Crucial Role of Artificial Intelligence and Robotics in Different Field

Anupam Bonkra

Assistant Professor, Department of Computer Science, Vidya Jyoti Eduversity, Derabassi, India

Abstract: With the growth of technology there are lots of changes overwriting the human effort in many field The concept of Artificial Intelligence and Robotics systems play very major role in all fields. The Artificial Intelligence is the subpart of computer science with is based on automaticity. It become the very trendy field in computer science day by day In future the concept of Artificial Intelligence will replace the human efforts in all areas. Artificial Intelligence is revealed with the help of machine or software and in today's time the very big machine which having with AI is Robotics. The Robotics is branch of AI which explores the designing, manufacturing and working phase of all application. The AI and Robotics is act as an expert system and this expert system is used to solve the complex problem in different areas like engineering, business, medicine, weather forecasting etc. The vicinity utilizing the technology of Artificial Intelligence have seen enhance in the quality and efficiency. This paper will given the generalize view of Robotics technology and Artificial Neural Network This paper also explore the application areas of this technology is widely in use. By this paper we could also explore the locomotion process used in robotics.

Keywords: Artificial Intelligence, ANN, Bayesian ANN, Robotics, Locomotion, Back propagation Algorithm.

I. INTRODUCTION

Artificial Intelligence plays a pivotal role in today's era of technology. It is tremendously important for a person who wants to connect with automaticity. It play important role in research of construction and service management. The term Artificial Intelligence and robotics will replace the human potential in different areas. It is a branch of computer science which is used automatic technology to solve out complex problem in easy way.

Earlier the first AI program was introduced by Newell and Simon in year of 1955.But after some addition finally this program was enhanced by John McCarthy and popular as Artificial Intelligence in 1956.Artificial Intelligence follow construct the computers or machines as intelligent as human beings. According the John McCarthy"The science and engineering of making intelligence machines, especially intelligent computer programs". AI is a method of making machine which is controlled by computer and the software installed in this machine is worked and act as human mind known as software think intelligently. The very big application of AI was popular as computer controlled robot which was developed by studying how the human brain thinks, learn, how makes decision and act The Artificial Intelligence is very useful in number of fields such as Computer Science, Biology, Psychology, Linguistics, Mathematics, Engineering, Sociology, Philosophy and Neuron Science.

There are two basic goal of Artificial Intelligence one is to create and demonstrate expert system and another one is to implement human intelligence in machine. How Artificial Intelligence work? That type of question arise in real world so for solve out this kind of problem we should gone through areas of Artificial Intelligence.
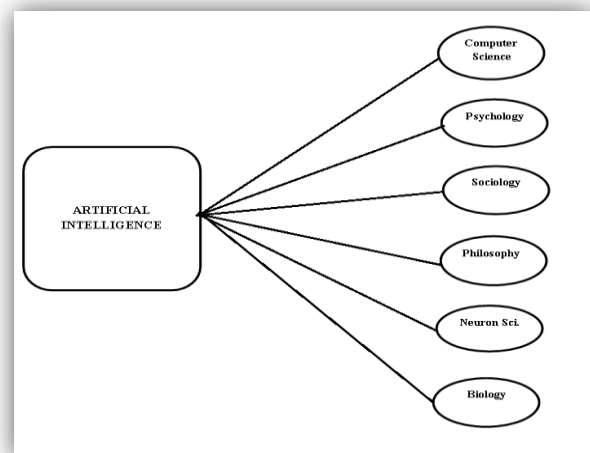

Fig1 Usage areas of Artificial Intelligence

BASIC DOMAIN USED IN ARTIFICIAL INTELLIGENCE
Every Domain of AI is having premeditated function for each application and these function used the following phase for initializing and executing any complex problem. The below function is lies under the Mundane task of Artificial Intelligence

