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Cyborg Crab

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***Abstract* – In this paper we emphasis on the cyborg in cybernetic which is a part of Artificial Intelligence. Artificial intelligence (AI) is the intelligence exhibited by machines or software. It is also an academic field of study. The paper gives an idea of an artifact which is supposed to match the intelligence and behavior of a human being. Cybernetics is formally defined as the science of control and communication in animals, men and machines. Paper discusses cybernetics and how they can work with artificial intelligence. In this paper, we motivate an interesting challenger model, cyborgs, which are either humans assisted by bots or bots assisted by humans. Since there is always a human behind these bots or a human can always be available on demand. I discuss the evaluation of cyborg technology in real world. In this paper I also include benefits and drawbacks of cyborg technology. This paper gives an idea that how cyborg differs from robots? The notion of telling humans and cyborgs apart is novel.**

Keywords - Artificial intelligence, cybernetics, cyborgs, bots, artifact , crab.

I. INTRODUCTION

Artificial Intelligence (AI) is the concept which making a computer that thinks like a human to be able to learn and to have new ideas. AI can build a machine that can act smart and seem more human. Artificial Intelligence (AI) is a very general term but defining it precisely is very difficult. And the design of an artificially intelligent agent totally depends on the fact how we define the term "Artificial Intelligence". The right definition can lead us to develop a successful intelligent artifact.

There are number of definitions to define artificial intelligence, if it is with respect to reasoning or behavior and secondly, whether it is with respect to human or ideal (i.e. rational) as shown in the fig-1.

Computers are very good at following exact orders, and handling very specific things, but not good at dealing with new things they haven't seen before. For example, a common computer program can turn a report of names and hours worked into paychecks for the workers at a company. But the same program could not answer questions from an employee about why the company will not pay for nap time. That is the difference between a program and AI.

If we consider the category-1 or category-3 definition of AI then we try to develop an artifact that can think like and can act like human being respectively. Further, if we consider category-2 or category-4 definition of AI then we try to develop an artifact that thinks or acts optimally respectively. A lot of research work has been done among all the dimensions depending upon the need. As a result we have different model of artificial agent following the definitions from different category.

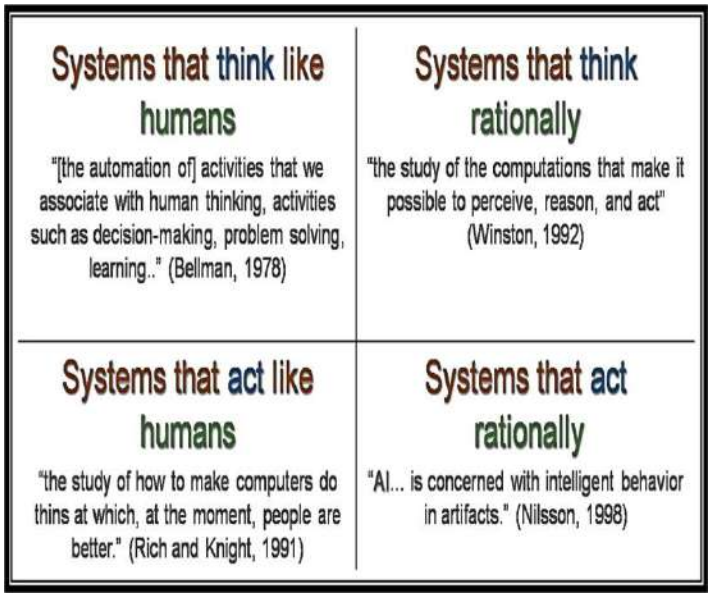

Fig.1 Four perspective of Artificial Intelligence

In this paper, I would be considering definitions from category 1 and 3 only, means we will be defining the intelligence in terms of human only.

Human kind has given itself the scientific name homo sapiens-man the wise-because human mental capacities are so important to human's everyday lives and human's sense of self. The field of artificial intelligence, attempts to understand intelligent entities.

