Bert Kappen: Integrating control, inference and learning. Is it what the brain does?

By elsc_admin
Created 11/1/2016
By elsc_admin November 1, 2016

Information, Control, and Learning: The Ingredients of Intelligent Behavior.

September 2016, Jerusalem

Abstract:

Intelligent systems, whether natural or artificial, must act in a world that is highly unpredictable. To plan actions with uncertainty is a stochastic optimal control problem. However, there are two fundamental problems: the optimal control solution is intractable to compute and intractable to represent due the non-trivial state dependence of the optimal control. This has prevented application of stochastic optimal control theory to robotics or as a model for the brain so far. The path integral control theory describes a class of control problems whose solution can be computed as an inference computation through Monte Carlo sampling. The sampling can be made more efficient by adaptive importance sampling. This defines a recursive learning problem, where a better importance sampler is learned from self-generated data. I formalize the intuitive notion that the efficiency of the importance sampling is related to the proximity of the sampling control to the optimal control. Secondly, I show how parametrized feed-back control functions can be estimated using the cross entropy method. I finally discuss how these ideas can be used as an abstract model for sensorimotor control.
It is now widely accepted that deciphering the enigma of the brain is the most challenging intellectual endeavor of the 21st century, "The Century of the Brain" - Join our quest and become a friend of ELSC.

Our Int'l Ph.D. program provides outstanding students with top-notch courses in computational neuroscience.

The Jerusalem Brain Sciences Building will provide a state-of-the-art research and teaching facility for the Edmond and Lily Safra Center for Brain Sciences.

Get into our media channel and investigate ELSC's latest videos: seminars, public lectures, courses and video articles.