

36th European Conference on Visual Perception

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effect called ‘perceptual memory’ (PM), which increases the likelihood to perceive the same again, and a repulsive effect called ‘perceptual adaptation’ (PA), which increases the likelihood to perceive something else. We combined functional magnetic resonance imaging and psychophysics in humans to test how the brain entertains these two processes without mutual interference. We found that although affecting our perception concurrently, PM and PA map into distinct cortical networks: a widespread network of higher-order visual and fronto-parietal areas was involved in PM, while PA was confined to early visual areas. Our data refute theoretical models that either explain PM and PA with a single mechanism or with two separate mechanisms that, however, co-localize to the same early sensory area. In turn we propose that the areal and hierarchical segregation may enable the brain to maintain the balance between stabilization and exploring new information. A Bayesian model which implements perceptual memory as changes in the prior and adaptation as changes in the sensory evidence reproduces the behavioral data.

SYMPOSIUM : SYNERGISTIC HUMAN COMPUTER INTERACTION (HCI)

◆ Attentive Computing – Using Eye Gaze for Unintrusive Services

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In the recent years, eyetracking devices have made tremendous improvements wrt. their accuracy, the comfort of use and also the costs. These trends open up new possibilities apart from their classical application domains in e.g. customer analysis where only little number of devices are used for one-time experiments. The DFKI has investigated to what degree eye trackers can improve our daily lives, assuming that with raising sales figures these devices might soon become affordable to everyone. Under the label “Text 2.0” we developed a framework that observes the user when reading text on a computer screen using a desktop eye tracker. It not only recognizes which textline or word a user currently looks at, but also if he is skimming over a text, or getting stuck at some word. These mechanisms have led to a series of applications and proactive services ranging from entertainment to education. In parallel, we worked with mobile eye trackers which permit services apart from monitor screens. By analyzing the provided scene image together with eye fixations and optional movement sensors we built several prototypes that anticipate when the user shows interest to some object. Sample applications are the “MuseumGuide2.0” or an automatic “Visual Diary”.

◆ Perceptual and Adaptive Learning Technologies in Education and Training

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Recent in perceptual learning offers remarkable potential to improve almost any kind of education or training. I will discuss recent innovations in perceptual learning and adaptive learning technologies. Whereas learning in educational settings most often emphasizes declarative and procedural knowledge, studies of expertise point to crucial components of learning that involve improvements in the extraction of information. I will describe research that uses perceptual learning modules (PLMs) in computer-based learning technology to address challenges in learning in mathematics, science, medicine, and aviation. In the second part of the talk, I discuss the novel ARTS (adaptive response-time based sequencing) system, an adaptive learning system that markedly improves interactive learning by using both accuracy and speed data, and concurrently implementing a number of laws of learning and mastery. PLMs and the ARTS system, separately and in combination, have remarkable potential to enhance efficiency, durability, mastery, and objective assessment of learning in a wide range of educational and training domains.

◆ Perception, Image Processing and Fingerprint-Matching Expertise

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Fingerprint evidence plays an important role in forensic science. Little is known about the perceptual aspects of expert fingerprint analysis, or the differences between performances of fingerprint experts