An Innovative Study on Artificial Intelligence and Robotics

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ABSTRACT: Artificial Intelligence is the art of developing intelligence in machines and computers. The basic motto behind writing this paper is to advocate my work in building such systems which are independent of themselves in terms of intellectual power. Proposing and implementing the new idea in the field of Robots accompanied with Intelligence.

KEYWORDS:AI (Artificial intelligence), NLP (Natural Language Processing).

I. INTRODUCTION

Artificial intelligence is the branch the science which deals with all the contents related to intelligence. As far as intelligence is concerned it is defined as "The capability of reasoning, thinking, and to make decisions." And this is the reason we are more concerned about the intelligence power given to machines and robots. When machines or robots inhibit intelligence it is called as artificial intelligence. Hence AI is medium and robots are agent on which the concept of intelligence is implemented.

II. LITERATURE REVIEW

According to the father of Artificial Intelligence John McCarthy, it is "The science and engineering of making intelligent machines, especially intelligent computer programs". Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think. AI is accomplished by studying how human brain thinks and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems. John McCarthy; while exploiting the power of the computer systems, the curiosity of human, lead him to wonder, "Can a machine think and behave like humans do?" Thus, the development of AI started with the intention of creating similar intelligence in machines that we find and regard high in humans.

III. GOALS OF ARTIFICIAL INTELLIGENCE

- To Create Expert Systems: The systems which exhibit intelligent behaviour, learn, demonstrate, explain, and advice its users.
- To Implement Human Intelligence in Machines: Creating systems that understand, think, learn, and behave like humans.

IV. CONTRIBUTION TO AI

Artificial intelligence is a science and technology based on disciplines such as Computer Science, Biology, Psychology, Linguistics, Mathematics, and Engineering. A major thrust of AI is in the development of computer functions associated with human intelligence, such as reasoning, learning, and problem solving.

Out of the following areas, one or multiple areas can contribute to build an intelligent system.

V. AI TECHNIQUES

In the real world, the knowledge has some unwelcomed properties:

- Its volume is huge, next to unimaginable.
- It is not well-organized or well-formatted.
- It keeps changing constantly.
- AI Technique is a manner to organize and use the knowledge efficiently in such a way that:
- It should be perceivable by the people who provide it.
- It should be easily modifiable to correct errors.
- It should be useful in many situations though it is incomplete or inaccurate.
- AI techniques elevate the speed of execution of the complex program it is equipped with.

VI. INTELLIGENCE AND ITS TYPES

The ability of a system to calculate, reason, perceive relationships and analogies, learn from experience, store and retrieve information from memory, solve problems, comprehend complex ideas, use natural language fluently, classify, generalize, and adapt new situations.

Intelligence	Description	Example
Linguistic intelligence	The ability to speak, recognize, and use mechanisms of phonology (speech sounds), syntax (grammar), and semantics (meaning).	Orators, Narrators.
Musical intelligence	The ability to create, communicate with, and understand meanings made of sound, understanding of pitch, rhythm.	Musicians, Singers, Composers.
Logical mathematical intelligence	The ability of use and understand relationships in the absence of action or objects. Understanding complex and abstract ideas.	Mathematicians, Scientists
Spatial intelligence	The ability to perceive visual or spatial information, change it, and re-create visual images without reference to the objects, construct 3D images, and to move and rotate them. Map	Map readers, Astronauts, Physicists.
Bodily-Kinaesthetic intelligence	The ability to use complete or part of the body to solve problems or fashion products, control over fine and coarse motor skills, and manipulate the objects.	Players, Dancers
Intra-personal intelligence	The ability to distinguish among one's own feelings, intentions, and motivations.	Gautama Buddha
Interpersonal intelligence	The ability to recognize and make distinctions among other people's feelings, beliefs, and intentions.	Mass Communicators, Interviewers

TABLE: Table for various types of intelligence with its description and examples.

Hence, a machine or a system is artificially intelligent when it is equipped with at least one and at most all intelligences in it.

