

# BIOINSPIRED ROBOTICS AND VISION WITH HUMANOID ROBOTS

José Santos-Victor

*Instituto Superior Técnico, Lisboa, Portugal*

**Abstract:** In this talk, I will describe recent results on exploring recent results from neurophysiology and developmental psychology for the design of humanoid robot technologies. The outcome of this research is twofold: (i) using biology as an inspiration for more flexible and sophisticated robotic technologies and (ii) contribute to the understanding of human cognition by developing biologically plausible (embodied) models and systems.

One application area is the domain of video surveillance and human activity recognition. We will see how recent findings in neurophysiology (the discovery of the mirror neurons) suggest that both action understanding and execution are performed by the same brain circuitry. This might explain how humans can so easily (apparently) understand the actions of other individuals, which constitutes the building block of non-verbal communication first and then, language acquisition and social learning.

The second aspect to be addressed is the use of development as a methodological approach for building complex humanoid robots. This line of research is inspired after the human cognitive and motor development, a pathway that allows newborns to progressively acquire new skills and develop new learning strategies. In engineering terms, this may be a way not only to structure the sensed data but also to master the complexity of the interaction with the physical world with a sophisticated body (sensing and actuation).

During the talk, I will provide examples with several humanoid platforms used for this research: Baltazar is a humanoid torso we developed to study sensorimotor coordination and cognition; the latest results are implemented in the iCub humanoid robot, for which we designed the head, face and body covers as well as the attention and affordance learning system.

## BRIEF BIOGRAPHY

José Santos-Victor received the PhD degree in Electrical and Computer Engineering in 1995 from Instituto Superior Técnico (IST - Lisbon, Portugal), in the area of Computer Vision and Robotics. He is an Associate Professor with "Aggregation" at the Department of Electrical and Computer Engineering of IST and a researcher of the Institute of Systems and Robotics (ISR) and heads the Computer and Robot Vision Lab - VisLab.

He is the scientific responsible for the participation of IST/ISR in various European and National research projects in the areas of Computer Vision and Robotics. His research interests are in the areas of Computer and Robot Vision, particularly in the relationship between visual perception and the control of action, biologically inspired vision and robotics, cognitive vision and visual controlled (land, air and underwater) mobile robots.

Prof. Santos-Victor was an Associated Editor of the IEEE Transactions on Robotics and the Journal of Robotics and Autonomous Systems.