1. Language understanding
2. Learning adaptive systems
3. Problem solving
4. Perception (visualization)
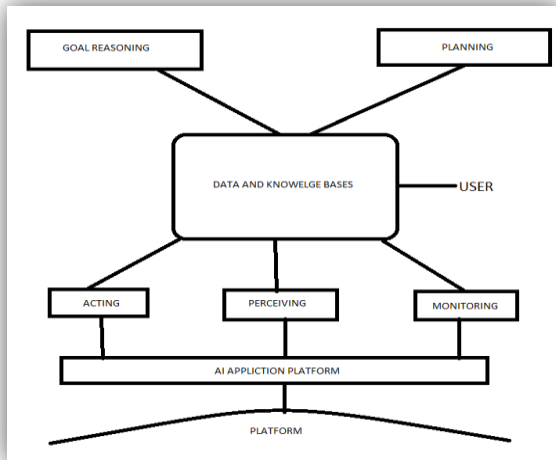5. Modeling
6. Robots
7. Games

Fig2-Schematic view of premeditated function

II. LANGUAGE UNDERSTANDING

The language understanding is very useful in field of artificial intelligence. The Natural Language understanding is the part of machine processing which deals with machine reading comprehension. The language understanding is the ability read text, processed and understands its meaning. This term is connected with the translation of one natural language into another natural language and also declared in written form. There are some other understanding with is include in Artificial Intelligence.

The **Speech understanding** is the part of computational linguistics which enables to translate language spoken at user end converted into text by computer. It is also defined as "Automatic Speed Recognition (ASR)".

The **Semantic information** processing is used for making logical and non logical inferences. It is popular as Semantic information repository is the collection of data linked with the help of concepts and names.

The **Question Answering**, **Retrieval of Information** and **Translation of Language** also very important part of artificial intelligence as the field of language understanding.

LEARNING ADAPTIVE SYSTEMS

Learning adaptive systems is the ability to adapt the behavior which is based on previous experience and generate the general rules on the base of previous experience for future use. There are two basic concept include in complex adaptive system one is Cybernetics and another is Concept Formation

PROBLEM SOLVING

Problem solving is provide a formulate solution of any type of problem and represent it into proper manner. It is also include inference (Resolution based theorem, Plausible inference and Inductive inference), Interactive problem solving, Automatic program writing and Heuristic search techniques.

PERCEPTION (VISUAL)

Perception is the process of interpreting, acquiring, selecting and organizing sensory information. In the domain of AI, perception is act as mechanism which collects the data acquired by the sensors together in a meaningful manner. The two basic concept include in perception are Pattern Recognition and Scene Analysis.

MODELING

Modeling is imperative concept used for create internal representation of a machine and demonstrate some set of transformation rule, and those rules are identify for predict the behavior and relationship between real world object and entities. There are following aspect fall under in this category such as The Representation problem for problem solving systems, modeling natural systems defined as economic , sociological, ecological, biological) and last Hobot world modeling.

ROBOTS

Robot is a combination of abilities to manipulating the objects by perceiving, picking, moving, modifying the physical properties of object, destroying it and it is have a full authority to reduce the human effort in every work. Robots are used to handle exploration, transportation (navigation), automation, security, military, construction, mining, fishing, agriculture etc.

GAMES

It is used to produce the technique of illusion of intelligence in the computer and video games which having no interaction with player character (NPCs) The basic techniques are applied on the different games such as chess, checkers, go, Othello, tic-tac-toe etc.

III. ARTIFICIAL INTELLIGENCE AS A ROBOTICS

Robotics is the domain of Artificial Intelligence used for creating effecting and attractive robot. Robot is a synthetic agent performing in actual world surroundings. Robot is manipulation of human effort into machine which is act as realistic object. Robotics is a branch of AI, which is composition of Electrical Engineering, Mechanical Engineering and Computer Science for designing, construction of robots.

In the mechanical field robots have to used for construction, form, or shape deliberate to achieve a fastidious task. In the electrical filed robot are used to control and power the machinery. In the field of computer robot installed with the help of sophisticated software program and also control with the help of computer programs.

Now we are going to describe about how the Robotics AI is differ from another AI.

The robots are activated for real physical world but the other AI is worked with the help of computer so that's why those AI is act in computer simulated world. The input is applied to robots is in the form of image and

speech waveform and the signal is transferred in the analog form but on the other hand the input applied to other AI program is in the form of symbols and rules. The robots need special hardware with sensor technique but AI program general purpose computer for operating purpose.