VII.   RESEARCH AREAS OF AI

The domain of artificial intelligence is huge in breadth and width. While proceeding, we consider the broadly common and prospering research areas in the domain of AI:

1. Expert Systems
2. Neural Networks
3. Natural Language Processing
4. Robotics
5. Fuzzy logic

VIII.   COMPONENTS OF AI SYSTEM

An AI system is composed of an agent and its environment. The agents act in their environment. The environment may contain other agents. The intelligent connection of perception to action replaces sensing by perception, and software by intelligent software. Perception differs from sensing or classification in that it implies the construction of representation that are the basis for recognition, reasoning and action.

1. An agent is anything that can perceive its environment through sensors and acts upon that environment through effectors.
2. A human agent has sensory organs such as eyes, ears, nose, tongue and skin parallel to the sensors, and other organs such as hands, legs, mouth, for effectors.
3. A robotic agent replaces cameras and infrared range finders for the sensors, and various motors and actuators for effectors.
4. A software agent has encoded bit strings as its programs and actions.
5. As described in figure the artificial system must incorporate a sensor, actuators, and reflectors. Hence for creating the system and making it work efficiently agent is required. And while implementing AI with robotics we use camera as eyes of any human beings.
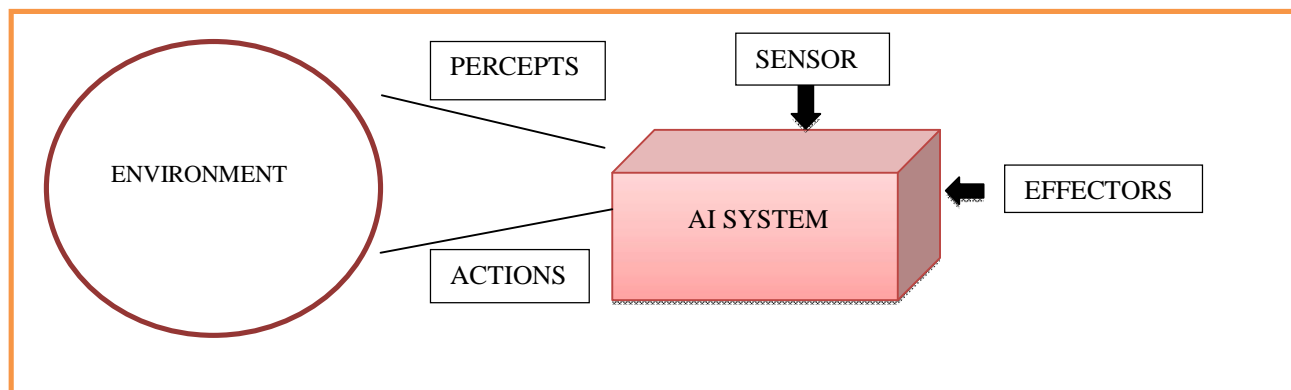

Figure: Components of AI

IX.   NATURAL LANGUAGE PROCESSING

Natural Language Processing (NLP) refers to AI method of communicating with an intelligent system using a natural language such as English. Processing of Natural Language is required when you want an intelligent system like robot to perform as per your instructions, when you want to hear decision from a dialogue based clinical expert system, etc. The field of NLP involves making computers to perform useful tasks with the natural languages humans use. The input and output of an NLP system can be:

*   Speech
*   Text

X. STEPS IN NLP

There are general five steps:

1. Lexical Analysis It involves identifying and analysing the structure of words. Lexicon of a language means the collection of words and phrases in a language. Lexical analysis is dividing the whole chunk of txt into paragraphs, sentences, and words.
2. Syntactic Analysis (Parsing) It involves analysis of words in the sentence for grammar and arranging words in a manner that shows the relationship among the words. The sentence such as "The school goes to boy" is rejected by English syntactic analyser.
3. Semantic Analysis It draws the exact meaning or the dictionary meaning from the text. The text is checked for meaningfulness. It is done by mapping syntactic structures and objects in the task domain. The semantic analyser disregards sentence such as "hot ice-cream".
4. Discourse Integration The meaning of any sentence depends upon the meaning of the sentence just before it. In addition, it also brings about the meaning of immediately succeeding sentence.
5. Pragmatic Analysis During this, what was said is re-interpreted on what it actually meant. It involves deriving those aspects of language which require real world knowledge.

