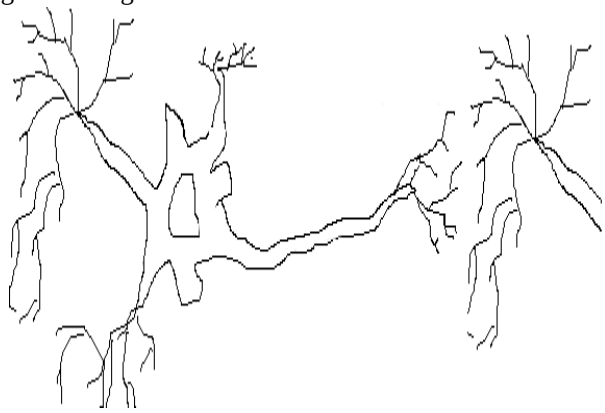

Fig: 2 The Neuron "Firing", Passing a Signal to the Next in the Chain.

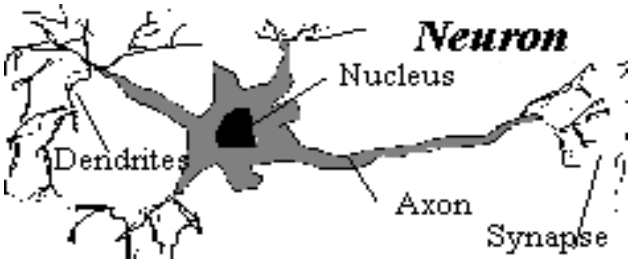

Fig: 3 Architecture of Neuron

Research has shown that a signal received by a neuron travels through the dendrite region, and down the axon. Separating nerve cells is a gap called the synapse. In order for the signal to be transferred to the next neuron, the signal must be converted from electrical to chemical energy. The signal can then be received by the next neuron and processed.

Warren McCulloch after completing medical school at Yale, along with Walter Pitts a mathematician proposed a hypothesis to explain the fundamentals of how neural networks made the brain work. Based on experiments with neurons, McCulloch and Pitts showed that neurons might be considered devices for processing binary numbers. An important back of mathematic logic, binary numbers (represented as 1's and 0's or true and false) were also the basis of the electronic computer. This link is the basis of computer-simulated neural networks; also

ISSN: 2277-3754
International Journal of Engineering and Innovative Technology (IJEIT)
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know as parallel computing. A century earlier the true / false nature of binary numbers was theorized in 1854 by George Boole in his postulates concerning the Laws of Thought. Boole's principles make up what is known as Boolean algebra, the collection of logic concerning AND, OR, NOT operands. For example according to the Laws of thought the statement: (for this example consider all apples red)

***Apples are red*-- is True**

***Apples are red AND oranges are purple*-- is False**

***Apples are red OR oranges are purple*-- is True**

***Apples are red AND oranges are NOT purple*-- is also True**

Boole also assumed that the human mind works according to these laws, it performs logical operations that could be reasoned. Ninety years later, Claude Shannon applied Boole's principles in circuits, the blueprint for electronic computers. Boole's contribution to the future of computing and Artificial Intelligence was immeasurable, and his logic is the basis of neural networks.

McCulloch and Pitts, using Boole's principles, wrote a paper on neural network theory. The thesis dealt with how the networks of connected neurons could perform logical operations. It also stated that, one the level of a single neuron, the release or failure to release an impulse was the basis by which the brain makes true / false decisions. Using the idea of feedback theory, they described the loop which existed between the senses ---> brain ---> muscles, and likewise concluded that Memory could be defined as the signals in a closed loop of neurons. Although we now know that logic in the brain occurs at a level higher then McCulloch and Pitts theorized, their contributions were important to AI because they showed how the firing of signals between connected neurons could cause the brains to make decisions. McCulloch and Pitt's theory is the basis of the artificial neural network theory.

Using this theory, McCulloch and Pitts then designed electronic replicas of neural networks, to show how electronic networks could generate logical processes. They also stated that neural networks may, in the future, be able to learn, and recognize patterns. The results of their research and two of Weiner's books served to increase enthusiasm, and laboratories of computer simulated neurons were set up across the country.

