Prof. Dr. Gregor Schöner

Presentation Title:

Toward a neural theory of goal-directed reaching movements

Abstract:

How do we bring about goal-directed motor acts? Reaching for an object offers a very useful exemplary case around which the processes underlying human movement behavior can be studied. Reaching for an object entails processes from scene and object perception, to target selection and movement initiation, to timing, and control. These processes are typically studied in different sub-disciplines, using different methods based on different theoretical concepts. Yet they are continuously coupled online and evolve in a closed loop. Understanding how they work together thus requires an integrative theoretical framework. While abstract computational ideas are often invoked for such integration, we argue for a theoretical account that is grounded in neural principles. We review the key concepts of a neural theory of goal-directed reaching movements that draws on neural dynamic models of population activation in which recurrent connectivity provides stability.

For each component process, we discuss the key issues and empirical constraints for a neural dynamic account. Although a complete neural architecture of goal-directed movement behavior is still under development, the outline we provide makes contact with a large set of empirical findings.

Short CV:

With a background in dynamical systems, Gregor Schöner has worked in interdisciplinary settings on a spectrum of problems that range from human movement, visual psychophysics, and cognition to autonomous robotics, and computer vision. Typically working closely with experimental groups, Gregor Schöner seeks to develop a neurally grounded framework to understand how cognition emerges from its sensory-motor foundations. This effort links to his work on movement coordination, on the degree of freedom problem (through the concept of the uncontrolled manifold), on sensory-motor decision making, metric working memory, change detection, sequence generation, perceptual grounding of relational and action concepts, mental mapping, and analogical reasoning. He uses robotic demonstrations of the neural dynamic models to probe how these provide process accounts for emerging cognitive function. Gregor Schöner has directed the Institute for Neural Computation at the Ruhr-University for over 20 years, published over 270 papers and lectured broadly all over the world.