Artificial Intelligent computers are not thinking machines. Something more was needed to make computers worthy competitors of human beings.

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II. WHAT IS ARTIFICIAL INTELLIGENCE?

"Artificial intelligence is the science of making machines do things that would require intelligence if done by humans"

Artificial Intelligence is the capability of a device to perform activities, which would otherwise only be expected of the human brain. These activities include the capacity for knowledge and the ability to acquire it. It also comprises of the ability to judge, understand relationships and last but not least produce original thoughts.

Artificial intelligence**,** the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. Since the development of the digital computer in the 1940s, it has been demonstrated that computers can be programmed to carry out very complex tasks—as, for example, discovering proofs for mathematical theorems or playing chess. AI comprises of that branch of computer science that aims to make an intelligent machine that can react in ways similar to humans and thus, one can say that artificial intelligence is the simulation of human thinking. This limitation of the human brain can be done in two ways- one via a structural simulation where the structure mechanism used is similar to that of the human brain while the other is the functional simulation which involves putting aside the internal structure and concentrating the efforts solely on the functionality.

III. WHAT IS CYBERNETICS?

Cybernetics is a word coined by group of scientists lead by Norbert Wiener and made popular by Wiener's book of 1948, *Cybernetics or Control and Communication in the Animal and the Machine*. Based on the Greek "kybernetes," meaning steersman or governor, cybernetics is the science or study of control or regulation mechanisms in human and machine systems, including computers.

CYBERNETICS could be thought of as a recently developed science, although to some extent it cuts across existing sciences. Cybernetics is a classification, which cuts across them all. Cybernetics is formally defined as the science of control and communication in animals, men and machines. It extracts from whatever context, that which is concerned with information processing and control. One major characteristic of Cybernetics is its preoccupation with the construction of models and here it overlaps operational research. Cybernetic models are usually distinguished by being hierarchical, adaptive and making permanent use of feedback loops. Cybernetics in some ways is like the science of organization, with special emphasis on the dynamic nature of the system being organized." Fig. 2 gives the idea about relation between Cybernetics and AI.

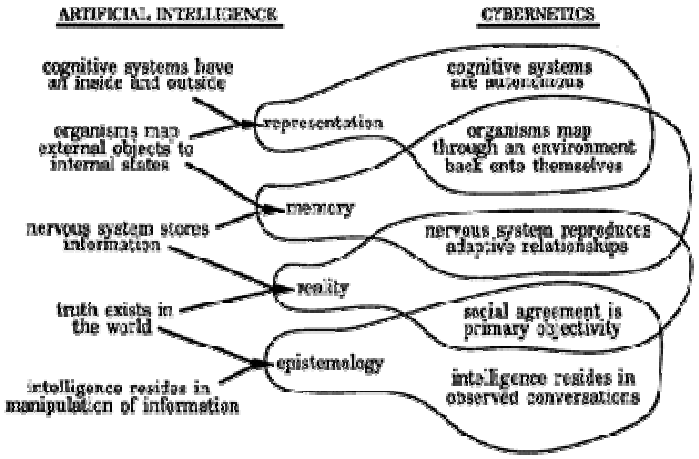

Fig.2 AI and Cybernetics

IV. WHO ARE BEHIND THIS CYBERNETICS?

A. Dr. Kevin Warwick: (Prof. of cybernetics)

Kevin Warwick is Professor of Cybernetics at the University of Reading, UK where he carries out research in artificial intelligence control and robotics. His favorite topic is pushing back the frontiers of machine intelligence. Kevin began his career by joining British Telecom with whom he spent the next 6 years. At 22 he took his first degree at Aston University followed by a PhD and research post at Imperial College, London. He subsequently held positions at Oxford, Newcastle and Warwick Universities before being offered the Chair at Reading, at the age of 32.

