

Overview of Cyborg Technology

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ABSTRACT

In this research paper we will focus on the cyborg technology in cybernetic. Cyborg in cybernetic is a part of Artificial Intelligence (AI). Artificial Intelligence is area of computer science that deals with the creation of intelligent machines or software that work and react like a human being. Cybernetic is the basic science of control system and communication in both areas that cover machines as well as living things. This paper will mainly be focusing on how Cybernetics and Artificial Intelligence work together. This paper will also include evaluation of cyborg technology in real world, benefits, drawbacks of cyborg technology and how cyborgs are different from robots.

KEYWORDS: AI (Artificial Intelligence), Cybernetics, Robotics.

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INTRODUCTION

Technology has become an important part of our day-to-day life and with each day newer technology are introduced to help humans in various fields. In this research paper we'll talk about one of the technologies named as "Cyborg", that has help human beings in many areas. The term Cyborg was mainly derived from the word Cybernetics organism. This term was coined by NASA Scientist Manfred E. Clynes and Nathan S. Kline in the 1960s. According to them the basic term "Cyborg" was referring to concept of an enhanced human being who can outlive in an extra-terrestrial environment (i.e. outer space). They discussed about the various possibilities and the advantages of a half-machine/human hybrid that could operate in outer space. If put in more simple term we can say a Cyborg is being that has biological and artificial part, basically a human being whose powers are improved with the help of computer implantation. A Cyborg Foundation was also made in 2010 that became the world first International organization who helped humans being to become cyborgs. And with the coming year this technology had many applications in real world. This technology will truly help many people to repair and overcome the physical and mental constraints. Cyborg also is famous in the science fiction stories world also. And through this research paper we will also be the clearing the fact that cyborg and robots are two totally different concepts.

Artificial Intelligence:

In the world of the computer science where the technology is growing at a rampant rate each day, Artificial Intelligence is the one of the factors that is changing the level of automation

and the technology. With the help of AI, we might reach to a place where intelligent machine can replace or enhance the human capability in many fields. AI, it is the ability of computer system or other software/computer-controlled robots/ machine to perform those tasks that are commonly associated with the Intelligent beings and AI main aim since it developed is to make machines that are intelligent and react is the same way humans. In Other words, we can say that Artificial Intelligence is the concept in which a computer thinks like a human and learn new idea. AI focuses on three major things that is learning, reasoning and self-correction. In learning process covers acquiring data and creating rules (algorithm) for how to convert the information/data into actionable information. In Reasoning process, we focus on selecting the correct algorithm to reach a desired output. In self-correcting process focusses on tuning the algorithm and make sure that the algorithm provides the most precise result possible. Computer system are efficient when it comes to following orders given by the user and handling very specific task, but are not good in handling thing that are new and they haven't seen before. Let's take an example of a common computer program that can turn a report of names and hours worked into pay checks for the workers in an organisation but, the same program is incapable of answering the questions from an employee about why the organisation will not pay for a nap time. This actually shows us the main difference between a program and AI. AI is widely used these to solve the complex problem in various fields such as science, business, medicine, weather forecasting, engineering, etc.

Since there are various of definition that define Artificial Intelligence and that is with respect to the behaviour or reasoning or with respect to human or ideal that is rational but we will learn about the four perspective of the Artificial Intelligent that will help us understand in which category “Cyborg” falls into.

According to Figure 1, if we consider the two category 1 or 3, then the definition of Artificial Intelligence will develop a machine that think like and also can act as human being respectively.

<p>Systems that think like humans</p> <p>"the automation of activities that we associate with human thinking, activities such as decision-making, problem solving, learning.." (Bellman, 1978)</p>	<p>Systems that think rationally</p> <p>"the study of the computations that make it possible to perceive, reason, and act" (Winston, 1992)</p>
<p>Systems that act like humans</p> <p>"the study of how to make computers do things at which, at the moment, people are better." (Rich and Knight, 1991)</p>	<p>Systems that act rationally</p> <p>"AI... is concerned with intelligent behavior in artifacts." (Nilsson, 1998)</p>

Fig.1 Four perspective of Artificial Intelligence

And If we consider the other two category that is 2 or 4 then the definition of Artificial Intelligent will develop a machine that think or acts more optimally respectively. But the term “Cyborg” falls in the category 1 and 3 that is it will be define the intelligent in the term of the human only.

