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Cybernetics: How It Compares to Science-fiction and Future Possibilities

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Abstract

Cybernetics is a branch of science that studies how information is communicated in machines and electronic equipment compared to how information is communicated in the brain and nervous system. It also relates to the theory of automatic control and physiology, particularly the physiology of the nervous system. Usage of cybernetics is very popular in various science-fiction medium. This naturally leads one to be curious if its depictions might turn into reality one day. This research paper delves into the growth of cybernetics since its inception, current applications of cybernetics, and what the future might hold.

Keywords

Cybernetics, Prosthetics, Artificial Intelligence, Robotics, Automation, Science-fiction

Disciplines

Artificial Intelligence and Robotics | History of Science, Technology, and Medicine

Comments

This poster was created based on work completed for FYS 179-2: Science Fiction/Science Fact, and presented as a part of the ninth annual CAFE Symposium on February 7, 2024.

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Cybernetics: How It Compares To Science-fiction and Future Possibilities

Anindo Majumder

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Abstract

Cybernetics is a branch of science that studies how information is communicated in machines and electronic equipment compared to how information is communicated in the brain and nervous system. It also relates to the theory of automatic control and physiology, particularly the physiology of the nervous system. Usage of cybernetics is very popular in various science-fiction medium. This naturally leads one to be curious if its depictions might turn into reality one day. This research paper delves into the growth of cybernetics since its inception, current applications of cybernetics, and what the future might hold.

What is Cybernetics?

Cybernetics is defined as the science of communications and automatic control systems in both machines and living things. The term was coined by American mathematician Norbert Wiener. Some examples of applications of cybernetics are:

- Prosthetics
- Artificial Intelligence
- Robots
- Drones



Figure 1: Prosthetic Arm

How Does Cybernetics Work?

Cybernetics explores how information and feedback loops can be used to control and regulate complex systems. There are four key points to describe how cybernetics function:

- **Feedback Loops:** Transmission of information.
- **Homeostasis:** Tendency to maintain a stable equilibrium.
- **Teleology:** Study of how systems can exhibit purposeful behaviour even with the absence of conscious intention.
- **Control and Communication:** Information flow and decision-making mechanisms to achieve desired outcomes.

Significance

Cybernetics has vast applications across many fields of science and has significant importance in our daily lives.

- Improved healthcare through automation.
- Prosthesis that improve the quality of life of people with various disabilities.
- Enhancing physical capabilities through prosthesis.
- Used in robotics and automation.
- Allows automated warfare.
- Improves artificial intelligence applications