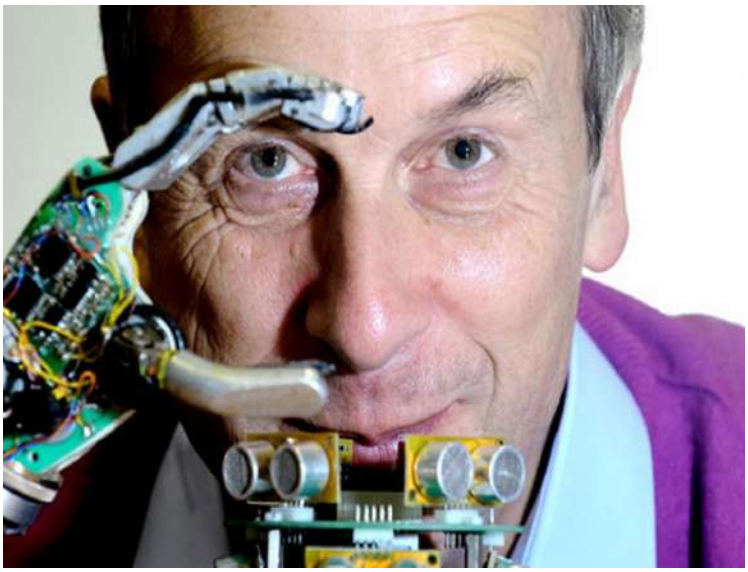

Fig.3 Kevin Warwick

Kevin's paper "Mind of the Machines" gives knowledge that machines are more intelligent than. He has been awarded higher doctorates both by Imperial College and the Czech Academy of Sciences, Prague and has been described as Britain‟s leading prophet of the robot age. In Guinness Book there is one appearance of Kevin for an Internet robot learning experiment and in the 2002 edition for his Cyborg research.

In 1998 he shocked the international scientific community by having a silicon chip transponder surgically implanted in his left arm. A series of further implant experiments have taken place in which Kevin‟s nervous system was linked to a computer. This research led to him being featured in February 2000, as the cover story on the US magazine wired. Kevin also presented the Year 2000 Royal Institution Christmas Lectures with great success. Kevin's new implant experiment called 'Project Cyborg' got underway in March 2002 and is providing exciting results.

B. And His Team:

1) Dr. Brain Andrew: Prof. of control systems and bioengineering.
2) Dr. Peter Teddy: Consultant neurosurgeon and clinical director.
3) Dr. Amjad Shad: Dr. in spinal surgery and neurostimulation.
4) Dr. Mark Gasson: Design Engineer and specialist in robotics.
5) Dr.Brain Gardner: Surgeon in spinal injuries.

V. CYBORG IN CYBERNETICS

A Cyborg is a Cybernetic Organism, part human part machine. In this we will go through Kevin Warwick‟s amazing steps towards becoming a Cyborg. The story is one of scientific Endeavour and devotion, splitting apart the personal lives of himself and those around him. This amazing and unique story takes in top scientists from around the globe and seriously questions human morals, values and ethics.

Humans have limited capabilities than machines. Humans sense the world in a restricted way, vision being the best of the senses. Humans can understand the world in only 3 dimensions and communicate in a very slow, serial fashion called speech. But question is that, can we improve it? Can we use technology to upgrade humans?

The possibility exists to enhance human capabilities. To harness the ever-increasing abilities of machine intelligence, to enable extra sensory input and to communicate in a much richer way, using thought alone. Kevin Warwick has taken the first step on this path, using himself as a guinea pig test subject receiving, by surgical operation, technological implants connected to his central nervous system.

VI. CYBORG EVALUATION

A. Cyborg 1.0

A Simple RFID transmitter being implanted in Mr. arwick‟s skin. It does not carry any battery but through coil it can receive power and after that he used to control doors, lights, heaters and other computer-controlled devices based on his proximity. The main purpose of this experiment was to test the limit of the body would accept and how easy it would be to receive a meaningful signal from the chip.

Fig.4 Cyborg 1.0 chip

1) *How it can be helpful? :* It gives you a unique code. It is quite possible for an implant to replace an Access, Visa or bankers card. An implant could carry huge amounts of data on an individual, such as National Insurance number and blood type, blood pressure. Clocked in and out of office automatically. Find the exact location of the person in the office. Useful for the car security. Car remains disabled unless it recognized the unique signal from its owner.

