Institutional Partners

German Aerospace Center - DLR, Germany:
Project coordinator. Responsible for integrating a variable-impedance robotic system in the project. Development of a novel EMG system for human impedance measurements. Integration of human and robotic impedance control approaches.

Technische Universiteit Delft, Netherlands:
Responsible for modelling the human neuromuscular system from muscle to joint level. Developent of time varying system identification and parameter estimation techniques to quantify the model parameters from recorded data using haptic manipulators.

Dalle Molle Institute for AI - IDSIA, Switzerland:
Responsible for learning high-level task-specific controllers based on reinforcement signals for the flexible variable-impedance robot arm developed by DLR, and for inverse reinforcement learning to extract cost functions in collaboration with UEDIN.

University of Edinburgh, United Kingdom:
Responsible for development of 'Optimal Feedback Control' based closed-loop control paradigms, specifically tailored to redundant and variable impedance actuators. Developing methods to extract cost functions and comparing control policies to evaluate improvement in performance when modulating impedance optimally.

Université Paris Descartes - CNRS, France:
Responsible for studies of impedance control in humans, using a variety of techniques including direct physiologicial measurements (EMG, H-reflex), mathematical modeling and robotic simulation. The main emphasis is 1) to suggest biologically-inspired strategies to be applied to robotics control and 2) to use analogies with robotic devices to better understand human behaviour in terms of impedance.

BIOMORPHIC VARIABLE STIFFNESS

STIFF IS A RESEARCH PROJECT ON ENHANCING BIOMORPHIC AGILITY OF ROBOT ARMS AND HANDS THROUGH VARIABLE STIFFNESS & ELASTICITY.

OUR STUDIES COMBINE BIOPHYSICAL MODELS AND MACHINE LEARNING TO OPTIMALLY CONTROL A HUMAN-LIKE ROBOTIC SYSTEM.

PUBLICATIONS

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Vijayakumar, S., Toussaint, M., Petkos, G. and Howard, M. (2009). Planning and Moving in Dynamic Environments: A statistical machine learning approach. In Sendhoff, Koerner, Sporns, Ritter, Doya (Eds.) Creating Brain-Like Intelligence Springer-Verlag: 151-191.

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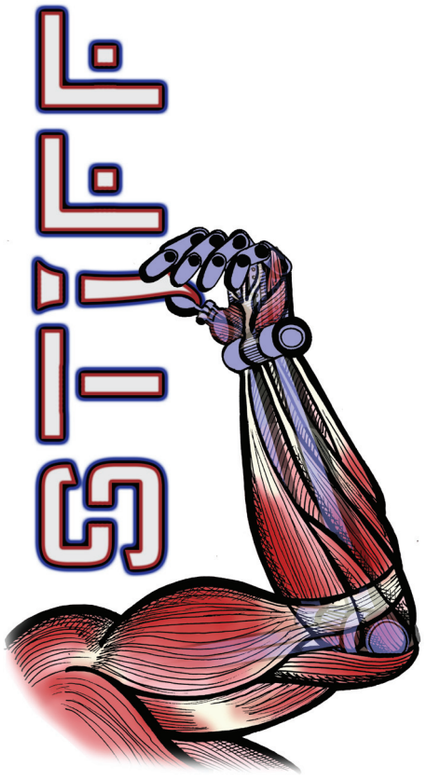

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