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Bio-Robotic Intelligence: Bridging the Gap Between Biology and Robotics

Yun-Fuog Tu*

Department of Library and Information Science, Research and Development Center for Physical Education, Health, and Information Technology, Fu Jen Catholic University, New Taipei City, Taiwan

***Corresponding Author:** Yun-Fuog Tu, Department of Library and Information Science, Research and Development Center for Physical Education, Health, and Information Technology, Fu Jen Catholic University, New Taipei City, Taiwan; E-mail: sandy0692@gmail.com

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Description

Bio-robotic intelligence represents an innovative and interdisciplinary field that combines principles from biology and robotics to create intelligent systems. This manuscript explores the foundations, advancements, and potential applications of bio-robotic intelligence. By integrating biological knowledge with robotic technologies, researchers aim to develop highly adaptable and efficient systems capable of performing complex tasks. This manuscript highlights the potential of bio-robotic intelligence and discusses its implications in various domains, including healthcare, agriculture, and exploration.

Bio-robotic intelligence is a rapidly emerging field that merges the principles of biology and robotics to create intelligent systems capable of emulating and interacting with biological organisms. This integration leverages the knowledge of biological systems to enhance the design and functionality of robotic platforms, enabling them to adapt to changing environments and perform intricate tasks. By borrowing concepts from biology, such as sensing, locomotion, and adaptation, researchers seek to develop robots with increased versatility and efficiency. This manuscript explores the key concepts, advancements, and potential applications of bio-robotic intelligence. Bio-robotic intelligence draws inspiration from various branches of biology, such as neuroscience, biomechanics, and evolutionary biology. Neuroscience provides insights into the structure and function of the nervous system, enabling the development of artificial neural networks that mimic the information processing capabilities of the brain. Biomechanics helps in designing robotic systems that replicate the movement and dexterity of living organisms, allowing for more natural interactions with the environment. Evolutionary biology guides the creation of adaptive algorithms that optimize robot behavior based on natural selection principles. Recent advancements in bio-robotic intelligence have paved the way for groundbreaking research and development. One notable area of progress is the development of bio-inspired sensors, which mimic biological sensory systems to enhance perception in robots. These sensors enable robots to gather and process information from the environment, leading to improved situational awareness and decision-making capabilities.

Another significant advancement is the integration of soft robotics and biomimetic materials. Soft robotic systems utilize compliant and flexible materials, mirroring the natural characteristics of biological organisms. This allows for safe human-robot interactions, delicate manipulations, and better adaptability to unstructured environments. Furthermore, bio-robotic intelligence has made substantial contributions to the field of prosthetics and exoskeletons. By incorporating biological control mechanisms and feedback systems, researchers have developed prosthetic limbs and wearable robotics that restore mobility and improve the quality of life for individuals with limb loss or mobility impairments. The potential applications of bio-robotic intelligence span across various domains. In healthcare, bio-robotic systems can assist in surgeries, rehabilitation, and patient care, enhancing precision, efficiency, and patient outcomes. These systems can also be deployed in disaster response scenarios, where they can navigate complex environments and provide aid in rescue operations. In agriculture, bio-robotic intelligence can revolutionize farming practices by automating tasks such as planting, harvesting, and pest control. Autonomous robots equipped with sensors and AI algorithms can optimize crop yield, reduce resource usage, and minimize the environmental impact of agriculture. Moreover, bio-robotic intelligence holds promise in space exploration and planetary research. Robots inspired by biological locomotion mechanisms can traverse challenging terrains and explore remote locations, assisting in the collection of valuable data and samples. Bio-robotic intelligence represents a compelling field that merges the principles of biology and robotics to create intelligent and adaptable systems. By integrating biological knowledge into the design and development of robots, researchers aim to unlock new capabilities and enhance performance. The advancements in bio-robotic intelligence hold immense potential for diverse applications, from healthcare and agriculture to exploration and beyond.

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