B.Cyborg 2.0

One hundred electrode arrays were surgically implanted into the median nerve fibers of the left arm of Professor Kevin Warwick on 14th of March 2002. The operation was carried out at Radcliffe Infirmary, Oxford**.**

Medical team headed by the neurosurgeons Amjad Shad and Peter teddy. The procedure, which took a little over two hours, involved inserting a guiding tube into a two inch incision made above the wrist, inserting the microelectrode array into this tube and firing it into the median nerve fibers below the elbow joint.

A number of experiments have been carried out using the

signals detected by the array; most notably Professor Warwick was able to control an electric wheelchair and an intelligent artificial hand, developed by Dr Peter Kyberd, using this neural interface. In addition to being able to measure the nerve signals transmitted down Professor Warwick‟s left arm, the implant was also able to create artificial sensation by stimulating individual electrodes within the array. This was demonstrated with the aid of Kevin‟s wife Irena and a second, less complex implant connecting to her nervous system.

VII. MECHANISM OF CHIP TRANSPONDER USED IN CYBORG

The transponder that was implanted in the forearm of Professor Kevin Warwick, on 24th August 1998 consists of a glass capsule containing an electromagnetic coil and a number of silicon chips. It is approximately 23mm long and 3mm in diameter.

The coil generates an electric current, When a radio frequency signal is transmitted to the transponder. To drive the silicon chip circuitry this electric current is used, which transmits a unique, 64-bit signal. A receiver picking up this signal can be connected in an Intelligent Building network.

Then computer is able to recognize the unique code and, in the case of an implant, the individual human in question. On picking up the unique, identifying signal, a computer can operate devices, such as doors, lights, heaters or even other computers. Which devices are operated and which are not depends on the requirements for the individual transmitting the signal.

The silicon chip transponder had not, prior to this experiment, been surgically inserted into a human. It was not known what effects it would have, how well it would operate and, importantly, how robust it would be. There was the very real possibility that the transponder might leak or shatter while in the body with catastrophic consequences! The implant in Kevin Warwick's forearm was successfully tested for nine days before being removed.

VIII. CLASSIFICATION OF CYBORGS

Cyborgs are categorized into three type based on their structural and functional role play.

A. Individual Cyborgs

The term "cyborg" is used to refer to a human with bionic, or robotic, implants. Artificial objects such as prosthesis are so closely attached human bodies as to be considered as a part of one‟s body.

In 1997, Philip Kennedy, a scientist and physician designed the world's first human cyborg named Johnny Ray.

In 2002, Canadian Jens Naumann, also blinded in adulthood, became the first in a series of 16 paying patients to receive Dobelle's second generation implant, marking one of the earliest commercial uses of BCIs.

In 2002, under the heading Project Cyborg, a British scientist, Kevin Warwick, had an array of 100 electrodes fired into his nervous system in order to link his nervous system into the Internet.

In 2004, a British and completely colorblind artist, Neil Harbisson, started wearing an eyeborg on his head in order to hear colors.

In 2012 at TED Global, Harbisson explained that he did not feel like a cyborg when he started to use the eyeborg, he started to feel like a cyborg when he noticed that the software and his brain had united and given him an extra sense.

B. Animal Cyborgs

The US-based company Backyard Brains released what they refer to as "The world's first commercially available cyborg" called the RoboRoach.

The project started as a University of Michigan biomedical engineering student senior design project in 2010 and was launched as an available beta product on 25 February 2011.

The RoboRoach was officially released into production via a TED talk at the TED Global conference, and via the crowd sourcing website Kick starter in 2013, the kit allows students to use micro stimulation to momentarily control the movements of a walking cockroach (left and right) using a Bluetooth-enabled Smartphone as the controller.

