

# Conference 6806: Human Vision and Electronic Imaging XIII

describe a study of the dimensionality of visual complexity in computer graphics scenes. We present an experiment where subjects judged the relative complexity of 21 high-resolution building, room, and tabletop scenes, rendered with photorealistic methods. Scenes were gathered from web archives and varied in theme, number and layout of objects, material properties, and lighting. Multidimensional scaling of pooled subject responses embeds the stimulus images in a two-dimensional space, with axes of "numerosity" and "material / lighting complexity". In a follow-up analysis, we derive a one-dimensional complexity ordering of the stimulus images and show discrepancies between this ordering and several computable complexity metrics, such as scene polygon count and JPEG compression size.

## 6806-14, Session 6

### Beyond image quality: designing engaging interactions with digital products

H. de Ridder, Delft Univ. of Technology (Netherlands); M. C. Rozendaal, Eindhoven Univ. of Technology (Netherlands)

Ubiquitous computing (or Ambient Intelligence) promises a world in which information is available anytime anywhere and with which humans can interact in a natural, multimodal way. In such world, perceptual image quality remains an important criterion since most information will be displayed visually, but other criteria such as enjoyment, fun, engagement and hedonic quality are emerging. This paper deals with engagement, the intrinsically enjoyable readiness to put more effort into exploring and/or using a product than strictly required, thus attracting and keeping user's attention for a longer period of time. The impact of the experienced richness of an interface, both visually and degree of possible manipulations, was investigated in a series of experiments employing game-like user interfaces. This resulted in a conceptual framework relating engagement to richness by means of two intermediating variables, namely experienced challenge and sense of control. Predictions from this framework are evaluated against results of an earlier experiment assessing the ergonomic and hedonic qualities of interactive media. Test material consisted of interactive CD-ROM's containing presentations of three companies for future consumers.

## 6806-15, Session 6

### Impact of sound on image-evoked emotions

R. van Egmond, Delft Univ. of Technology (Germany)

The effect of (abstract) sound on the emotional experience images was investigated. The images were selected from the validated International Affective Picture System. The selection criterion was that the pictures would evoke high and low levels of pleasantness and arousal. The sounds were frequency-modulated sounds that varied in their level of roughness. Roughness affects the sensory pleasantness of a sound (high roughness values evoke a sense of unpleasantness). Systematic combinations of sounds and pictures were presented to participants. Main and interaction effects were found for sound and pictures on the dimension of pleasantness. However, arousal was only affected by pictures and not by sound.

## 6806-16, Session 6

### The impact of interactive manipulation on the recognition of objects

F. Meijer, E. van den Broek, Univ. Twente (Netherlands)

A new application for VR has emerged: product development, in which several stakeholders (from engineers to end users) use the same VR for development and communicate purposes. Various characteristics among these stakeholders vary considerably, which imposes potential constraints to the VR. The current paper discusses the influence of three types of exploration of objects (i.e., none, passive, active) on one of these characteristics: the ability to form mental representations or visuo-spatial ability (VSA). Through an experiment we found that all users benefit from exploring objects. Moreover, people with low VSA (e.g., end users)

benefit from an interactive exploration of objects opposed to people with a medium or high VSA (e.g. engineers), who are not sensitive for the type of exploration. Hence, for VR environments in which multiple stakeholders participate (e.g. for product development), differences among their cognitive abilities (e.g., VSA) have to be taken into account to enable an efficient usage of VR.

## 6806-17, Session 6

### Virtual hand: a novel 3D tactile interface to virtual environments

B. E. Rogowitz, P. Borrel, IBM Thomas J. Watson Research Ctr.

No abstract available

## 6806-18, Session 6

### Augmented reality in physical procedures

E. Samset, Univ. of Oslo (Norway)

Minimally invasive therapy (MIT) is one of the most important trends in modern medicine. It covers the wide range of therapies in videoscopic surgery and intervention radiology and is performed through small incisions. It reduces hospital stay-time by allowing faster recovery and offers substantially improved cost-effectiveness for the hospital and the society.

However, the introduction of MIT has also led to new problems. The manipulation of structures within the body through small incisions reduces dexterity and tactile feedback. It requires a different approach than conventional surgical procedures, since eye-hand co-ordination is not based on direct vision, but more predominantly on image guidance via endoscopes or radiological imaging modalities.

ARIS\*ER is a multidisciplinary consortium developing a new generation of decision support tools for MIT by augmenting visual and sensorial feedback. The consortium is also focused on training and networking for young researchers.

We will present tools based on novel concepts in visualization, robotics and haptics providing tailored solutions for a range of clinical applications. Examples from radio-frequency ablation of liver-tumors, laparoscopic liver surgery and minimally invasive cardiac surgery will be presented. The demonstrators were developed with the aim to provide a seamless workflow for the clinical user conducting image-guided therapy.

## 6806-19, Session 6

### Context-based pixelization model for artificial retina using saliency map and skin color detection algorithm

S. Jin, Seoul National Univ. (South Korea); I. Lee, Electronics and Telecommunications Research Institute (South Korea); J. Han, K. Park, Seoul National Univ. (South Korea)

A key problem of artificial visual prosthesis is the low resolution due to the limited number of electrodes. Various methods such as edge detection, contrast enhancement have been studied as the solutions of the low resolution problem and these methods have been performed to face or object recognition in the close-up image. In this paper, we proposed the region-of-interest detection method using a context based model, which is appropriate for real situations. The visually-salient region was detected by combining the saliency map with the region of the skin. In experiment, to evaluate proposed model, gaze was estimated using an eye tracker when subjects watch the original image and two types of 16 x 16 pixelized images produced by conventional and saliency based method, respectively. Each estimated gaze of pixelized images was compared with the gaze of the original image. The experiment showed that the estimated gaze using the proposed context based model much more correlates with the gaze of the original image than conventional model.