Machines Like Us

by Staff Writer

Robots—machines capable of carrying out a complex series of actions automatically— have gone from a science fiction concept to a part of everyday life. These machines show up everywhere from children's toys to exploration vehicles on Mars. Robots are important in many fields, including the manufacturing, automotive, and medical industries.

Most robots do not look particularly similar to humans, but they do share several qualities with people. Essential characteristics of a robot include the ability to sense its surroundings, the ability to move, and some kind of intelligence. Because these qualities are similar to human characteristics, understanding the human body helps engineers develop robots. Engineers research the human body and try to build robots that imitate the way a body functions.

In fact, robots have many aspects similar to the human body. To start, a person may sense the surrounding world using eyes, ears, nose, tongue, and skin that responds to touch. A robot may have sensors that respond to light, sounds, pressure, and chemicals in the air or on surfaces. Next, a human has a brain that responds to this sense information and controls reactions. A robot has a control system and programs designed to respond to similar information. Finally, the human brain gives commands to the muscles via the nervous system, causing movement. A robot's computer "brain" decides on appropriate reactions for the robot "body." The control system gives commands to its moving parts through a computer program, causing movement.

The principles used in robotics are also useful for understanding the human body. The human body can be viewed as a functioning, controlled system, similar to a robot. Scientists who use this concept in their work are participating in biological engineering.

Biological engineering, or bioengineering, applies scientific principles to living systems. For example, a biological engineer might design machines that produce food, build a system to improve water quality, or work on medical equipment. All of these advances can help people, but some biological engineers are working more directly to benefit the human body. The advances in medicine are especially impressive. Some surgeons are already using robots to help perform delicate surgeries. The surgeon may manipulate a

control system across the room, while the robot performs the actual surgery. The robot can have much smaller “hands” that can control miniature tools. This allows for more precise procedures that cause less damage to the body.

Biological engineering has many more benefits to medical research. For example, an artificial body part can help replace limbs, organs, or skin lost due to an accident or disease. However, making the artificial part function in a natural way is complicated. It may require integrating human and robotic senses, control systems, and moving parts. One group of researchers is developing artificial skin that can detect pressure. This skin could be used on people who have lost feeling in parts of their body. It could also allow people with artificial limbs to feel what the limb is touching by sending an electric pulse to the brain cells that recognize touch. Finally, the technology may also be used on robots to help them function better. It’s an advance that helps people and robots both by taking advantage of the similarities in each.

Biological engineering is a relatively new branch of science. It is growing and changing quickly, providing many career opportunities. The field combines elements of computer science, chemistry, biology, and other branches of engineering. This makes it ideal for young people with a strong interest in science and computers. People who choose to study bioengineering can find work in many fields, from health care to environmental protection. In many cases, biological engineers will work with robots. These robots may or may not look anything like human beings, but on some level, they will function a lot like us.

Questions

1. What is the main idea of this article?

2. The article claims that biological engineering has made impressive advances in medicine. What evidence is given to support this statement?

3. What qualities would make someone a good biological engineer?

4. What are some of the ways humans and robots are similar? Use details from the text to support your answer.

Vocabulary List

Each of the vocabulary words below are used in the reading passage. As you read the passage, pay attention to context clues that suggest the word's meaning.

1. essential
2. aspects
3. impressive
4. manipulate
5. integrating

Context Clues

Using context clues from the sentences in the passage, underline the correct meaning of the word in boldface.

1) " **Essential** characteristics of a robot include the ability to sense its surroundings"

a. common or usual b. necessary; important c. unusual; unique d. handy or useful

2) "robots have many **aspects** similar to the human body"

a. weaknesses; faults b. senses, as in hearing c. limitations d. features or characteristics

3) "The advances in medicine are especially **impressive**"

a. exciting or remarkable b. needed; desired c. depressing; sad d. frightful or scary

4) "The surgeon may **manipulate** a control system across the room"

a. operate or maneuver b. receive commands from c. train; instruct d. purchase

5) "It may require **integrating** human and robotic senses"

a. using or employing b. separating; dividing c. blending or mixing d. recognizing