Other groups have developed cyborg insects, including researchers at North Carolina State University and UC Berkeley, but the RoboRoach was the first kit available to the general public and was funded by the National Institute of Mental Health as a device to serve as a teaching aid to promote an interest in neuroscience.

Several animal welfare organizations including the RSPCA and PETA have expressed concerns about the ethics and welfare of animals in this project.

C. Social Cyborgs

More broadly, the full term "cybernetic organism" is used to describe larger networks of communication and control. For example, cities, networks of roads, networks of software, corporations, markets, governments, and the collection of these things together.

A corporation can be considered as an artificial intelligence that makes use of replaceable human components to function. People at all ranks can be considered replaceable agents of their functionally intelligent government institutions, whether such a view is desirable or not.

IX. DIFFERENCE BETWEEN CYBORG AND ROBOT

Cyborgs	Robots
Cyborgs are a combination of a living organism and a machine. It doesn't necessarily have to be human; it can be a dog, a bird, or any other living thing.	A robot is basically a machine that is very advanced. It is often automated and requires very little interaction with humans.
A cyborg is a combination of an organism with a machine. It is a part of living beings.	A robot is an automated machine. It is not alive.
Cyborgs are typically very Complex.	Robots can be simple or very complex.

A. In Art

Often the concept of art is associated with science fiction. Many artists have tried to create public awareness of cybernetic organisms. These can range from paintings to installations.

Now a days, machines are becoming more universal in the artistic process itself, with computerized drawing pads replacing pen and paper, and drum machines becoming nearly as popular as human drummers. This is perhaps most notable in generative art and music.

Stelarc is a performance artist who has visually probed and acoustically amplified his body.

Wafaa Bilal is an Iraqi-American performance artist, who had a small 10 megapixel digital camera surgically implanted into the back of his head.

Fig.6 Example of Cyborg in Art

CYBORG PROLIFERATION IN SOCIETY

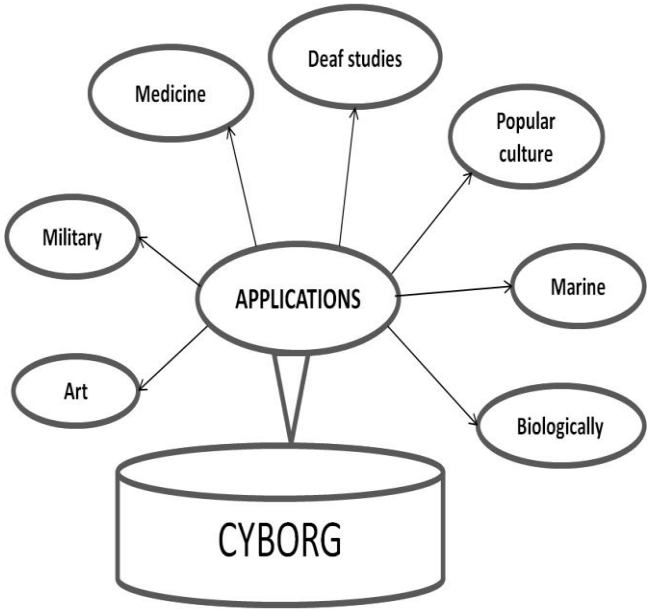

Fig. 5 Applications of cyborg

B. In Military

Military organizations' research has recently focused on the utilization of cyborg animals for the purposes of a supposed tactical advantage. DARPA has announced its interest in developing "cyborg insects" to transmit data from sensors implanted into the insect during the pupal stage. The insect's motion would be controlled from a Micro-Electro-Mechanical System (MEMS) and could conceivably survey an environment or detect explosives and gas. Similarly, DARPA is developing a neural implant to remotely control the movement of sharks. The shark's unique senses would then be exploited to provide data feedback in relation to enemy ship movement or underwater explosives.

Fig7 cyborg in Militry

Cyborg Crab

C. *In Medicine*

For centuries, man has depended on technology, understanding human physiology and medicine to “construct tools to replace or augment natural physiologic functions”.
Many of these technologies were created to restore abilities that were lost to injury, disease, and age.

