Cybernetics Encyclopedia Article

Cybernetics

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Cybernetics

Cybernetics is a term that was originated by American mathematician Norbert Wiener (1894-1964) in the late 1940s. Based on common relationships between humans and machines, cybernetics is the study and analysis of control and communication systems. As Wiener explains in his 1948 book, *Cybernetics: or Control and Communication in the Animal and the Machine*, any machine that is "intelligent" must be able to modify its behavior in response to feedback from the environment.

This theory has particular relevance to the field of computer science. Within modern research, considerable attention is focused on creating computers that emulate the workings of the human mind, thus improving their performance. The goal of this research is the production of computers operating on a neural network. During the late 1990s work has progressed to the point that a neural network can be run, but, unfortunately, it is generally a computer software simulation that is run on a conventional computer. The eventual aim, and the continuing area of research in this field, is the production of a neural computer. With a neural computer, the architecture of the brain is reproduced. This system is brought about by transistors and resistors acting as neurons, axons, and dendrites. By 1998 a neural network had been produced on an integrated circuit, which contained 1024 artificial neurons. The advantage of these neural computers is that they are able to grow and adapt. They can learn from past experience and recognize patterns, allowing them to operate intuitively, at a faster rate, and in a predictive manner.

Another potential use of cybernetics is one much loved by science fiction authors, the replacement of ailing body parts with artificial structures and systems. If a structure, such as an organ, can take care of its own functioning, then it need not be plugged into the human nervous system, which is a very difficult operation. If the artificial organ can sense the environment around itself and act accordingly, it need only be attached to the appropriate part of the body for its correct functioning. An even more ambitious future for the cybernetics industry is the production of a fully autonomous life form, something akin to the robots often featured in popular science fiction offerings. Such an artificial life form with learning and deductive powers would be able to operate in areas that are inhospitable to human life. This could include long-term space travel or areas of high radioactivity.