Time & Location: April 5, 2010 at 3:00 PM in HEC 438
Title: A Step Toward Evolving Biped Walking Behavior Through Indirect Encoding

Teaching simulated biped robots to walk is a popular problem in machine learning. However, until this thesis, evolving a biped controller has not been attempted through an indirect encoding, i.e. a compressed representation of the solution. However, intriguingly, natural bipeds such as humans evolved through such an indirect encoding (i.e. DNA). Thus the promise for indirect encoding is to evolve gaits that rival those seen in nature. In this thesis, an indirect encoding called HyperNEAT evolves a controller for a biped robot in a computer simulation. To most effectively explore the deceptive behavior space of biped walkers, novelty search is applied as a fitness metric. The result is that although the indirect encoding can evolve a stable bipedal gait, the overall neural architecture is brittle to small mutations. This result suggests that some capabilities might be necessary to include beyond indirect encoding, such as lifetime adaptation. Thus this thesis provides fresh insight into the requisite ingredients for the eventual achievement of fluid bipedal walking through artificial evolution.

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Approved for distribution by Dr. Kenneth O. Stanley, Committee Chair, on March 19, 2010.

The public is welcome to attend.