Neurotechnology

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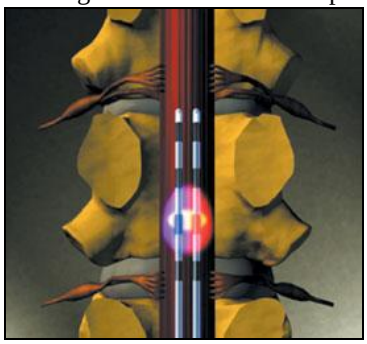
***Abstract*—In the past twenty years, the field of Neurotechnology has grown substantially. There are vast amounts of applications that can be used with Neurotechnology to scan, enhance or alter the neurological system, and the main goal now is to assist those that have been paralyzed, and can no longer function independently.**

I. Introduction

Neurotechology is a branch in biomedical engineering, where the applications of engineering are used to observe the brain and neurological system, and if needed install devices to these areas of the body to enhance or provide function to these organs. The brain and central nervous system can be observed by medical imaging. The brain, and its topography are viewed by Magnetic Resonance Imaging(MRI), Computed Topography(CT), and Positron Emission Topography(PET). The brain can be observed more closely with Electroencephalography (EEG), and Magneto encephalography (MEG). EEG picks up electric currents from the brain by the number of electrodes attached to the head and scalp, and MEG picks up the magnetic fields associated with the electric currents in the brain, and shows where certain areas of the brain react to stimulation.

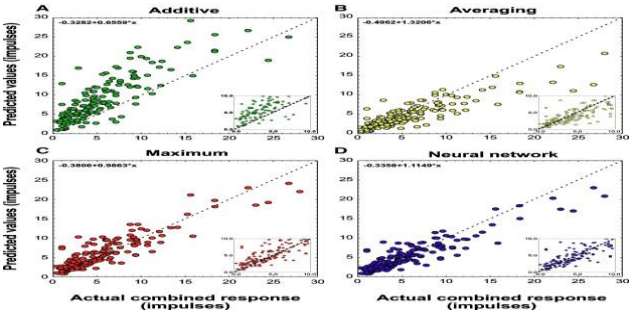
II. Methods

Along with observation, there is also the ability to alter and enhance the neurological system. Through the various types of implant technologies, one can return to normal life function. With Neuromodulation, the device is installed surgically, and sends out an electrical stimulation to control a part of that nervous system. This is particularly useful with a spinal chord injury, where the electric stimulation is used to block pain-receptors from getting to the brain. Another surgical procedure practiced is neural prosthesis which is when a device is installed in place of an impaired limb or organ. This device provides all the functions that the organ would, by reacting to nerve impulses from the brain.



III. Results

Furthermore, there was a test conducted by a collaboration of researchers from Brown University, the Department of Veteran Affairs, Massachusetts General Hospital, Harvard Medical School, and the German Aerospace Center. In this test two patients were taken that had both suffered from strokes years earlier, and are now both paralyzed. This group of researchers known as Brain Gate, first installed a device in each patients motor cortex-a part of the brain, which is the part of the brain associated with voluntary movement. This device is connected to a robotic arm that has an external computer. This computer takes the neural impulses from the device, and translates them into various commands for the robotic arm, such as grabbing things. One patient tested out two different arms, the DLR robotic arm, manufactured by DLR Institute of Robotics and Mechatronics, and the other by DEKA Research and Development Corporation. The DEKA arm and hand had a wider grasp and the patient, in forty-five trials, he was able to touch the target 95.6% of the time, and of those successful touches, he was able to grasp the target 43.6% of the time with the DLR arm, and 66.7% with the DEKA arm.



IV. Discussion

With, the advances in Neurotechnology, there has also been rising controversy. There is the ability to completely alter someone's brain, by means of surgery or medicine. People heavily oppose this because by altering a person's brain, they are ridding them of the basic personality they were born with. Concern also arises with Neural prosthesis, people feel that as the technology becomes more complex, the line must be drawn to keep and humans and machines separate.

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