ROBOT LOCOMOTION

Robot locomotion is apparatus by which show the robot movement in environment. There are basically four types of Locomotion.
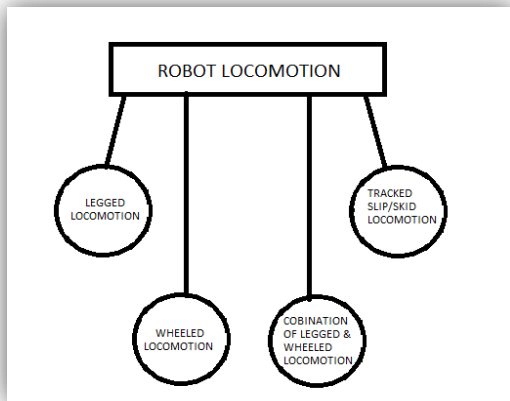

Fig3 –Types of locomotion

LEGGED LOCOMOTION

The legged locomotion requires large number of motors to execute movement. It consumes huge amount of power for demonstrate walk, jump, trot, hop, climb up and down. It is apposite for rough and smooth terrain but when it works then consumes lot of energy.

The legged locomotion is not suitable for stable application. It is having with different multiplicity of one, two, four and six legs. But there is one problem by increasing the legs of Robot, the leg coordination should maintain for its properly working. The possible combination of travelling pace of robot is depending upon the number of its legs.

If a robot has L legs and number of possible actions N then it determine as

$N=(2L-1)!$ For example (L=4) then N= (2*4-1)! = (8-1)! =7!= 5040 obtained events.

So that show if numbers of legs are increased its correspondence events also increase, because complexity factor of robots is directly proportional to total legs of Robot.

WHEELED LOCOMOTION

It is the enhancements of previous one by decreasing the motor force for accomplish a movement. This type is power saver compared to legged locomotion. There are four types of wheels used in this locomotion. The first one is popular as Standard wheel which rotate around the wheel axel and around the contact. The second is defined as Castor wheel which rotate around the wheel and the offset steering joint. The next one is Swedish 45° and 90°

wheels also known as Omni wheel which rotate around the contact point, wheel axle and the rollers. The last one is Ball /Spherical wheel which is technically difficult to implement.

SLIP/SKID LOCOMOTION

This type of locomotion is widely used in large vehicles. The robot is turned by moving the tracks with different speeds in the same or opposite direction. The very great stability is offered in this type of locomotion.

IV. COMPONENTS OF ROBOT

Table1: Components of Robot

Sr No.	Component Name	Description Of Component
1	Power Supply:	Power supplies are used to boost the robot, batteries, solar power, hydraulic and pneumatic power act as power supply supplement
2	Actuators	They are used to convert the energy into movement. They are available into two categories 1. Synchronous actuators 2. Asynchronous actuators
3	Electric motors (AC/DC)	Electric motors are used for doing the movement on the rotation bases.
4	Pneumatic Air Muscles	PAMs are contractile device maneuver by pressurized air filling a pneumatic bladder. They are clustered into two pair on both end one is agonist and another is antagonist.
5	Muscle Wires	Muscle Wires are slim string of a special nickel-titanium alloy that actually shorten in length when electrically powered
6	Piezo Motors and Ultra sonic Motors	They are basically used for industrial robots.
7.	Sensors	Sensors are providing the information about real task happened in an environment. A special sensor is used in robot which is vision sensor for sensing the human fingerprints worked on any robotic machine.

There are number of fields where we can use robotics for reduced the manpower. The application of robots is defined those fields.

1. In the industries the robots are used to cutting, polishing, drilling, color coating to different equipments.
2. In the field of military robots are used as indicator those could easily reach the unapproachable and precarious zone during war.

3. In the medical field robots are capable for handling complex problem simultaneously and also perform very complicated surgeries very easily without any failure.
4. In the area of entertainment robots are capable for making movies and perform other task also.

V. ARTIFICIAL INTELLIGENCE AS NEURAL NETWORK

Another enhancement in AI is popular as Artificial Neural Network. This enhancement is inspired from human nervous system and the principle of its working is related with nervous system. The neural network is also known as Connectionist systems.

The first Artificial Neural Network was developed by psychologist Frank Rosenblatt in year of 1958.According to Dr. Robert Hecht-Nielsen a neural network defines as a computing system combination of highly interconnected elements, which process information by their dynamic state response to external inputs.