There are two important and different types of cyborgs used in medicine : The restorative and the enhanced. Restorative technologies "restore lost function, organs, and limbs" The key aspect of restorative cyborgization is the repair of broken or missing processes to revert to a healthy or average level of function.

On the contrary, the enhanced cyborg "follows a principle, and it is the principle of optimal performance: maximizing output and minimizing input". Thus, the enhanced cyborg intends to exceed normal processes or even gain new functions that were not originally present.

Although prostheses in general supplement lost or damaged body parts with the integration of a mechanical artifice, bionic implants in medicine allow model organs or body parts to mimic the original function more closely.

D. In Critical Deaf Studies

“Cyborgization” is an attempt to classify “normalization”. Hearing aids are widely used and can help assist individuals that are hard of hearing.

Cochlear implants may help provide hearing in patients that are deaf due to damage to sensory hair cells in their cochlea. It is an alternative method of treatment for profoundly deaf people, mostly children.

It is estimated that in India, there are 1million profoundly deaf children and most of them still remains deaf.

E. In Popular Culture

Cyborgs have become a well-known part of science fiction literature and other media. Although many of these characters may be technically androids, they are often referred to as cyborgs.

Examples of fictional biologically based cyborgs include Iron Man, Robo Cop, Terminators, Star Wars universe, Eliminators, Johnny Mnemonic, and Terminator Salvation etc.

An interesting idea is how the notion of a cyborg might change, since many of these devices use technology that is itself principally biological, such as stem cell lines in the bioreactor liver or artificial skin.

Just how much of the human body can you replace or augment: seemingly everything apart from the tadpole like remnants of the brain and spinal chord, Like Robocop.

Fig.8Example of Cyborg in Popular Culture

F. *In Marine*

The term cyborgs not only apply to the humans, but to animals as well. Some of the best examples of such animal‟s cyborgs one from the ocean, but such research is relatively new like,

1) Cyborg Dolphin
2) Sea Cyborg
3) Cyborg Jellyfish

G. In Biological

Our medical technology becomes more advance, so some techniques and innovations are adopted by the body modification community.

A blind man wearing a camera interfaced to nerve cells in brain to View images on Television artificially.

Retinal implants are the modern way of healing blindness.

In retina, we have light detecting rod and cone cells. And we place electrodes to do the same function.

The signals are then fed to optic nerve and brain. Biological cyborg uses as human body part like as follows,

1) Touch Bionics I-Limb
2) Proprio Bionic Foot
3) Tooth and Ear Cell phone Implant
4) Bone Marrow Stem Cell Artificial Skin
5) Otto Bock C-Leg Intelligent Prosthetic Leg
6) MC3 Bio lung Artificial Lung
7) Artificial Heart
8) Otto Bock- 3D Hip Joint system
9) McKibben Artificial Pneumatic Muscles
10) HepaLife Bioreactor Artificial Liver
11) World First Artificial Stomach
12) AWAK A Wearable Artificial Kidney

XI. CYBROG IN CRAB

Materials:

-paper clip
-4 sheets of A4 paper/ 2 sheets of A4 card
-small motor
-Use two LR44 button batteries if you want your robot to be self contained. If you want to hold a 9V battery while the robot runs along the ground this gives a much faster speed but doesn't look so great.
-small worm gear to fit the diameter of your small motor and an 8mm diameter gear with 18 teeth
-40 small pins
- superglue
-mini switch

All mechanized insect's legs are fully articulated and it has the capacity to move at speeds of up to 240 steps per minute.
Once we built this robot than it can move sideways much like a crab and the legs have a synchronized walking pattern.

Also, this little creature is too small so it is easy to store it like we can store it in a match box or even at the bottom of our pocket.
Further more, if we are looking it cost wise, it is made by paper and some electronic components so no more cost is required.

