- Friday, November 26, 2004
  Neural Motor Prostheses: Directly Coupling Brains and Machines to Restore Lost Function

  Building a direct, artificial, connection between the brain and the world requires answers to the following questions 1. What "signals" can we measure from the brain? From what regions? With what technology? 2. How is information represented (or encoded) in the brain? 3. What algorithms can we use to infer (or decode) the internal "state" of the brain? 4. How can we build practical interfaces that exploit the available technology? This talk will summarize work at Brown on developing neural prostheses and will provide preliminary answers to the above questions with a focus on the problem of modeling and decoding motor cortical activity. Recent work has shown that linear models can be used to approximate the firing rates of a population of cells in primary motor cortex as a function of the position, velocity, and acceleration of the hand. I will describe a real-time Kalman filter for inferring (or decoding) hand motion from the firing rates of a population of cells recorded with a chronically implanted microelectrode array. I will show recent results with direct neural control of smooth 2D cursor motion and will suggest future applications for brain machine interfaces and neural robot control.

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