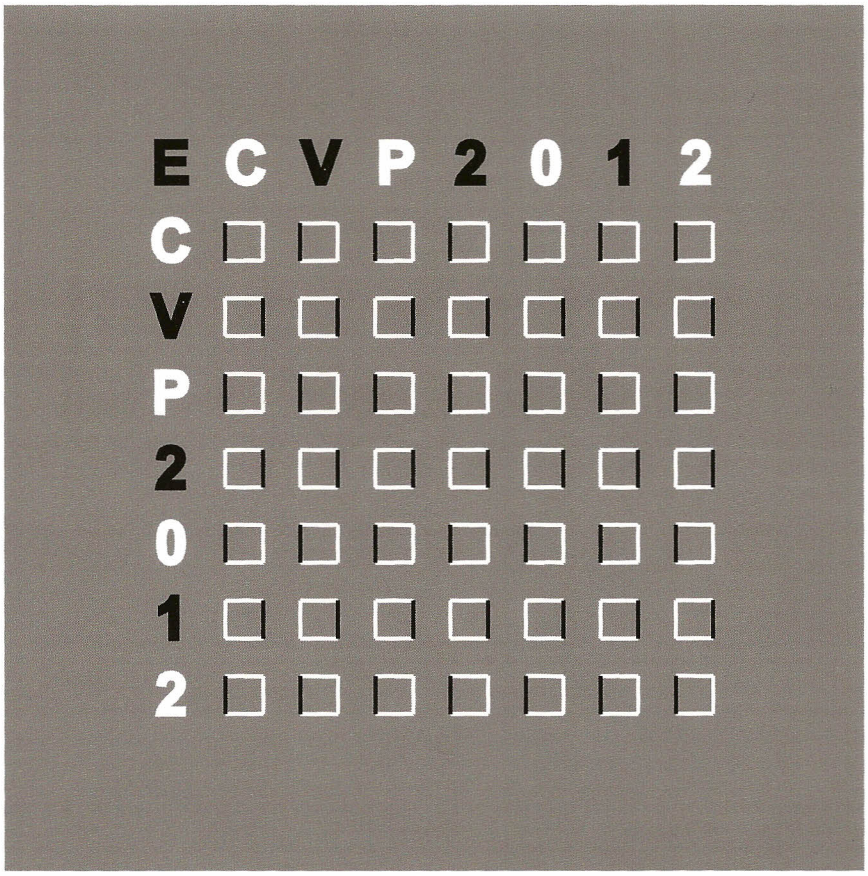
PERCEPTION

VOLUME 41 SUPPLEMENT



ECVP 2012

35th European Conference on Visual Perception

2–6 September 2012, Alghero – Italy

Abstracts

◆ **A computational model for saliency detection based on probability distributions**

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The detection of salient items is a key property in human perception which is also of significant interest in technical fields such as computer vision. For example, the detection of salient items in web images facilitates tasks such as object segmentation and recognition (Liu et al, 2009 *Transactions on Pattern Analysis and Machine Intelligence* **33**(2), 353–367). Here, we present a new way to compute saliency efficiently by using new methods for the representation of features and the computation of center-surround differences. Image regions are represented by multivariate normal distributions and compared with the Wasserstein metric. This is a well-known method to compare probability distributions and is especially suited to compute saliency since it considers also the similarity of feature values. We evaluated the method on psychophysical patterns as well as on a benchmark of natural images containing salient objects (Achanta et al, 2009 *Proceedings of Computer Vision and Pattern Recognition* 1597–1604) and show that the new approach outperforms nine state-of-the-art saliency detectors in terms of precision and recall.

◆ **Fast and accurate multi-scale keypoints based on end-stopped cells**

90 K Terzic, J Rodrigues, J Du Buf (Vision Laboratory, LARSys, University of Algarve, Portugal; e-mail: dubuf@ualg.pt)

Increasingly more applications in computer vision employ interest points. Algorithms like SIFT and SURF are all based on partial derivatives of images smoothed with Gaussian filter kernels. These algorithms are fast and therefore very popular. Our own multi-scale keypoint algorithm (Rodrigues and du Buf, 2006 *BioSystems* **86** 75–90) is based on V1 end-stopped cells on top of complex cells with inhibition schemes to suppress responses along edges etc. Although producing good results, it is slow because of many filter orientations and scales. We therefore developed an improved algorithm which is much faster, because instead of using big filter kernels (Gabor filters as simple cells) at coarse scales, we apply a Gaussian pyramid and do all filtering in the frequency domain. Stability and localisation are improved by automatic scale selection and by smoothing response maps prior to detecting local maxima. Extensive benchmarking concerning repeatability, precision and computing speed showed that the improved algorithm compares to or even outperforms most algorithms from computer vision. Since the code will be made publicly available, our new keypoint algorithm can be applied in advanced biological vision models and in computer vision applications. [Projects: PEst-OE/EEI/LA0009/2011, NeFP7-ICT-2009–6 PN: 270247.]

◆ **Relationship between imitating an expert's motion and improved motor skills**

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Imitation is an important function in human development, and imitating an expert's motion is considered an efficient way for beginners to improve their motor skills. In this study, we investigated the relationship between an improvement in beginners' skill of throwing darts and how closely they imitated the expert's motion they observed. Fourteen male participants, all right-handed, participated in the experiment, and all were considered as beginners since they had little experience with darts. The experiment was conducted over two days. On the first day, all participants threw darts in their own way. On the second day, 7 of them were instructed to imitate an expert's motion by watching a video, and threw darts. The other 7 participants threw darts without observing the expert's motion. The motion similarity of the expert and both beginner groups was analyzed using an Angular Metrics for Shape Similarity (AMSS). The result showed that the score of the observing group was higher than that of the other group. In addition, the closer the beginner came to imitating the expert's motion, the more skilled the beginner became at throwing darts. We suggest that the degree of motion similarity has a bearing on the improvement of motor skills.

◆ **Glare and neural contrast: scene content controls the neural contrast response**

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We collected magnitude estimates of scene lightness in white, black and average (half-white/half-black) surrounds (Rizzi et al, 2007 *JSID*) and then calculated their retinal luminance using Vos and van den Berg's glare spread function (1999 *CIE*). Each of the three sets of lightness magnitude estimates fit