Prosthetic Control

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- Many different methods are in use. Some prosthetics are controlled by the human body's natural movement, such as the case in leg replacement.

Electroencephalograph

- Electroencephalograph, or EEG for short, is the measurement and interpretation of brain waves. First discovered in the 1950's, research into this area of prosthetic control is limited because the patient can only *send* information, not receive anything. A patient using EEG can move cursors on a screen by merely thinking different thoughts for directions.

Videonystagmograph

- Videonystagmograph is a process that uses a persons eye movement to move cursors and other actions such as writing.

Free-Hand System

- Free-Hand system is for quadriplegics who still have their limbs. Implants similar to those used in pace-makers are inserted into the patients arms, and electronically stimulate muscles to contract and move. The muscles in the paralyzed limb are controlled by the movements of the shoulder.

NeuroProsthetics and BMI

- Perhaps the most fascinating and most terrifying development into the field of prosthetic control is the Brain-Machine Interface (BMI).
- Theory states that by inserting chips into the motor complex of the brain and interrupting the signals that generate movement, one could move a prosthetic limb with the same accuracy as perhaps the natural counterpart. For the researchers at Duke University, Theory, has become Practicality.
- In the Mid-90's Scientists at Duke implanted receptors in a rats motor cortex. In order to get a drink of water, the rat had to press a button that swung a lever that held a cup of water in it. The scientists recorded the signals the rat's brain generated when it made the movement to push the button. After the rat got used to the idea of pressing the button, the scientists disconnected the button from the water-lever. The lever was now controlled by the electronic signal that the rat's brain would produce. To the rat's surprise the lever moved before the button was pressed! Soon, all the rat had to do was *THINK* about the water lever, and it would activate.
- In 2000, more advanced chips were placed into the brains of monkeys, this time the purpose was to simulate real prosthetic limb movement. It was a success. The monkey was able to control a robot arm continuously (not discrete) in Three-Dimensional Space.
- The most important part of this research happened when the FDA approved the chip for humans who have been "locked -up" by a near-fatal stroke or accident. A 53-year old stroke victim, who has not moved for over 20 years, can now type 3 words a minute controlling a cursor with his mind. What places BMI over the other methods of control is that the patient does not have to learn to use a different part of their brain, (as with EEG) but can just mentally mimic the motions they used to make. BMI also offers the patient the ability to control ANY object outside their body. They could mentally surf the internet just as easy as they could walk or talk. The future of BMI is to someday give the patient feedback, or a sense of touch for their artificial limbs, and this goal is very close indeed.