Growth of Cybernetics

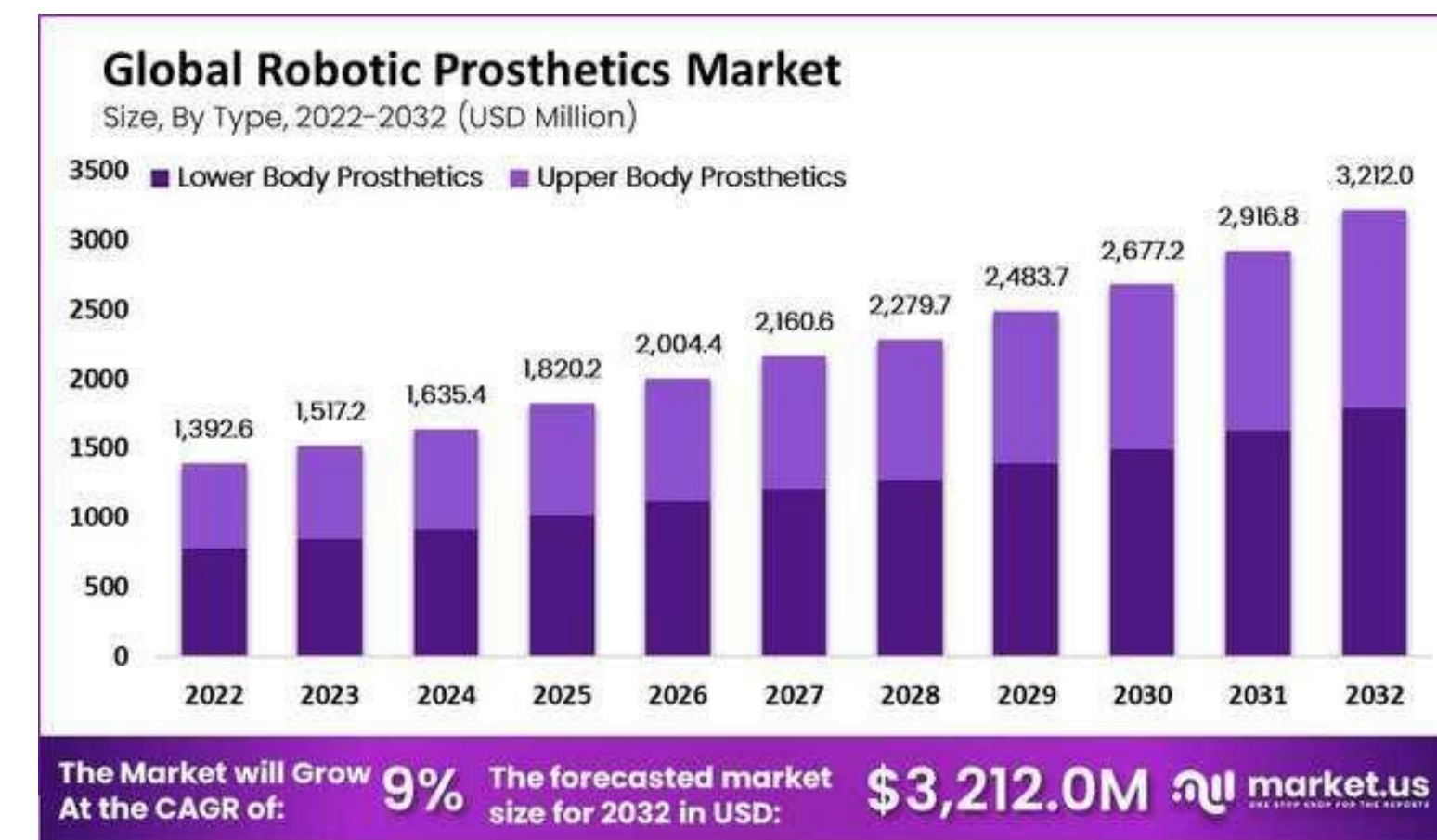


Figure 2: Projected Growth of Prosthetics Market (2022-2032)

