- Thursday, March 2, 2006
  Representation of discrete and continuous reach plans in the parietal cortex: Applications for brain-machine interfaces

  Sensorimotor transformations necessary for visually guided reaching are thought to take place in the posterior parietal cortex (PPC). PPC encodes movement plans in eye coordinates and participates in the online control of reaching. Forward models that act as neural simulators are thought to be important for continuous movement control due to large peripheral sensory delays. I will show that neurons exist in the PPC that support the existence of a forward model. These neurons are not only tuned in space, but also in time. We hypothesize that the temporal evolution of their firing rate predicts sensory feedback or encodes future motor goals. In addition, I will elaborate on the ability of PPC neurons to localize and plan reaches to targets in 3-D space. PPC neurons were found that encode the eccentricity and depth of a reach target. Cognitive variables related to the expected value of reward were also found to modulate the reach activity of PPC neurons. In the second part of the talk, I will show that these signals can be used to drive a cognitive neural prosthetic. We recorded signals related to movement planning from the parietal cortex and used these signals to place cursors on a computer screen (discrete decode) and guide cursors to targets (continuous decode). The decode was accurate and fast and only a few neurons were needed. These results indicate that continuous and discrete reach plans in PPC are a viable source of signals for the rapid control of a neural prosthetic.

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