Two major factors have inhibited the development of full scale neural networks. Because of the expense of constructing a machine to simulate neurons, it was expensive even to construct neural networks with the number of neurons in an ant. Although the costs of components have decreased, the computer would have to grow thousands of times larger to be on the scale of the human brain. The second factor is current computer architecture. The standard Von Neumann computer, the architecture of nearly all computers, lacks an adequate number of pathways between components. Researchers are now developing alternate architectures for use with neural networks.

Even with these inhibiting factors, artificial neural networks have presented some impressive results. Frank Rosenblatt, experimenting with computer simulated networks, was able to create a machine that could mimic the human thinking process, and recognize letters. But, with new top-down methods becoming popular, parallel computing was put on hold. Now neural networks are making a return, and some researchers believe that with new computer architectures, parallel computing and the bottom-up theory will be a driving factor in creating artificial intelligence.

B.Top Down Approaches; Expert Systems

Because of the large storage capacity of computers, expert systems had the potential to interpret statistics, in order to formulate rules. An expert system works much like a detective solves a mystery. Using the information, and logic or rules, an expert system can solve the problem. For example it the expert system was designed to distinguish birds it may have the following:

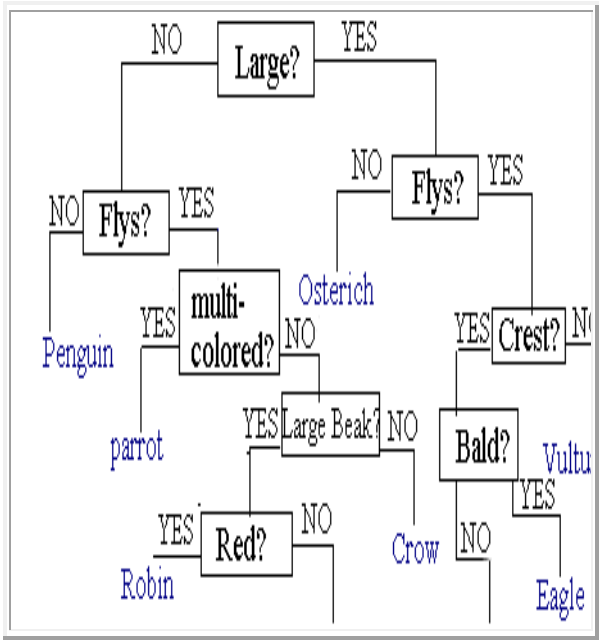

Fig 4. Flow chart

Charts like these represent the logic of expert systems. Using a similar set of rules, experts can have a variety of applications. With improved interfacing, computers may begin to find a larger place in society.

C. Chess

AI-based game playing programs combine intelligence with entertainment. On game with strong AI ties is chess. World-champion chess playing programs can see ahead twenty plus moves in advance for each move they make. In addition, the programs have an ability to get progressably better over time because of the ability to learn. Chess programs do not play chess as humans do. In three minutes, Deep Thought (a master program) considers 126 million moves, while human chess master on average considers less than 2 moves. Herbert Simon suggested that human chess masters are familiar with

ISSN: 2277-3754
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favorable board positions, and the relationship with thousands of pieces in small areas. Computers on the other hand, do not take hunches into account.

D. Frames

On method that many programs use to represent knowledge are frames. Pioneered by Marvin Minsky, frame theory revolves around packets of information. For example, say the situation was a birthday party. A computer could call on its birthday frame, and use the information contained in the frame, to apply to the situation. The computer knows that there is usually cake and presents because of the information contained in the knowledge frame. Frames can also overlap, or contain sub-frames.