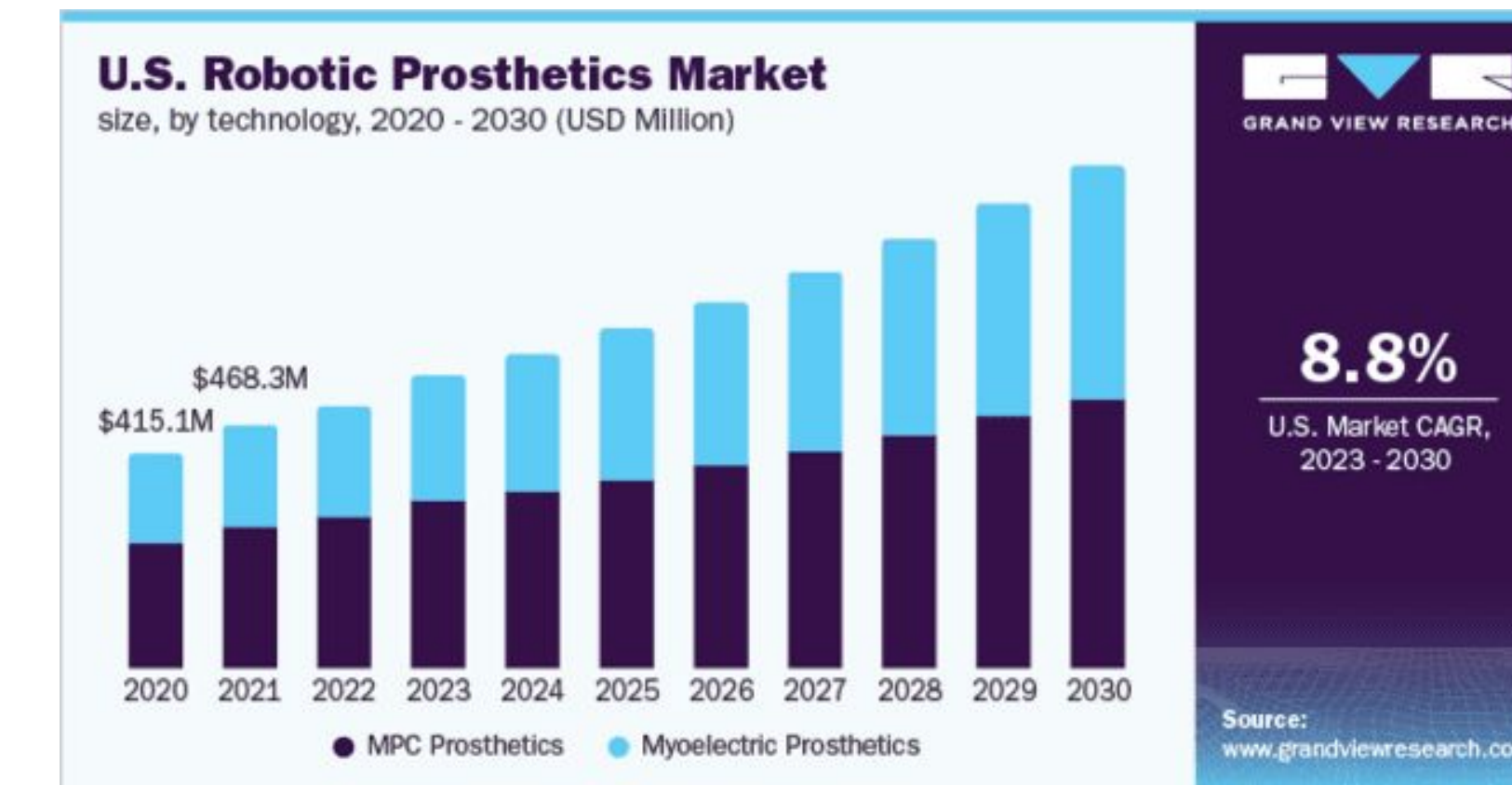




Figure 3: Projected Size of Prosthetics Market (2020 -2030)

Current Applications of Cybernetics

Prosthesis

Prosthesis is the most popular branch of Cybernetics. A prosthesis is an artificial device that replaces a missing body part or makes a part of the body work better. Prosthetics are also used as cosmetics to restore, for instance, the facial structure of a person.

Implants

Sensory implants are used to improve the quality of life of people with sensory loss/disabilities. Cochlear implants provide a sense of sound to those with severe hearing loss. Retinal implants restore partial to full vision to individuals with degenerative eye conditions.

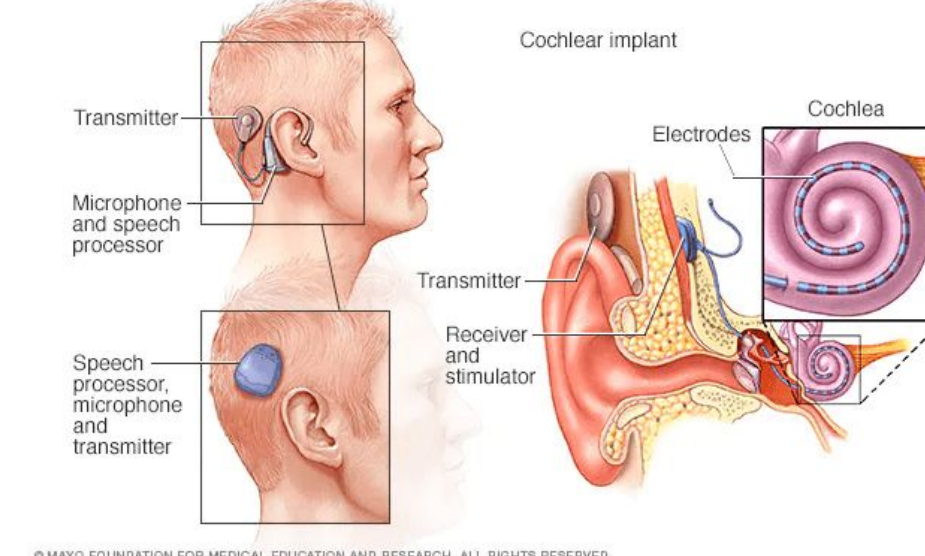
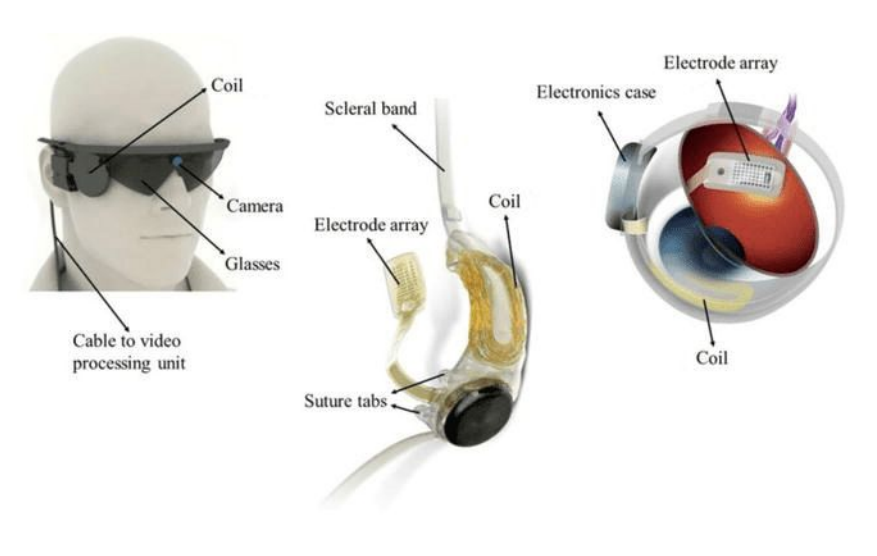



