



Institutsskolloquium

Psychologisches Institut

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**„Neuro-dynamic theory for the visual
recognition of goal-directed actions
and the perception of causality“**

Mittwoch, 12.11.2014, 16.15 – 17.45 Uhr,
Raum 01-231 (Binger Str. 14-16)



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Abstract:

“Neuro-dynamic theory for the visual recognition of goal-directed actions and the perception of causality”

The visual recognition of biological movements and actions is a centrally important visual function, involving complex computational processes that link neural representations for action perception and execution. This fact has made this topic highly attractive for researchers in cognitive neuroscience, and a broad spectrum of partially highly speculative theories have been proposed about the computational processes that might underlie action vision in primate cortex. Additional work has associated underlying principles with a wide range of other brain functions, such as social cognition, emotions, or the interpretation of causal events. In spite of this very active discussion about hypothetical computational and conceptual theories, our detailed knowledge about the underlying neural processes is quite limited, and a broad spectrum of critical experiments that narrow down the relevant computational key steps remain yet to be done.

I will present a physiologically-inspired neural theory for the processing of goal-directed actions, which provides a unifying account for existing neurophysiological results on the visual recognition of hand actions in monkey cortex. At the same time, the model accounts for several new experimental results, where a part of these experiments were motivated by testing aspects of the proposed neural theory. Importantly, the present model accounts for many basic properties of cortical action-selective neurons by simple physiologically plausible mechanisms that are known from visual shape and motion processing, without necessitating a central computational role of motor representations. We demonstrate that the same model also provides an account for experiments on the visual perception of causality, suggesting that simple forms of causality perception might be a side effect of computational processes that mainly subserve the recognition of goal-directed actions. It will be shown how the theory can be extended to account for neuro-dynamic phenomena, such as multi-stable action perception and the influence of repetition suppression.

The talk will be concluded by a short overview of experimental work of our lab that exploits advanced computational methods from machine learning and computer animation for the study of interactive emotional body movements in terms of interactions with a virtual human agent.