XI. ROBOTICS

Robotics is a domain in artificial intelligence that deals with the study of creating intelligent and efficient robots. Robotics is a branch of AI, which is composed of Electrical Engineering, Mechanical Engineering, and Computer Science for designing, construction, and application of robots.

Robots are the artificial agents acting in real world environment.

Robotics is an interdisciplinary integrative field, at the confluence of several areas, ranging from mechanical and electrical engineering to control theory and computer science, with recent extensions toward material physics, bioengineering or cognitive sciences. The AI–Robotics intersection is very rich. It covers issues such as:

a) Deliberate action, planning, acting, monitoring and goal reasoning,
b) Perceiving, modelling and understanding open environments.
c) Interacting with human and other robots.
d) Learning models required by the above functions.
e) Integrating these functions in an adaptable and resilient architecture.

XII. OBJECTIVES BEHIND ROBOTICS

Robots are aimed at manipulating the objects by perceiving, picking, moving, modifying the physical properties of object, destroying it, or to have an effect thereby freeing manpower from doing repetitive functions without getting bored, distracted, or exhausted.

XIII. ASPECTS OF ROBOTICS

1. The robots have mechanical construction, form, or shape designed to accomplish a particular task.
2. They have electrical components which power and control the machinery.
3. They contain some level of computer program that determines what, when and how a robot does something.

XIV. COMPONENTS OF ROBOTS

Robots are constructed with the following:

1. Power Supply: The robots are powered by batteries, solar power, hydraulic, or pneumatic power sources.
2. Actuators: They convert energy into movement.
3. Electric motors (AC/DC): They are required for rotational movement.
4. Pneumatic Air Muscles: They contract almost 40% when air is sucked in them.
5. Muscle Wires: They contract by 5% when electric current is passed through them.
6. Piezo Motors and Ultrasonic Motors: Best for industrial robots.

7. Sensors: They provide knowledge of real time information on the task environment. Robots are equipped with vision sensors to be to compute the depth in the environment. A tactile sensor imitates the mechanical properties of touch receptors of human fingertips.

XV.   APPLICATION OF ROBOTS

The robotics has been instrumental in the various domains such as:
1. Industries: Robots are used for handling material, cutting, welding, colour coating, drilling, polishing, etc.
2. Military: Autonomous robots can reach inaccessible and hazardous zones during war. A robot named Daksh, developed by Defence Research and Development Organization (DRDO), is in function to destroy life-threatening objects safely.
3. Medicine: The robots are capable of carrying out hundreds of clinical tests simultaneously, rehabilitating permanently disabled people, and performing complex surgeries such as brain tumours.
4. Exploration: The robot rock climbers used for space exploration, underwater drones used for ocean exploration are to name a few.
5. Entertainment: Disney's engineers have created hundreds of robots for movie making.

XVI.   CONCLUSION

Till now the system is not yet implemented that can overcome the drawbacks of the existing system. Such a system is required which can create environment based upon circumstances and think accordingly. Artificial intelligence is such a broad field that till date only 0.001% discovery and inventions are implemented. The rest are yet to be discovered. This discovery will give rise to a new technological era. The systems will be more realistic and more resemblance with humans will be made. Artificial intelligence is combined with robotics so as to implement machines which are independent and have a power to perceive and think accordingly. Natural language processing will be and soon robots accompanied with artificial intelligence will be able to react to languages like English and respond accordingly. The data processing capacity will be increased to a remarkable extent.

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BIOGRAPHY

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