Emulating Connectomics, animal and artificial, to develop Biological Machine Intelligence

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Abstract

Keywords:

1. Introduction

Having emulated the full connectome of the nematode Caenorhabditis Elegans (C. Elegans) [1, 2, 3] and observed the same behaviors displayed in the biological worm using the simulated connectome on simple robots, we have extended the knowledge and information about connectomes in general to create artificial connectomes or artificial nervous systems, based on animal connectomics, that can be applied to non-specific domain tasks. This is the start of Artificial General Intelligence (AGI) where artificial biological connectomes can be taught, continue to learn and execute tasks in varying environments. Applying this technology to software applications, data or robotics, will allow for adaptable systems that can overcome unforeseen obstacles. We call this connectomic adaptation into computer emulation, Connectomic AI, or Biological Machine Intelligence (BMI).
Furthermore, from our current research, we have shown that modeling animal nervous systems or creating artificial biological connectomes does not require the computing resources that other popular AI paradigms require. Being able to create intelligent systems that can be executed on ordinary computing resources gives great advantage by allowing small, self-contained intelligence systems, independent of external computing resources.
Biological Machine Intelligence differs from other AI paradigms (Deep Learning, Convolutional neural networks, et al) because BMI learns and adjusts as it develops an understanding of its environment [4]. Other AI paradigms must be trained and usually with enormous data sets (thousands of annotated items), and the output created by the input of these sets, must be classified and delineated. Likewise, Biological Machine Intelligence can be trained in the same manner as other AI paradigms but has two factors that allow it to operate unsupervised: 1) the connectomic nature has built in control features that can override and operate in unfamiliar environments, and without prior knowledge of that environment, and 2) Biological Machine Intelligence can develop new understanding through plasticity, much like animal nervous systems, where the BMI system can learn new behaviors based on new input from its environment and feedback input based on its own motor activity. Biological Machine Intelligence can create a system that is self-aware, albeit at a low level.

2. Keywords

Connectome1, Neurorobotics2, Robotics3, Neuroscience4, Artificial General Intelligence5.

3. References

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Author biography

Timothy Busbice is an author, connectomic engineer and entrepreneur that is applying biological nervous systems into complex networks through simulation and real world adaptation. Busbice has combined his expertise in neurobiology and computer science to create full sensory to motor nervous system simulations and continues to grow those results into more complex inorganic organisms. Busbice is the co-founder and CTO of PROME that is a startup organization dedicated to the creation of artificial nervous systems for the use in domain agnostic, unsupervised learning and execution.