Cybernetics:

The word Cybernetic is Greek word “kybernētiké” that means governance or steersman. The word cybernetic was first coined by a scientist named Norbert Wiener. The term cybernetic became more famous after the book written by Norbert Wiener in 1948, “*Cybernetics or Control and Communication in Animal and the Machine*”. According to Norbert Wiener Cybernetic is defined as “the science or it’s a study of basic science of control system and communication in both areas that cover machines as well as living things”. Cybernetic is formally defined as the communication and automatically control system in animals, human being and machines. Cybernetics is like the knowledge of organization, with special focus on the dynamic nature of the system being prearranged. Often cybernetic and AI are considered as the same thing, but that’s not the case, Cybernetic and AI are two different ways for creating Intelligent systems or systems that can act toward reaching a goal. But if we combine all different feature of AI and Cybernetic then a system can be made that can learn and enhanced the skills as AI considers using stored representations as a means of acting intelligently whereas cybernetics will focus on the grounded and situated behaviours that express intelligence and learning based on interaction and feedback A focus is made on machines as machines cannot be understood by verbal communication it forms abstractions and concepts [1].

Cyborg

A Cyborg is term that is defined as the Cybernetic organism, that is some part living being and some part machine. Cyborg is a combination of both technology Artificial Intelligence and Cybernetic. The concept of cyborg is totally different from that of a robot or bionic and android. Cyborg is a way of

enhancing the capability of living being. The technology that is used in cyborg are used to repair and overcome physical and mental constraints. It not just only repair and overcome physical and mental constraints, it also enhances a particular human organ/living being. This technology has many application and success stories not only in just one field but also in many different fields. There are many success stories of Cyborg in cybernetic organism, and through these stories we came across the classification of the cyborg. This classification consists of three type of cyborg, first type is “**Animal Cyborg**”, second is “**Individual Cyborg**” and last is the “**Social Cyborg**”. The Animal Cyborg is made of half animal and half machine and world first cyborg was an animal cyborg only. Individual Cyborg consist of cyborg that are half human and half machine. Social Cyborg is term that is used describe people who have larger networks of communication and control.

World's first cyborg was a lab rat, that was a part of an experimental program at New York's Rockland State Hospital in the 1950s. The rat was the first cyborg given to the world, that had tiny osmotic pump implanted in its body, this tiny osmotic pump that was injected was used to controlled the doses of chemicals, altering various physiological parameters of this rat. The first living thing that was a part animal and a part machine which is also an example of Animal cyborg. The first cyborg was a white lab rat and if we talk about human being a cyborg then the first human cyborg was “**Neil Harbisson**”. Neil Harbisson was the first human cyborg that implanted an antenna in his skull. Neil Harbisson was born on 27 July 1982, Ireland in UK, when he was born, he had an extreme form of colour blindness that resulted in seeing only in greyscale.



Figure 2: First Human Cyborg “Neil Harbisson”.

To remove this colour blindness, he implanted an antenna into his skull. The antenna uses to send an audible vibration inside his skull that use to inform the information to him about the colour. In other words, it allows him to feel and hear colours as audible vibrations inside his head. This sensory device antenna helped Neil to overcome his limitation of colour blindness. This antenna not just only overcome the limitation of his colour blindness but also enhance his sensory as he could hear infrareds and ultraviolet that are invisible to human eyes also and also, he is now legally known as the human cyborg by the government. In 2010, he was the co-founder if a Cyborg Foundation, that is an International Organisation that protected the rights of human cyborg and also supported people who have the desire or wants to become a “Cyborg”.

Another example of human Cyborg is “Kevin Warwick” also known as Captain Cyborg, professor of Cybernetics at the University of Reading, UK. Kevin Warwick research and his focus were mainly on the technology like artificial intelligence, control systems, robotics and biomedical engineering. Kevin Warwick took the first step that will increase the abilities of machine intelligence and to allow extra sensory input and to link in much efficient way, using his own thoughts alone. He became a test subject on which technology was implanted to his central nervous system by a surgical operation. The Professor Kevin Warwick implanted one hundred electrode arrays connected to the median of the nerve fibre of the left arm. This operation was held at Radcliffe Infirmary, Oxford in 2002. Through this array electrode he was able to control an electric wheelchair and also an artificial hand that was developed using neural interface by Dr Peter Kyberd and many another experiments were tried using this technology chip transponder. Neil Harbisson and Kevin Warwick are a good example of the category of “Individual Cyborg”.

