Linking the Mind to Machines

Shaun Russell
ELE 282 Biomedical Engineering Seminar I
Biomedical and Computer Engineering, University of Rhode Island
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The idea of decoding the human brain has been around since the 1960's but was considered impossible until the late 1990's when after a years of breakthrough the scientific community began looking upon the brain as a complex computer created by nature.

For years researchers assumed that each thought was controlled by only a specific handful of the brain's billions of neurons hence the only way to decode the brain was to monitor each and every one.

Modern researchers have discovered that even the simplest thought creates activity in various parts of the brain contrary to the beliefs of their predecessors.

When a movement occurs "a whole orchestra of neurons scattered across the brain play in synchrony. And the neurons behave like an orchestra in another important way. Beethoven's Fifth Symphony and Gershwin's Rhapsody in Blue sound nothing alike, even if many of the same musicians are playing both pieces, on many of the same instruments, using many of the same notes. Likewise, many of the same neurons, it turned out, participated in generating many different kinds of body movement."

Therefore only a small fraction of the neurons in the brain must be listened to in order to generate enough information to recognize many different commands. "You don't need to set up a microphone next to every instrument to tell whether the orchestra is playing Beethoven's Fifth or Rhapsody in Blue. You could probably figure it out by listening to just a handful of the musicians."
Biomedical engineers Miguel Nicolelis and John Chapin are among the worlds leading researchers in this field. They recently conducted an experiment in conjunction with the staff at Duke University which involved a brain machine interface between a macaque monkey and a robotic arm. They trained the monkey to use a joystick controller to move a cursor over a dot on the computer screen. Each time the monkey did so they would reward it with a squirt of juice into the mouth. They used an array of electrodes implanted in the monkey's brain to monitor the activity in certain areas of the brain during this exercise. A computer then compared the joystick movements and the brain signals and created a correlation between the two. The computer then used the brain signals rather than the joystick to move the cursor. The monkey soon realized she did not need the joystick and simply thought the cursor across the screen. The scientist then applied the movement of the dot to a robotic arm in another room. When the monkey thought about moving the cursor the arm also moved. They monkey was then trained to grip a joystick with the cursor over the dot. The grip was represented on the screen by an expanding dot. The monkey soon learned that it could control this through thought also. The monkey could move and grip a robotic arm with its thoughts. This proved Miguel's theory about the "orchestral nature of neurons," because it showed that one array of sensors could detect multiple 'commands.'

There are limitless possibilities for the application of this technology ranging from prosthetics for the disabled to military robots and telepathic communication.

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