Artificially Intelligent Robotics: A Survey

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ABSTRACT

The world is rapidly moving towards the automation. When the word automation is used then our mind turns towards the Artificial Intelligent and Robots, but AI without Robots and Robots without AI does not fulfill the requirement of automation, then after merging these technologies Artificially Intelligent Robots were developed. This article gives the overall view of Artificially Intelligent Robotics. It especially focused on functionality and components of Artificially Intelligent Robotics and how it changes the life of humankind. In today's society, it's used is limited, but as the world moving towards automation in next few year it is used in almost every area.

Keyword: - *Artificial Intelligent, Robotics, Robots, Machine learning, Computer vision, Artificial neural networks.*

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1. INTRODUCTION

Anything that could give rise to smarter than human intelligence in the form of Artificial Intelligence, brain-computer interfaces, or neuroscience-based human intelligence enhancement wins hands down beyond contest as doing the most to change the world. Nothing else is even in the same league."- Eliezer Yudkowsky. [1]. "People are fascinated by robots because they're machines that can mimic life." - Colin Angle. [2]

Artificial Intelligence and Robotics both have a long history and both are originated from the common root and in the same period ('50), thus they are related to each other and very famous topic for interaction and scientific discussion. Initially, there was no clear distinction between the two disciplines. The reason is that the belief of creating an advance machine automatically leads to robots and robotics. This article focuses on the functionality and purpose of Artificially Intelligence Robots in various areas like medical, military, space research, exploration, industries, entertainment, rescue and several other areas and how it changes the human's life. When we imagine the future, we might think the use of a humanoid robot that explore the space, performing dangerous military operations, performing critical surgery, rescue missions. Being a soldier it is very tough and dangerous task to fight against with enemies but what if we assign these dangerous tasks to humanoid robots who have their own intelligent system and capable of taking

decisions on its own, we only lose money and resources when something went wrong, but we save our humans life, but in all we can say that these robots can play prominent role either in the protection of mankind or in the destruction. In case of space exploration it is very costly and risky to send humans into deep space, so in this situation, robots are more effective and reliable.

2. HISTORY

Robots are the artificial agents acting in a real-world environment. Robots are aimed at manipulating the objects by perceiving, picking, moving, modifying the physical properties of an object, destroying it, or to have an effect thereby freeing manpower from doing repetitive functions without getting bored, distracted, or exhausted. It is a machine which is equipped with sensors, processors, computer control system, human interface system and accompanied with AI act upon the real world environment. ***"John McCarthy"*** is the father of AI. He used the first time the term **"Artificial Intelligence"** (AI), and developed the LISP programming language family, which is used for AI programming, and "***Joseph F. Engelberger"*** is the father of robotics**.** The history of robots is not a present-day concept, in the year 1898 an American researcher, ***Nikola Tesla*** demonstrated a wireless boat which works on radio wave and controlled by a remote controller. It was a great invention that changed our vision in robotics. The AI is the concept which provides the ability to machine to extract, analyze the environment and then react accordingly. The first general purpose robot was developed from approximately 1966 through 1972 named **"*Shakey the robot"*** developed at the ***Artificial Intelligent Centre*** of ***Stanford Research Institute***. After that many new robots were developed and the first artificial personal robot was developed by ***US Startup Robotbase*** which is 4-foot tall uses deep neural networks to assist in day-to-day tasks is shown at the Consumer Electronics Show (CES) in Las Vegas.

3. ARTIFICIAL INTELLIGENCE

Artificial Intelligence is the combination of two words, in which the word *Intelligence* means the ability to calculate complex algorithms, solve reasoning, perceive relationships and analogies, learn from experience, store retrieve, analyze and manipulate information of the surroundings, problems solving ability, comprehend complex ideas, use natural language fluently to communicate, classify, generalize, and adopt new situations, and when these ability and functioning is implemented artificially as in the form of software then it is termed as *Artificial Intelligence.*

Some of the modern AI's are Google Assistant, Cortana, Siri, and Mycroft.

3.1 Tasks of AI

***Mundane tasks*:** Mundane tasks are *Perception, Common Sense, Reasoning, Natural Language Processing, and Planning.* Perception is done using *Computer Vision, Speech* and *voice,* whereas Natural Language processing is done using *Understanding, Language Generation,* and *Language Translation.*

Formal tasks: Formal tasks are *Verification, Solving Mathematics, Theorem Proving* and *Playing Games.*

Expert tasks: Expert tasks are *Engineering, Scientific Analysis, Financial Analysis* and *Medical Diagnosis.*

4. ROBOTICS

Robotics is a one of an important branch of AI and without AI it is impossible to imagine about intelligent robots. Robot composed of Electrical Engineering, Mechanical Engineering, and Computer Science for designing, construction, and application of robots.

There are three Laws of Robotics according to Asimov's short story "Runaround":

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

In later stories, Asimov's robots are responsible for the government of entire planets and human civilizations. Then he added a fourth, or zeroth law, to precede the others:

A robot may not harm humanity, or, by inaction, allow humanity to come to harm.

4.1 Aspects of Robotics

Mechanical Construction: It means, form, or shape provided to robots to perform the desired task for which it is built and designed.

Electrical Components: These components supply power to the machinery and control the functionality of robots. Electrical components consist of wires, chipsets, microphone, sensors, and cameras.

