International Conference on Intelligent Robots and Systems(IROS)

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IEEE IROS 2020 Workshop on *Animal-Robot Interaction*

Title Introduction to the Workshop on Animal–Robot Interaction

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Abstract

The Workshop on Animal-Robot Interaction is a world first, and aims at introducing a broad range of methodologies and results based on a novel, highly multidisciplinary biomimetic approach, and at providing a well substantiated vision on future strategic research lines in this field. Among the contexts of biorobotics and bionics, animal–robot interactive systems represent a fascinating and unique research field, opening up to new opportunities for multiple scientific and technological purposes, including biological structure and function investigations, as well as bioinspired algorithms and artifacts design.

In these biohybrid dynamic systems, artificial agents are no longer simple dummies, but they are accepted as natural agents (i.e. heterospecific or conspecific) by animals. Robots are able to perceive, communicate and interact/adapt with the animals, activating, in the latter, selected neuro-behavioral responses, and adjusting their behavior according with the animal's one.

Cognitive traits, including perception, learning, memory and decision making, play an important role in biological adaptations and conservation of an animal species.

Robots can represent advanced allies in studying these behavioral adaptations, since they are fully controllable, and it is possible to adjust their position in the environment, allowing a highly standardized and reproducible ethorobotic experimental interaction.

This research field represents a paradigm shifting in the study of animal behavior, with potential applications to the control of animal populations in agriculture, to the improvement of animal farming conditions, as well as in preserving wildlife.

Understanding animal intelligence through interactions with artificial agents relies on several "hot" research avenues, such as biomimetic control, soft robotics, (machine) learning of behavior, and many

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more. Animals are exceptional model organisms to use as a problem setting in which we develop new methods in the fields mentioned above. Animals can learn and remember, they exhibit inter-individual differences, they habituate to experimental setting. These abilities can be used to face fundamental robotics challenges when robots interacts with biotic and abiotic environmental factors, including interactions with humans.

One of the aims of this scientific field is to advance animal wellness and environmental sustainability by mitigating the influence of human activities on ecosystems.

In addition, these biohybrid systems can act as distributed networks of sensors and actuators in which animals and robots take the best from each other, producing advanced bio-artificial multiagent systems with new biohybrid cognitive and physical capabilities.

The aim of this workshop is to introduce and promote the field of animal-robot interaction to a wide and multidisciplinary audience, and in particular to the robotics community. It will facilitate communication and exchange of information among roboticists and biologists that want to learn innovative approaches to establish animal-robot interactions to successfully investigate and control natural-artificial systems, by exploiting the synergic contribution from multiples scientific and technological fields. Also, it is an attempt to help biologists and in particular zoologists to shift from traditional ethological methods to the highly advances approach offered by robotic systems, in order to improve reliability and reproducibility of their studies in an Open Science perspective.

Animal-robot hybrid systems will bring new capabilities to current bioinspired robotic systems.

Furthermore, animal-robot interaction, beside new knowledge, can hold to a remarkable socioeconomic impact on our daily lives, as well as on the environmental impact of humans.

The Organizers consider this active scientific and technological field as the future of robotics and bionics as it merges the best of biological and engineering worlds, and includes multiple disciplines.

Although, the scientific and technological potential that these biohybrid systems have is huge, still few pathways have been explored. Given the outstanding worldwide reputation of IROS in the field of robotics, IROS will be a key vector contributing to the spreading of this novel and promising field of Science, providing a significant added value to it.

This Workshop on Animal-Robot Interaction will represent a significant landmark to introduce the potentiality of this field to the whole robotics community, and for triggering future developments.