The working structure of Artificial Neural Network is similar as human brain. ANN is combination multiple nodes, which similar as biological neurons of human brain. Those neurons are interconnected with each other and same as at other end the nodes can take input data and perform number of operations on this data. The result of this input is passed to other nodes. The node value is used for activation of output on each node. The link between each node is controlled by weight.
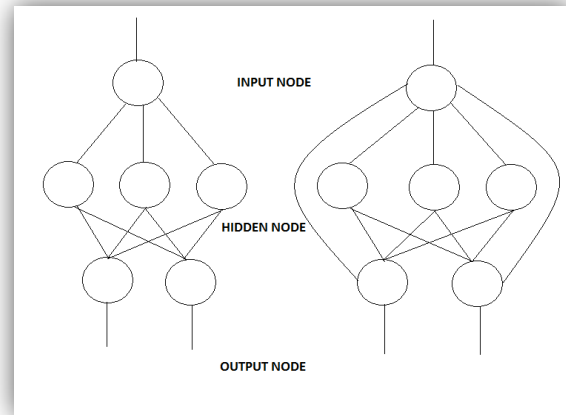

Fig4- Basic structure of ANN

The ANN is categorized into two types

FEED FORWARD ANN
In this number of nodes are connected with each other via link and represented as directed graph. Nodes are used to represent the neurons and arrows represent links between them. Each node has its individual identification number when they start interaction with another node that interaction represents as pair of number. These types of network have no cycle for moving backward.

The input nodes are unite with the input variables(x_1............x_m) and output modes are unite with output variable (y_1............y_m). Input and output node are intermingle with the help of hidden node

Fig5- Feed forward network

FEEDBACK ANN
It is an enhancement of previous one, in this network the loops are allowed means we could move back to the previous stage also. The very big example of this network is Content addressable memories.
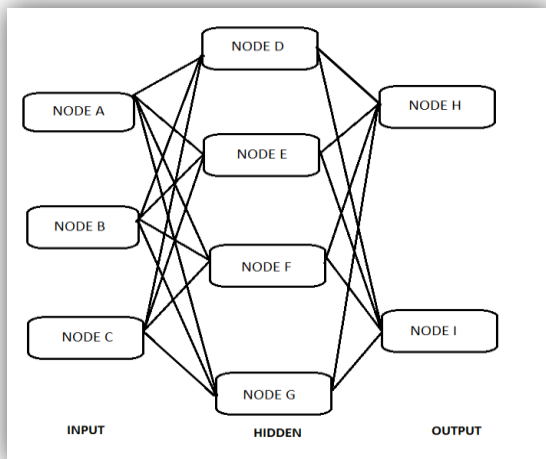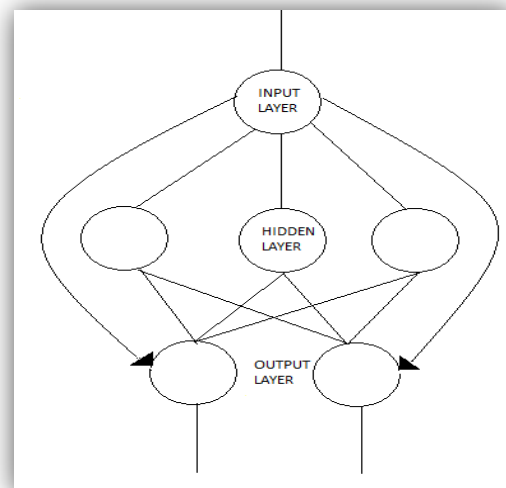

Fig6-Feedback Network

The concept of Learning is also considered in Artificial Neural Network. Basically three types of learning we can use in ANN. One is supervised learning the operator is already aware about the output result when he/she feeds the input. The very big example of this learning is Pattern recognizing. Second one is unsupervised learning, in this type of learning operator could not aware about the upcoming output of data. In this hidden pattern matching method is used. Last one is reinforcement learning; in which all outputs are depending upon the number of observation.