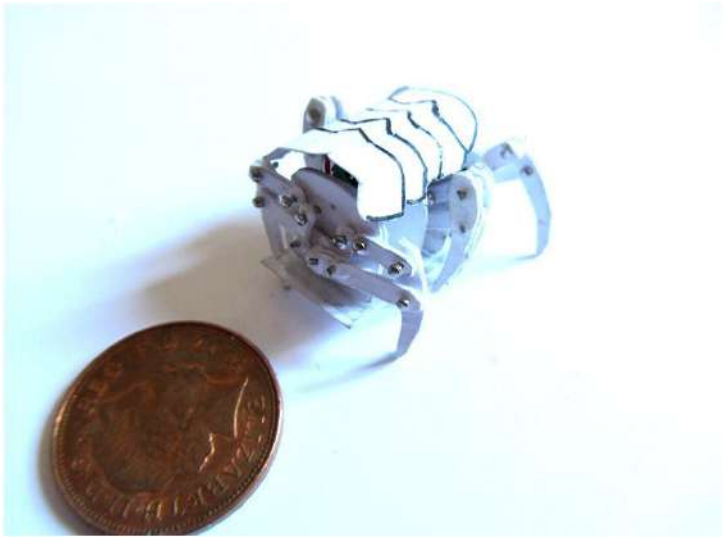

Fig. 9 cyborg crab

XI. ADVANTAGES OF CYBORGS

The benefits of cyborg technology are vast and are expanding, and are helping people live normal lives and in some cases give a human a better advantage physically.

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) Electronic „life", however one recent theory that has been bantered about lately is that the human race may have reached the saturation point for economic growth, but this is fortunate since it has arrived in time for it to work on „human growth", i.e. the re-engineering of the human species.
3) We can „graducate" from being victims of natural selection to masters of self-selection. It seems hard to argue against increasing human longevity, intelligence, or strength, since human beings seem to live too short a span.
4) Certainly, it would be easy to utilize bio-implants that would allow people to trace the location and perhaps even monitor the condition and behavior of implanted persons.

5) Harnesses the ever increasing abilities of machine intelligence, to enable extra sensory input and to communicate in a much richer way, using thought alone.
6) Supplements, lost or damaged body parts with the integration of a mechanical artifice.
7) Bionic implants in medicine allow model organs or body parts to mimic the original function more closely.

XII. 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 race will divide along the lines of Biological haves and have-nots.
2) People with enough money will be able to argument their personal attributes as they see fit as well as to utilize cloning , organ replacement, etc. to stave off death for as long as they wish ,while the majority of humanity will continue to suffer from hunger ,bad genes, and Infirmity
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 implanted with bio-implant electronic devices, „cyborg" might become highly dependent on the creators of these devices for their repair, recharge, and 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.
5) Even those not spiritually motivated who still nevertheless posses the feeling that there is something within humanity which is not found in animals or machines and which makes us uniquely human, worry that the essence of our humanity will be lost to this technology.

XIII. CONCLUSION

Finally I would like to say that if the future is of intelligent robots than to protect mankind we will must need some NEOs, TERMINATORs. They all are CYBORGS. Because by making human CYBORGS we may have following extra ordinary capabilities…

I think by 2100 we're going to see people able to communicate between each other by thought signals alone, so no more need for telephones, old fashioned signaling, we'll be able to think to each other via implants.

Linking oneself up via an implant to a computer, one"s nervous system, electronic signals connected to the electronic signals in the computer - effectively mentally becoming one with the computer. This will mean movement type signals and emotional type signals can transmit from one"s body to the computer, but also the other way. The computer will be able to affect one"s emotionally, perhaps cheer one"s up when anyone is depressed or cause one"s to move when anyone didn't think about moving. It opens all sorts of other possibilities; the computer will be able to send down other information ultrasonic or infrared information on one"s nervous system to brain

Instead of communicating by speech as we do presently, we'll be able to think to each other, simply by implants connected to our nervous system linking our brains electronically together, possibly even over the internet.

We won't need the languages that we presently do; we'll need a new language of ideas and concepts in order to communicate thoughts from brain to brain.

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