

Cybernetic Augmentation - a Key to Utopia or Dystopia?

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Abstract

Here goes the abstract

I. Introduction

The prosperity that we have achieved in the last few millennium is mainly thanks to our ability to make tools to complement ourselves; we have made tools that helped us adapt our environment more habitable, ensured our food supply, increased our strength and dexterity, widened our knowledge and improved our ability to carry out mental activities. However, after the millennium of progress we are approaching a new dimension of technology; a dimension which some believe will be our salvation while others would easily relate to the legends of Icarus, Pandora's box and Prometheus fire. The dimension referred to is the prospect of actively and invasively improving the human mind and body. Developments in fields such as electronics, nanotechnology, robotics, cybernetics, information technology, neurotechnology, genetic engineering and pharmacology, among others, are enabling a new field of technology labeled by some as Human Engineering to emerge.

The authors of this paper realize that human engineering is a very broad and trans-disciplinary field, and it would take volumes to analyse its ethical implications; thus this paper attempts to narrow the field by only looking at the ethical implications of one form of human engineering; namely cybernetic human augmentation. For the purpose of this paper cybernetic human augmentation is defined as the following: any (1) electro-mechanical addition to the human body that (2) becomes a natural part of the human body and that (3) improves the performance of an individual beyond normal human capacities. Needless to say genetic or chemical forms of human augmentation are external to the purview of cybernetic augmentation.

The paper is structured as follows; the first part of the essay looks at the effects of cybernetic human augmentation on society; following this an ethical perspective is used to analyse the effects of augmentation. After looking at the effects and their ethical implications, recommendations are made to support the implementation of cybernetic augmentation on society. Finally conclusions are drawn regarding the future of humanity, its ethics and cybernetic augmentation.

II. Analysis

To explore the potential ethical implications of cybernetic augmentation in a more structured manner, a distinction is made between the two types of cybernetic augmentations:

1. Augmentations to enhance the user's physical ability
2. Augmentations to enhance the cognitive ability.

For example, if one's arm is replaced by a robotic arm which gives the user a superior arm with better strength and agility, then it is seen as an augmentation which enhances the physical ability. On the other hand, if a computer chip is implemented in one's brain to increase the user's memory capacity, then it is considered as an augmentation which enhances the cognitive ability of the user.

With such a distinction in mind, let us analyse and discuss the ethical implications of cybernetic augmentation. Before we start, it is important to ask ourselves "What is meant by an ethical implication?". According to the Longman Dictionary of Contemporary English, an implication means "a possible future effect or result of an action, event, decision, etc" [1]. Therefore, an ethical implication would mean the possible future effect or result with regard to associated moral values and principles of morality. For analysis, this section is divided into two main parts:

1. Physical cybernetic augmentation
2. Cognitive cybernetic augmentation

These two parts provide an insight into the possible social, economical, and technological influence of the development and application of cybernetic augmentation technology, as well as its potential direct impact on users' physical and psychological state. Subsequently, the ethical implications of the technology are analysed and discussed by relating to the existing ethical theories and models.

A. Physical Cybernetic Augmentation

In this essay, physical cybernetic augmentation is defined as any kind of cybernetic augmentation that enhances the physical (i.e. of the body) qualities of a human being. Examples

of physical improvement include among others a reconstruction/replacement of certain body parts with enhancement of physical abilities, or modification of the body to adapt to diverse environments (e.g. giving human beings gills and webbed feet to adapt for life underwater or improving the lungs and skin to tolerate different types of atmospheres).

A..1 Benefits of Physical CA

There can be numerous potential benefits when the cybernetic augmentation is implemented to enhance the user's physical ability. For example, these are: better well-being, increased efficiency and productivity, self-defense, further development of technology. Of course, there will be many other unmentioned potential benefits (and risks), but it should be noted that our intention is to give an overview and "food for thought" that is useful and adequate to comprehend the general implications, rather than to give you an exhaustive list of every possibility in the future.