Cyborg Vs Robots

There are many misconceptions when it comes to describing a cyborg and robots. Many people have misconception that these both terms are same and their functionality and purpose is also same but this not the case. In this section we’ll clear the fact that cyborg and robots two totally different concepts.

- Cyborg are combination of both living beings and a machine, Living being does not necessary mean that it should be a human only it can be anything (it can be a dog, rat, birds etc.) whereas when we talk about robots, it is a full pledged machine that is very advance in technology, it is automated and require very less interaction with Human Being.
- Cyborg are typically way more complex whereas a robot can be complex as well as can be very easy.
- Cyborg have good understanding of living being terms and can react on these concepts whereas robots learn on the basic of the knowledge provided to them and may or may not react.

Application Of Cyborg

As Cyborg being a technology that is half living being and half machine, can be used in many fields in the real world. In this section we discuss about the various application of Cyborg technology.

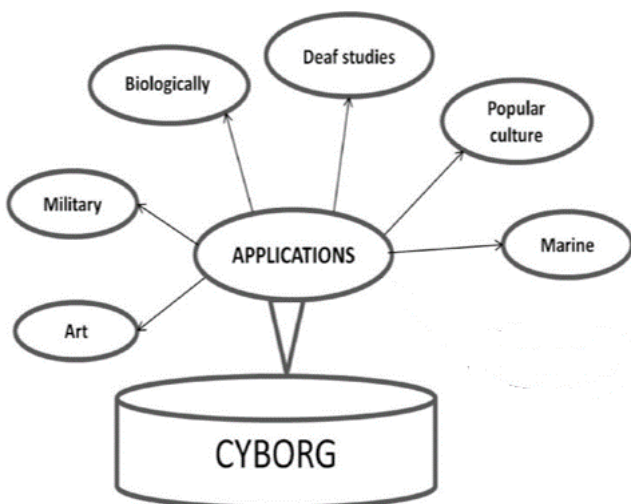


Figure 3: Applications of cyborg

1. In Art:

These days technology/ machine are growing at a rampant rate each day, that they are making everything computerize. Even basic thing for doing art like pen and paper are also replaced by the computerized drawing pads and in the world of music, drumming machine are becoming as popular as human drummer. Similarly the cyborg technology is also used by some human for art and some music.

Stelarc is a Legendary Australian performance artist who has explored and acoustically improved his body. Stelarc cell prepared ear surgically connected/attached to his left arm. Another example is the Wafaa Bilal who is Iraqi-American performance artist, whose has showed another example how cyborg technology can be used in Art. Wafaa Bilal implanted a small 10-mega pixel camera into his back of the head.

2. In Military:

Military organization researchers are focusing on using cyborg technology in animal and human so that they can have tactical advantages. The Defense Advanced Research Projects Agency (DRAPA) is trying to make an “Cyborg Insect” that can transmit data from sensors implanted inside the insect during pupal stage.

Even DRAPA is trying to make a human arm that can be controlled by human thoughts.

3. In Critical Deaf Studies :

A term known as “Cyberization” is used for an attempt to classify “Normalization”. Hearing aid are majorly used by the people which help them to hear. Cochlear implantation can be used for deaf patient. It is basically an electronic device that replaces the function of inner damaged ear.

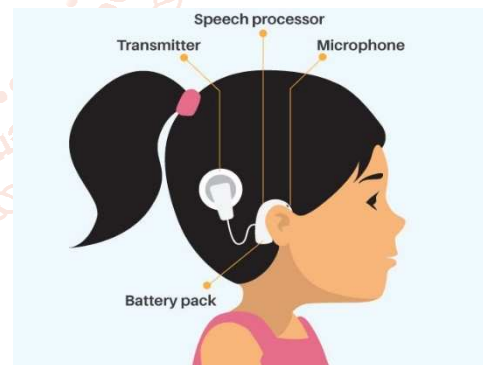


Figure 4: Cochlear implantation

4. Retinal Implant:

Retinal implantation can restore the sight of the patients who are blinded by retinal degeneration. In the eye, in retina we have light detecting rod and cones cell and in retinal implantation they have placed electrode to do the same thing. The signal are then fed/transferred to the optic nerve and brain then help the patient to see again.

