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Research Article

Study of action selection contend Neuro robotic system mechanism with much simpler persuasions such as self-preservation or perpetuation of the population of robots

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Abstract

Neurorobotics, a combined study of neuroscience, robotics, and artificial intelligence, is the science and technology of embodied autonomous neural systems. Neural systems include brain-inspired algorithms (e.g. connectionist networks), computational models of biological neural networks (e.g. artificial spiking neural networks, large-scale simulations of neural microcircuits) and actual biological systems (e.g. in vivo and in vitro neural nets). Such neural systems can be embodied in machines with mechanic or any other forms of physical actuation. This includes robots, prosthetic or wearable systems but at also, at smaller scale, micro-machines and, at the larger scales, furniture and infrastructures. Neurorobotics is that branch of neuroscience with robotics, which deals with the study and application of science and technology of embodied autonomous neural systems like brain-inspired algorithms. At its core, neurorobotics is based on the idea that the brain is embodied and the body is embedded in the environment. Therefore, most neurorobots are required to function in the real world, as opposed to a simulated environment.

Introduction

Neuroscientists benefit from neurorobotics because it provides a blank slate to test various possible methods of brain function in a controlled and testable environment. Furthermore, while the robots are more simplified versions of the systems they emulate, they are more specific, allowing more direct testing of the issue at hand.[7] They also have the benefit of being accessible at all times, while it is much more difficult to monitor even large portions of a brain while the animal is active, let alone individual neurons.

Figure1. Diagram of neuroscience technology

With subject of neuroscience growing as it has, numerous neural treatments have emerged, from pharmaceuticals to neural rehabilitation [1].Progress is dependent on an intricate understanding of the brain and how exactly it functions. It is very difficult to study the brain, especially in humans due to the danger associated with cranial surgeries. Therefore, the use of technology to fill the void of testable subjects is vital. Neurorobots accomplish exactly this, improving the range of tests and experiments that can be performed in the study of neural processes.

Figure2. Diagram for Neuroscience interconnection with technology

Action selection studies deal with negative or positive weighting to an action and its outcome. Neurorobots can and have been used to study *simple* ethical interactions, such as the classical thought experiment where there are more people than a life raft can hold, and someone must leave the boat to save the rest. However, more neurorobots used in the study of action selection contend with much simpler persuasions such as self-preservation or perpetuation of the population of robots in the study. These neurorobots are modeled after the neuromodulation of synapses to encourage circuits with positive results. In biological systems, neurotransmitters such as dopamine or acetylcholine positively reinforce neural signals that are beneficial. One study of such interaction involved the robot Darwin VII, which used visual, auditory, and a simulated taste input to "eat" conductive metal blocks. The arbitrarily chosen good blocks had a striped pattern on them while the bad blocks had a circular shape on them [2]. The taste sense was simulated by conductivity of the blocks. The robot had positive and negative feedbacks to the taste based on its level of conductivity. The researchers observed the robot to see how it learned its action selection behaviors based on the inputs it had. Other studies have used herds of small robots which feed on batteries strewn about the room, and communicate its findings to other robots. **Neuroscience** is the scientific study of the nervous system. Traditionally, neuroscience has been seen as a branch of biology. However, it is currently an interdisciplinary science that collaborates with other fields such as chemistry, cognitive science, computer science, engineering, linguistics, mathematics, medicine (including neurology), genetics, and allied disciplines including philosophy, physics, and psychology. It also exerts influence on other fields, such as neuroeducation, neuroethics, and neurolaw [3]. The term **neurobiology** is usually used interchangeably with the term neuroscience, although the former refers specifically to the biology of the nervous system, whereas the latter refers to the entire science of the nervous System.

Figure3. Diagram for neuroscience interpretation

The scope of neuroscience has broadened to include different approaches used to study the molecular, cellular, developmental, structural, functional, evolutionary, computational, and medical aspects of the nervous system [4]. The techniques used by neuroscientists have also expanded enormously, from molecular and cellular studies of individual nerve cells to imaging of sensory and motor tasks in the brain. Recent theoretical advances in neuroscience have also been aided by the study of neural networks [5].The scientific study of the nervous system has increased significantly during the second half of the twentieth century, principally due to advances in molecular biology, electrophysiology, and computational neuroscience. This has allowed neuroscientists to study the nervous system in all its aspects: how it is structured, how it works, how it develops, how it malfunctions, and how it can be changed. For example, it has become possible to understand, in much detail, the complex processes occurring within a single neuron. Neurons are cells specialized for communication. They are able to communicate with neurons and other cell types through specialized junctions called synapses, at which electrical or electrochemical signals can be transmitted from one cell to another [5]. Many neurons extrude long thin filaments of protoplasm called axons, which may extend to distant parts of the body and are capable of rapidly carrying electrical signals, influencing the activity of other neurons, muscles, or glands at their termination points. A nervous system emerges from the assemblage of neurons that are connected to each other.In vertebrates, the nervous system can be split into two parts, the central nervous system (brain and spinal cord), and the peripheral nervous system [7]. In many species — including all vertebrates — the nervous system is the most complex organ system in the body, with most of the complexity residing in the brain. The human brain alone contains around one hundred billion neurons and one hundred trillion synapses; it consists of thousands of distinguishable substructures, connected to each other in synaptic networks whose intricacies have only begun to be unraveled. The majority of the approximately 20–25,000 genes belonging to the human genome are expressed specifically in the brain. Due to the plasticity of the human brain, the structure of its synapses and their resulting functions change throughout life.[16] Thus the challenge of making sense of all this complexity is formidable [8].

Conclusion

Neuroethology can help create advancements in technology through an advanced understanding of animal behavior. Model systems were generalized from the study of simple and related animals to humans. For example the neuronal cortical space map discovered in bats, a specialized champion of hearing and navigating, elucidated the concept of a computational space map. In addition, the discovery of the space map in the barn owl led to the first neuronal example of the Jeffress model. This understanding is translatable to understanding spatial localization in humans, a mammalian relative of the bat. Today, knowledge learned from neuroethology are being applied in new technologies.

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