Tabla de Contenidos

Neuroevolución

El estudio de qué neuronas parecen responsables de qué actividades cognitivas así como nuestra capacidad de simular la actividad neuronal de aprendizaje en computadores abren este área de investigación.

Francesco Ferrari

Mirror Neurons and the Evolution of Embodied Language

> Mirror neurons are a class of neurons first discovered in the monkey premotor cortex that activate both when the monkey executes an action and when it observes the same action made by another individual. These neurons enable individuals to understand actions performed by others. Two subcategories of mirror neurons in monkeys activate when they listen to action sounds and when they observe communicative gestures made by others, respectively. The properties of mirror neurons could constitute a substrate from which more sophisticated forms of communication evolved; this would make sense, given the anatomical and functional homology between part of the monkey premotor cortex and Broca's area (the “speech” area of the brain) in humans. We hypothesize that several components of human language, including some aspects of phonology and syntax, could be embedded in the organizational properties of the motor system and that a deeper knowledge of this system could shed light on how language evolved.

Gene I. Sher

Handbook of Neuroevolution Through Erlang

> Handbook of Neuroevolution Through Erlang presents both the theory behind, and the methodology of, developing a neuroevolutionary-based computational intelligence system using Erlang. With a foreword written by Joe Armstrong, this handbook offers an extensive tutorial for creating a state of the art Topology and Weight Evolving Artificial Neural Network (TWEANN) platform. In a step-by-step format, the reader is guided from a single simulated neuron to a complete system. By following these steps, the reader will be able to use novel technology to build a TWEANN system, which can be applied to Artificial Life simulation, and Forex trading. Because of Erlang’s architecture, it perfectly matches that of evolutionary and neurocomptational systems. As a programming language, it is a concurrent, message passing paradigm which allows the developers to make full use of the multi-core & multi-cpu systems. Handbook of Neuroevolution Through Erlang explains how to leverage Erlang’s features in the field of machine learning, and the system’s real world applications, ranging from algorithmic financial trading to artificial life and robotics.

Discover & eXplore Neural Network (DXNN) Platform, a Modular TWEANN

> In this paper I present a novel type of Topology and Weight Evolving Artificial Neural Network (TWEANN) system called Modular Discover & eXplore Neural Network (DXNN). Modular DXNN utilizes a hierarchical/modular topology which allows for highly scalable and dynamically granular systems to evolve. Among the novel features discussed in this paper is a simple and database

> friendly encoding for hierarchical/modular NNs, a new selection method aimed at producing highly compact and fit individuals within the population, a "Targeted Tunning" system aimed at alleviating the curse of dimensionality, and a two phase based neuroevolutionary approach which yields high population diversity and removes the need for speciation algorithms. I will discuss DXNN's mutation operators which are aimed at improving its efficiency, expandability, and capabilities through a built in feature selection method that allows for the evolved system to expand, discover, and explore new sensors and actuators. Finally I will compare DXNN platform to other state of the art TWEANNs on a control task to demonstrate its superior ability to produce highly compact solutions faster than its competitors.

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