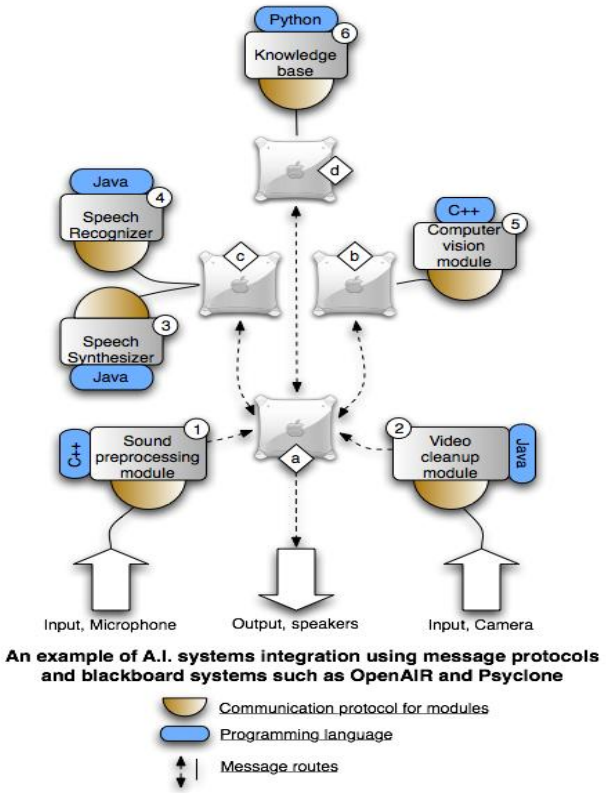

Fig: 5 Structural Representation

IV. CONCLUSION

This page touched on some of the main methods used to create intelligence. These approaches have been applied to a variety of programs. As we progress in the development of Artificial Intelligence, other theories will be available, in addition to building on today's methods. In the early 1980s, AI research was revived by the commercial success of systems, a form of AI program that simulated the knowledge and analytical skills of one or more human experts. By 1985 the market for AI had reached over a billion dollars. At the same time, Japan's fifth generation computer project inspired the U.S and British governments to restore funding for academic research in the field. However, beginning with the collapse of the Lisp Machine market in 1987, AI once again fell into disrepute, and a second, longer lasting AI winter began. In the 1990s and early 21st century, AI achieved its greatest successes, albeit somewhat behind the scenes. Artificial intelligence is used for logistics, data mining, medical diagnosis and many other areas throughout the technology industry. The success was due to several factors: the increasing computational power of computers (see Moore's law), a greater emphasis on solving specific sub problems, the creation of new ties between AI and other fields working on similar problems, and a new commitment by researchers to solid mathematical methods and rigorous scientific standards.

ACKNOWLEDGMENT

The special thanks is given to the Dean of School of electrical engineering for their excellence support and associate dean for his kind help. We are thanking all the faculty members who help in guiding us for this purpose. We are grateful to research head of kiit university Dr.parashar for his support regarding this matter. Thanks to the digital library members who help for searching different papers regarding this.

REFERENCES

[1] AAAI: American Association for Artificial Intelligence The AAAI is a nonprofit scientific society devoted to the promotion and advancement of AI.

[2] ACM: the Association for Computing Machinery ACM is an international scientific dedicated to advancing information technology.

[3] AIAI: Artificial Intelligence Applications Institute AIAIis maintaining and improving its position for the application of knowledge based techniques.

[4] AT&T Bell Labs The main page for AT&T Bell Labs where new Artificial Intelligence is being researched and applied.

[5] Carnegie Mellon University Artificial Intelligence Repository A collection of files, programs and publications of interest to Artificial Intelligence research.

[6] MIT: AI lab at Massachusetts Institute of Technology The MIT AI research ranges from learning, vision, robotics to development of new computers.

[7] IJCAI Home Page The IJCAI is the main international gathering of researchers in AI.

[8] Neural Networks-Applications of AI Data and AI technology for businesses and education.(Skillings 2006) McCarthy's definition of AI:McCarthy 2007.

[9] Pamela McCord (2004, pp. 424) writes of "the rough shattering of AI in subfields—vision, natural language, decision theory, genetic algorithms, robotics ... and these with own sub-subfield—that would hardly have anything to say to each other.".

[10] This list of intelligent traits is based on the topics covered by the major AI textbooks, including: Russell & Norvig 2003 Luger & Stubblefield 2004 Poole, Mack worth & Goebel 1998 Nilsson 1998.

[11] General intelligence (strong AI) is discussed in popular introductions to AI:Kurzweil 1999 and Kurzweil 2005See the Dartmouth proposal, under Philosophy, below.

ISSN: 2277-3754
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 1, Issue 5, May 2012

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