Better well-being of the user

Among the various potential benefits of the physical cybernetic augmentation, the most apparent beneficiaries would be the amputees (i.e. those who lost their limb due to accident, war, etc.) and patients with physical disability. The cybernetic augmentation can plausibly allow those people to move and look like a normal person again, and moreover, it can give them extra physical abilities beyond the normal standard level. Besides, this can affect them not only physically, but also mentally; they can gain higher self-esteem and confidence, which would give them more sense of happiness.

Moreover, just an average people can also enjoy the sense of better well-being as the cybernetic augmentation can enable them to carry out their daily actions in a more convenient way. For example, with augmented arms or legs, one may never have to struggle when lifting or carrying things. Also, the level of pain might be controlled in those augmented organs - for example, when you touch something very cold or hot beyond a certain threshold level, then it may regulate the synaptic information to your nerve system that you do not feel the pain you would have felt if you were not augmented. Such technology can give the user more control over their bodies, and thus reducing the level of inconvenience and stress.

In addition, the cybernetic augmentation can help the users maintain or improve their health by incorporating advanced medical technology. For example, the research is ongoing on the development of the nanorobots which are designed to navigate through our bodies' blood vessels, detect the cancerous cell, and kill it [2]. Through the technology of cybernetic augmentation, such nanorobots can monitor our

body more comprehensively, and perform medical tasks more quickly and efficiently at an early stage.

Such strengths gained by the cybernetic augmentation are likely to increase the chance of the user's survival in wild nature (or in the unfamiliar environment or situations) as this technology can possibly allow him/her to evolve into a stronger and more adapted species.

Increased efficiency and productivity

An enhanced physical capability of the workers by means of cybernetic augmentation is most likely to increase the efficiency and productivity of the work and industry. This would be a good news to the employers, since they can either reduce the labor cost by employing less number of people to do the same job, or increase the profits with the same number of employees because they would have enhanced efficiency and productivity, thanks to cybernetic augmentation.

Self-defense and military application

One may claim that cybernetic augmentation which enhances the physical ability would lead to more security as it can be used as means of self-defense. However, this is indeed subjected to the dispute that it can be used also as a weapon to attack others, which is analogous to the current debate regarding the gun control issue in U.S. Nevertheless, it is hard to deny that the cybernetic augmentation can be used to enhance the level of self-defense of the user, compared to the non-users of cybernetic augmentation.

Such advantage of cybernetic augmentation can be most extensively exploited in the field of military application; the soldiers with high-level cybernetic augmentation can gain enhanced physical combat ability.

Further development of technology

Once the physical cybernetic augmentation becomes an active trend of the society, there will be more initiatives for the further research, development and application of the technology in the fields of not only in cybernetic augmentation, but also in other fields of technology and industries. For instance, the design of the interfaces of many electronic gadgets or machines can change into a more efficient form (e.g. semi-automated guns that can be attached to the part of an augmented arm, or infrared monitors/screens when the visible frequency of our eyes can be controlled using an advanced electronic lens, etc)

A..2 Risks of Physical CA

This section needs further elaboration. A basic overview is given in bullet points.

- Short-term risks that the lack of knowledge and maturity of the technology may harm the bodies and decrease the convenience, as opposed to the original intentions.
- Unknown psychological side-effect
- Increased life expectancy has side effects: over population, increased social-welfare cost, youth unemployment, etc.
- Increased sense of insecurity (Analogous to gun control issue)
- Employment issue (i.e. few people replacing many people's job)
- Military application can be problematic in view of ethics. Can we justify the use of cybernetic augmentation to produce a stronger army? What is the soldiers' point of view, and what is the significance for the humanity?
- Necessity to change many regulations and laws, as well as to create ones
- Inequality issue - The rich is most likely to get an earlier (or even monopolistic) access to such technology and gain an unfair advantage of cybernetic augmentation.
- Human dignity - loss of "humanness"

B. Cognitive Cybernetic Augmentation

There are three primary types of cognitive enhancements that can be attained through cybernetics. 1. improvement of thinking capacity; 2. improvement of sensory capacities; 3. accommodation for a interfacing with the external world. Current innovations have only began to scratch the surface of devices that may lead to the second or third type of enhancements. Most of the devices being researched are not intended for enhancement rather aiding people with existing mental or physical disabilities; however, one need only apply a little imagination to see how the application of these technologies to people without illness or disabilities may lead to enhancements of their functionalities.