Figure 4: Prosthetic leg

Figure 5: Prosthetic Arm

Figure 6: Cochlear Implant

Figure 7: Retinal Implant



Figure 8: Ability Hand




Figure 9: Moto Knee




Figure 10: Exoskeleton



Figure 11: Sports Prosthetic

Depiction in Science-Fiction

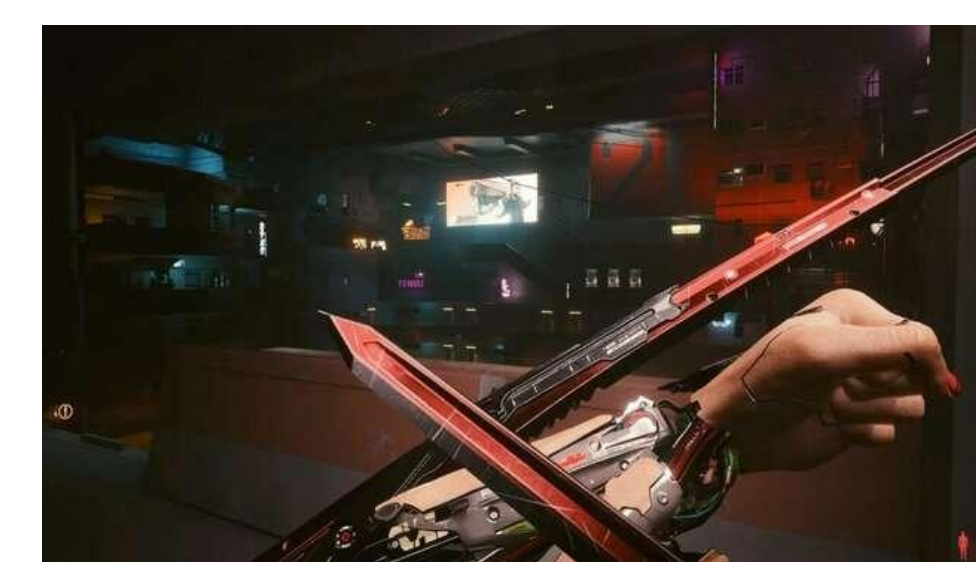


Figure 12: Mantis Blades (CP 2077)



Figure 13: Automated Police Force (CP 2077)



Figure 14: Ghost (Ghost in the Shell)



Figure 15: Iron-Man

Future Possibilities

The depiction of cybernetics in science-fiction posits the idea of much more advance applications that what is currently possible. Were these ideas to be implanted in the real-world, it would improve the quality of life for humans in many areas.

- Enhanced strength prosthesis could allow people with degenerative muscle disorders to complete daily tasks proficiently.
- Enhanced retinal implants could restore vision to those with complete vision loss.
- Brain implants could enhance the processing power of the human brain.
- Preservation of one's identity could be made possible with brain implants.
- Use of robots would lead to reduced human casualties in warfare.
- Automated mass transportation that improves the efficiency of public transportation.
- Automated drones could reduce/remove menial tasks such as delivery of food/packages.

Conclusion

In conclusion, this study explores ideas that could be feasible in the subject of cybernetics in the future by drawing inspiration from various science-fiction media. Since the field of cybernetics is constantly expanding, there's a good chance that we'll soon have access to the technology discussed in this study.

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