By Matt Brady
June 2005

Enter the CyPod

If only there was time to type that novel in our heads. What if we could get it down on the fly, bypassing our arms? Need to report live without being detected? How about surreptitiously uploading your consciousness to the Net in real time; now that'd sure make for an interesting blog. With a "CyPod", you could do them both. Of course, you can't buy a "CyPod"...yet, but how close are we, and how might they work?

Cognitive engineering was born in the 1960's when neurosurgeons first discovered they could elicit sensory experiences and motor responses by electrically stimulating particular regions of the brain; now they've accomplished the reverse. Human brain activity is now translatable into direct computer control using a brain-computer interface, or BCI.

To create a BCI, a hole is drilled in the skull and a neural sensor the size of an aspirin is placed on the motor cortex, the part of the brain responsible for controlling muscular movement. Neurons grow into the sensor's thinner-than-a-human-hair electrodes so that when the neurons "fire", the electrical activity is detected by the electrodes, transmitted to a computer and then processed by the software to control the device.

The current state of the art is a system made by Cybernetics Neurotechnology Systems called BrainGate. It is the first BCI to receive FDA approval for clinical study on humans. Its first test subject has already successfully operated both a computer and a prosthetic arm using only his thoughts.

The BrainGate takes advantage of one of the most incredible features of the brain: its plasticity. Because the brain's functions are highly distributed, a patient can "will" the brain to adapt its neural signals to

synchronize with the software and control the external device, largely irrespective of the implant's location on the cortex.

Enter the CyPod

Which begs the question: just how plastic is the brain? Could we refine the software to distinguish between individual words and thoughts and record them? In other words, how long before consumers are purchasing Microsoft MindWord, or Adobe PhotoBrain?

Obviously, the technology is a long ways off in terms of a brain-computer interface that can function at a level of speed, accuracy and complexity that matches human hands, not to mention one that can detect and render words and images, or that comes in a compact package the size of a "Cypod". Nonetheless, the processing power, wireless and nanotechnologies to make it possible from a hardware point of view aren't that far down the pipeline.

Besides shrinking the BrainGate's refrigerator-sized cart of electronics and eliminating the thick fiber optic cable that attaches it to the patients head, another challenge in turning the BrainGate into a "CyPod" is how to economically and safely perform brain implant surgeries on millions of consumers. Going to Best Buy is already horrible; imagine making it through the checkout with your new "CyPod" and the having to wait in line for the next available neurosurgeon.

While electing to have another hole in your head might seem far-fetched, the explosive popularity of cosmetic surgery in the past ten years suggests it's only a matter of time before you chase your next Botox shot with a skull implant. As well, there's a great deal of research being done developing less invasive methods to listen in on the brain's neural symphonies, so surgery might not be necessary after all.

Even though the direction of control would be *from* the brain to the "CyPod" (as opposed to sending signals *to* the brain), people are generally afraid of brain implants given they conjure up images of Borg takeovers, mind control and evil nightmares about The Matrix. But once these and the other questions regarding the long-term safety of brain implants are answered, as Gerard Friehs, who performed the first human BrainGate implant put it- "everything else is just engineering."