Robotic Learning Of The Delayed Saccade Task Using A Neurally Inspired Adaptive Working Memory System

David Noelle
University of California, Merced

Justin Ray
University of California, Merced

Abstract: Computational models of the prefrontal cortex and its interactions with the basal ganglia have suggested that a reinforcement learning process involving dopamine drives the adaptation of frontal working memory circuits, determining when information should be actively maintained in working memory and when it should be released. The key mechanisms of these models have been translated into an open source software library called the Working Memory Toolkit (WMtk), which has been used to provide an adaptive working memory to robot control systems. We present a demonstration of the fidelity of the WMtk to its biological inspiration by using it to learn a task used to assess frontal function in humans and non-human primates: the Delayed Saccade Task. A camera on a motorized pan-tilt head learns, from simulated rewards, to remember the location of a peripheral visual target, demonstrating its knowledge by looking at that location long after the target is gone.