Available technology

Currently no form of cybernetic technology exists that can supplement the thinking capacity of the bearer. However some experiments on animals have had promising results. The Prosthetic Neuronal Memory Silicon Chips designed by Theodore Berger ^C have been demonstrated to be able to restore memories in rats and monkeys. Although he has not been able to form long term memories with his chip, he believes that his research will eventually lead to devices capable of doing so. He hopes these these devices will be able to help people with Alzheimer's disease, stroke or brain injury that suffer from memory loss.

Cochlear implants ^C are devices which directly interface with the nerves connecting the ear and the brain to give severely deaf people a sensation of sound; these devices are examples of cybernetic devices augmenting sound sensations. Devices such as the Argus II ^C and Alpha IMS ^C are implants placed directly within the retina of a person suffering from vision loss due to inability of the retinal cells to detect light. These implants are stimulated either by processing the image externally in the case of Argus II or by the directly by the light entering the eye, which are then converted to electronic impulses by the implants and sent to the brain.

Examples of existing devices for interfacing between the brain and an external object range from simple, wearable and off the shelf EEG devices such as Emotiv ^C and iFocus-Band ^C to experimental devices that physically interfaces with the brain using electrodes such as BrainGate ^C. While the former is mostly used for recreational purposes, the latter is being researched and developed to give people physically disabled some means of communicating with the world. Researchers at MIT are working on a device ^C, which is at a very early stage of development, that plans to fully bypass the eye and send impulses directly to the brain to give its user some kind of vision.

Prospective technology

With the knowledge of the current innovations that are already available and the ones expected to be available to us in the near future, one may speculate as to the kind of cognitive enhancement technology that humanity may have in the far future.

In lieu with the devices of Theodore Berger ^C one can imagine a range of devices that will aid and supplement the memory of human beings to beyond human levels. Science fiction writers and futurists have speculated on a device which they are calling an exocortex ^C; this external cortex will supplement our current consciousness by adding more memory, processing power, system software and interfacing ports.

Due to the wide range of electrical sensors that we have available, the possibilities of sensory augmentation are vast. One can augment the human vision to see a much wider range of the electromagnetic spectrum; The same can be done with hearing, tasting, smelling or even feeling. On a more imaginative and abstract note, sensory devices could be used to transpose different sensation onto different ones. If we connect our auditory devices to the visual perceptions, we may be able to see sounds, or hear the sensations of feeling and tasting.

Although any kind of cybernetic device implies some kind of interfacing between mind and machine; however here machine means an object existing outside the body.

Already the exocortex mentioned earlier hinted to some kind of interfacing, however purely interfacing cybernetic devices would also be a possibility. One may have a device that just links her/his mind to the internet, or to a network of other minds using those devices. Such a device maybe used by the wearer to communicate with other devices such as his car or his 'smart' house.

[2] Alla Katsnelson. Dna robot could kill cancer cells. <http://www.cs.york.ac.uk/hise/cadiz/home.html>, 2012.

Ethical implications

The ethical implications of such cognitive enhancements have been listed here. In the final essay few of these issues will be focused upon and elaborated upon.

1. Risk to humanbody, humanity and way of life
2. Affordability leading to human segregation and social stratification (violation of utilitarian ethics)
3. Communicatability between two types of sensory enhanced human
4. Need for rethinking of most institutions; e.g. having memory chips would nullify most academic tests we have now.
5. Manipulation of memory which maybe argued as fundamental to the fabric of human character formation (violation of virtue ethics; barrier to eudamonia)
6. Misuse of this technology; potential harm that humanity can unleash on itself with these enhancements. This may express itself as the following (violation of duty ethics):
 - Mind reading
 - Potential hacking of other human beings
 - Misuse by the government; e.g. with interrogation, monitoring of citizens thoughts, or altering their personality

III. Recommendations

These are our recommendations

IV. Conclusions

This is the conclusion

References

[1] Pearson Education. *Longman Dictionary of Contemporary English*. 2007.