5. In Popular Culture:

Cyborg technology has not just only made its place in the real world but has also made its place in science fiction literature and other media. There are many science fiction character that are introduced in using this cyborg. One of the famous character of DC universe is also known as “Cyborg” that is half human and half machine. And there are many more example of this technology such as Robo Cop, Terminators, Star Wars universe, Terminator Salvation, etc.

6. In Marine:

The term cyborgs is not just limited to the human beings but also cover animals also. There have been example of the animal from the water/oceans that are cyborg. Some of the examples are Cyborg Dolphin, Sea Cyborg and Cyborg Jellyfish.

7. In Biological:

Even medical fields also widely using this cyborg concept, so that they can help people and also repair and over come there physical impairments. Retinal implantation is very good example in terms of medical treatments for the people who are blind. And many more example are there like C-leg System that is basically used to replace human leg that has been lost due to some injury or illness. BCI(Brain Computer Interface) is used to provide a path of communication from the human brain to an external device.

Advantages Of Cyborgs

In one such recently suggested theory it is said that the human race has reached its peak in economic sector, fortunately it has arrived just in the nick of time for it to be implemented on humans i.e. to re-engineer human species As the artificial intelligence created for cyber security by using machine learning where a human brain is behind its existence to mimic the action of human to process the data [2].

1. It is clear that by using cyborgs the artificial life will eventually win out against organic life since it is more durable and more efficient.
2. In one such recently suggested theory it is said that the human race has reached its peak for in economic sector, fortunately it has arrived just in the nick of time for it to be implemented on humans i.e. to re-engineer human species.
3. Certainly, it would be easy to utilize bio-implants that would allow people to trace the location and perhaps even monitor the condition and behaviour of implanted persons
4. Harnesses the ever-increasing abilities of machine intelligence, to enable extra sensory input and to communicate in a much richer way, using thought alone.
5. Supplements, lost or damaged body parts with the integration of a mechanical artifice.
6. Bionic implants in medicine allow model organs or body parts to mimic the original function more closely.

Disadvantages Of Cyborgs

The Disadvantages of cyborg are:

1. The critics of bioelectronics and bio computing foresee numerous potential negative social consequences from the technology. One is that the human races will completely be devoid of its human touch/emotion and will be divided on the bases of statistics.

2. People with enough money will miss use this technology for their personal benefits such as to utilize it for cloning or organ replacement to delay death for as long as possible while the rest of the population continue to suffer from hunger, bad genes etc
3. This would be tremendous violation of human privacy, but the creators of human biotech might see it as necessary to keep their subjects under control. Once the bio-implant is fitted inside a human body, its user will become extremely dependent on the creator of the implant for its maintenance.
4. It could be possible to modify the person technologically so that body would stop producing some essential substance for survival, thus placing them under the absolute control of the designer of the technology.

Conclusion

This research paper is based on the idea of cyborg technology in cybernetic using the Cybernetics and Artificial Intelligence as the main technology

The review is divided into five major sections. In the first section, a short description about the Artificial Intelligence definition, how it has become a major part of our life and what are category in AI.

The second section is what is Cybernetic and how it is related to cyborg technology. The third section is about the what is cyborg, we have also talked about what are the different classification and related to some classification we have given some example to explain those classification. The fourth section gives a brief idea about how cyborg and robots are two different concepts. And the final section tells about all the application that are there in the real word and also covered the advantages and the disadvantages of Cyborg.

Taking this thesis description to another extent would prove to be fruitful as creation of cyborg has open a new way for the helping living being to be better or to repair and overcome physical and mental constraints and through this technology living being has given an option to choose to enhance their capabilities. This research paper is showing how Cyborg can be a new future for enhancing the human capabilities.

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