Computer Program: It loaded with some level of a computer program, by which robots decide when, what and how to perform the operation.

4.2 Components of robots

Power Supply: To work the robot well, it is necessary that power is supplied to every electrical component of a robot and it is achieved by batteries, solar power, hydraulic, or pneumatic power sources.

Actuators: It is necessary to convert energy into a movement for performing some useful task and the component used for this is actuators.

Electric Motors (AC / DC): For rotational movement, motors are one of the most useful components.

Pneumatic Air Muscles: They contract almost 40% when the air is sucked in them.

Muscle Wires: They contract by 5% when an electric current is passed through them.

Piezo Motors and Ultrasonic Motors: It is used mostly in industrial robots.

Sensors: Various sensors are used in the robots to get the real-time information from the environment. Sensors like vision sensors used to visualize the depth in the surrounding task environment whereas a tactile sensor senses the touch of human fingertips.

5. MACHINE LEARNING

Machine learning is the branch of computer science which gives the ability to the system or machine to learn virtually from the real world without explicitly programmed. ***"Arthur Samuel"***, an American researcher coined the term "Machine Learning" in 1959 while he was working at **IBM**.

Machine learning is derived from the study of Pattern Recognition and Computational Learning Theory in AI, it is employed where designing and programming explicit algorithms is difficult or infeasible with desired performance. The main purpose of machine learning is to study and construction of algorithms that can learn and make a prediction on data. Now training steps are pursued ranging from machine learning approaches to genetic programming and neural networks.

5.2.1 Types of Machine Learning

Supervised learning: In supervised learning example inputs and their desired output is presented by the *teacher* and let the machine to learn a general rule that maps inputs and outputs.

Unsupervised learning: In unsupervised learning, leaving the learning algorithm on its own to find structure in its input. The goal is to let the algorithm in itself to discovering a hidden pattern in data or a means towards an end.

Reinforcement learning: In reinforcement learning let the computer interact and perform certain goal in the dynamic environment, and the program is provided feedback in terms of reward and punishment.

The best example of machine learning is the face detection and voice recognition. In face detection, the first system learns to detect face, it first learn what are parts a face consists of and what are their position and when any of the objects come in front of its image acquisition device like camera then it matches the position of the parts of the face like eyes, nose, lips and if all set good and at their position then it detects that it is a human face.

5.3 Artificial Neural networks

The neurocomputer is invented by Dr. Robert Hecht-Nielsen, and he defines a neural network as:

"...a computing system made up of a number of simple, highly interconnected processing elements, which process information by their dynamic state response to external inputs." [3]

The idea of ANNs comes from the working of the human brain. The brain consists of 86 billion nerve cells called **neurons** and they are connected to other thousand cells by **Axons** and **dendrites** that accept the inputs from sensory organs, The input signals quickly travels in the neural networks from one neuron to another in the form of electrical impulses and then the neuron send the messages to another neuron to handle the issue. The human brain works fine only because of making the right connection. In case of a machine, **silicon** is used as **neurons** and **wires** as **dendrites**.

AANs consist of **nodes**, which is same as **neurons** in human brains. The nodes are connected to each other by a link to interact each other. The node takes input and performs some operation and sends the output to another node for further operation or does not send forward. The output generated by a node is called as **activation** or **node value.**

6. CONCLUSION

However, the use of AI Robots is limited in present society, but now as the world moves towards automation the demand of AI Robots increased rapidly and new innovations are done in this field in next few years we will see these intelligent robots working everywhere along with humans [6]. As the use of intelligent robots increased it causes some security issue for mankind because evolution of human brain is slower as compared to artificial intelligence, then it might possible that AI exceeds the human intelligent, but on another hand it is also very helpful for mankind because it can perform all such task which is not possible for humans.

7. FUTURE SCOPE

As stated above AI Robotics has a great scope in almost every area. From the ancient time to modern day's surgery is still done manually, so, there is always some risk to the life of the patient, but what if we deploy some Artificial Intelligent Robots which perform the surgery, it reduces the risk of the patient live as well as it is more accurate than a surgeon [4].

In space, in next few years we will move beyond our solar system, hence we face lots of technical and connection problem, as the distance is so far it takes a long time to receive and send the command to the probe, so, in that situation AI Robots are very helpful because it has the capability to take decision on its own in some critical situation [5].

In the military, transportation is one of the major problems for a soldier, so it is very helpful to deploy autonomous robots which carry the loads and able to travel in any type of terrain. Also in next few years, it is possible that humanoid robots take place in the military and ready to face the enemy.

There are several other areas like industries, rescue operation, entertainment where AI Robots are used extensively.

8. REFERENCES

[1] http://thepitcher.org/10-quotes-give-different-perspective-artificial-intelligence/

[2] https://www.brainyquote.com/quotes/keywords/robots.html.

[3]] https://medium.com/towards-data-science/a-gentle-introduction-to-neural-networks-series-part-1-2b90b87795bc

[4] https://www.nasa.gov/centers/ames/research/exploringtheuniverse/spiffy.html

[5] https://spectrum.ieee.org/the-human-os/biomedical/devices

[6] https://www.engadget.com/2017/09/11/human-robot-ai-manufacturing/