BAYESIAN NETWORKS (BN)

The Bayesian Networks are used to represent possible relationship between set of variable in a graphical form. It is also popular by Belief Networks or Bayes Nets. In this each node represent random variable with its specific intention. For example like in medical field, the node cancer represent the intention that patient has cancer.

The edges are used to connect the each node with their dependencies. If one node is affecting than other node, so the other node must be directly connected toward the direction of effect. In the BN there is only one restriction on arc is applied that we cannot move back to the node followed by directed arcs. So because of that reason BN is also called Directed Acyclic Graphs (DAGs).

The variables used in Bayesian Network are serene with the help of two dimensions

1. Range of prepositions
2. Probability assigned to each of the prepositions

Now with the help of real life example from medical field we can justify hoe the BN is build. A knowledge engineer can make Bayesian Network. When we can develop this network we ought to follow some steps.

For example a patient has been suffering from breathlessness. He /she concerned with doctor and suspecting has lung cancer. But there are various other possible diseases that patient might have such as tuberculosis and blood cancer. To solve this problem the steps are given as.

GATHER RELATED INFORMATION OF PROBLEM

Is the patient exposed to air pollution? If yes, then how to solve pollution problem? Is the patient having smoking problem? If yes, then the chances of cancer at extreme level. Take an X-ray for indicate the problem.

Identify Interesting Variables

There are three different node works under this network. Boolean node, order values and integral values.

The Boolean nodes show the result in the form of TRUE (T) and FALSE (F). The ordered values indicate the pollution level (low, medium, high) and also describe the degree of patient's exposure to pollution. The node is use to indicate the age of a patient with the possible values from 1 to 120. Possible relation between nodes and values for lung cancer problem.

Name of node	Type	Value	Graphical representation
Smoker	Boolean	True, False	
Lung cancer	Boolean	True, False	
Pollution	Binary	Low, Medium, High	
X- ray	Binary	Positive, Negative	

Develop arc between nodes

The constraints are used to capture the relationship between variables. For example Pollution and smoking is the reason to have lung cancer. Then add those two arcs towards the Lung cancer node.

Similarly if the cancer is diagnosed, then x-ray result will be positive. Then add this arc towards the lung cancer.
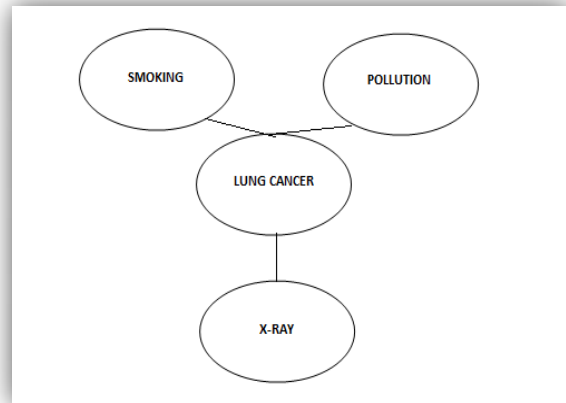

Fig7- Arc development process between nodes

In the above diagram the smoking and pollution is ancestor node of x-ray, that is defined as parent node and same as x-ray is the successor node of pollution and smoking, which is defined as child node.

Conditional Probabilities

To create the relationships between connected nodes is done by conditional probability distribution for each node. So for this we use Conditional Probability Table (CPT). First of all we could take all possible combinations of values of parent nodes. Each combination is called as instantiation of the parent set.

For example, the possible combination of variables for lung cancer is illustrated in given table

Table2 Conditional probabilities

SMOKING	POLLUTION	LUNG CANCER			X-RAY	
$P(S=T)$	$P(P=L)$	P	S	$P(C=T\|P,S)$	C	$X=(POS\|C)$
0.30	0.90	H	T	0.05	T	0.90
		H	F	0.02	F	0.20
		L	T	0.03		
		L	F	0.001		

VI. CONLUSION

The artificial intelligence is providing the automation process in every field, and it also provides the ability to machine to think and perform tasks like as human being. Artificial intelligence will play progressively more important role in future application. This paper is based

upon the Artificial intelligence and their techniques. And the paper also concludes how the medical science is improved with the help of Artificial Neural network. We also conclude that the future research in this area will facilitate the reliable and profitable results. This knowledge and its applications will likely have extensive effects on human life in the years to come.

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