## Sensory Saltation on the Abdomen

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Research is presented on the psychophysics of sensory saltation, one of several spatiotemporal illusions [1]. In saltation subjective localization of a cutaneous stimulus is altered by a second stimulus at a different place following the first one closely in time. The amount of mislocalization decreases linearly with the stimulus onset asynchrony (SOA). According to neurophysiological evidence, saltation can be explained by quantitative dynamic behavior of the neural network in the primary somatosensory cortex [2]. The psychophysical characteristics of saltation may be used to quantify the dynamic behavior of this network noninvasively. Assuming that neural behavior of the network leads to spatial anisotropy due to temporally associated stimulation, we expected that in saltation the amount of mislocalization not only depends on the SOA, but on the orientation of the stimulus pattern in relation to the body axes. The abdomen was chosen as stimulus area because previous studies focused on extremities show that subjective localization is affected by the position of the limb in relation to the trunk [3]. Studies using truncal stimuli, however, are rare [4]. We applied a stimulus sequence, consisting of a warning stimulus (S0) and two short stimuli 7cm apart (S1, S2) in a repeated measurement design (29 healthy subjects), varying time delays between S1 and S2 (SOA: 57–500ms) and sequence of the stimuli in relation to the longitudinal body axis (direction "upwards": S1 near the spina iliaca anterior superior, S2 near the costal arch; direction "downwards": S1 near the costal arch, S2 near the spina iliaca anterior superior). In all subjects an effect of SOA—saltation effect—could be elicited. The amount of mislocalization of S1 towards S2 increased linearly with a decreasing SOA. Furthermore direction had an effect on the amount of mislocalization, showing a greater amount of mislocalization of S1 towards S2 in direction "downwards". We hypothesize that this effect reflects anisotropic distribution of the spatiotemporal tactile map of the abdomen.

[1] Geldard, F.A. and Sherrick, C.E. (1972): Science. 178, 178–179
[2] Wiemer, J.C. et al. (2000): Biological Cybernetics. 82, 173–187
[3] Stolle, A.M. (2003): PhD Thesis, Faculty of social science, University of Mannheim
[4] Tan, H.Z., Lim, A. and Traylor, R. (2000): Proceedings of the ASME Dynamic Systems and Control Division. 69(2), 1109–1115

DFG Ho 904/10–1 & 10–3