- Tuesday, August 16, 2011
  Perception, Action and Uncertainty

  Bayesian decision theory (BDT) is a method for computing optimal decision rules. It is the mathematical framework for modeling economic decision making under risk. It is also an appropriate model for modeling how organisms compensate for their motor uncertainty in planning movement. Ill first describe recent experiments that explore how human subjects plan movements in tasks where good performance requires that the subject take into account his own temporal motor uncertainty. Subjects performance in these experiments was typically close to the performance that would maximize expected gain as predicted by BDT. This outcome is surprising since these tasks are mathematically equivalent to decision making under risk and subjects in economic decision making experiments typically fail to maximize expected gain. In particular, they show characteristic distortions of probability information, exaggerating small probabilities.

  Ill describe additional experiments that allow direct comparison of decision making under risk and planning of movement in equivalent tasks. We find that probability information is distorted in both decision making and movement planning but the patterns of distortion are very different in the two kinds of tasks. Ill discuss the implications of these differences for modeling how the nervous system compensates for uncertainty in perception, action, and cognition.

  Support: Grant EY019889 from the National Institutes of Health and the Alexander v. Humboldt Foundation.

  Larry Maloney
  New York University