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Viewpoint Invariant Object Features Attract Overt Visual Attention

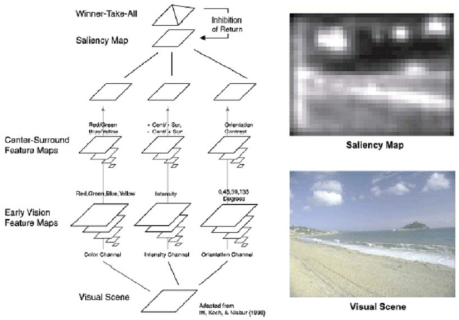
Overview

Currently visual saliency provides the leading description of stimulus driven overt visual attention. However, given that object recognition is necessary for most natural visual tasks, a plausible alternative default strategy is to attend to information likely to be important for object recognition.

A Saliency Model

Parkhurst, Law, & Niebur (2002) showed that people fixate on salient (or unique) image regions when participants freely view complex artificial and natural scenes.

Figure 1: ***A Saliency Model***



Scale Invariant Feature Transform (SIFT)

Object recognition depends in part on the presence of visual features that remain invariant across viewpoints (Biederman, 1987). Lowe (1999) developed the SIFT algorithm to identify such invariant features for use in computer object recognition.

Figure 2: ***Schematic Presenting our Adoption of the SIFT Algorithm***

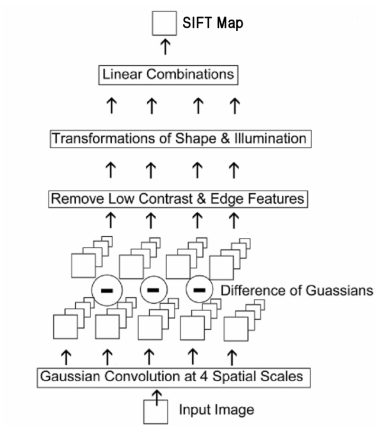
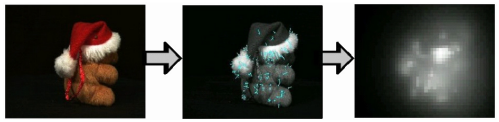


Figure 3: ***Transforming the SIFT's Keypoints into a Pre-attentional Map***



Method

The fixations made by 12 participants freely viewing images of objects were recorded. Images were color photographs from the Amsterdam Library of Object Images (Geusebroek, Burghouts & Smeulders, 2005).

Figure 4: ***Example of Stimulus with Fixations Overlaid***

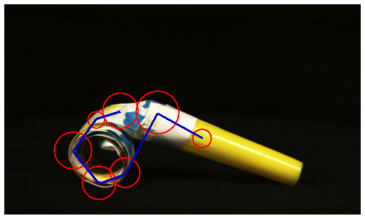
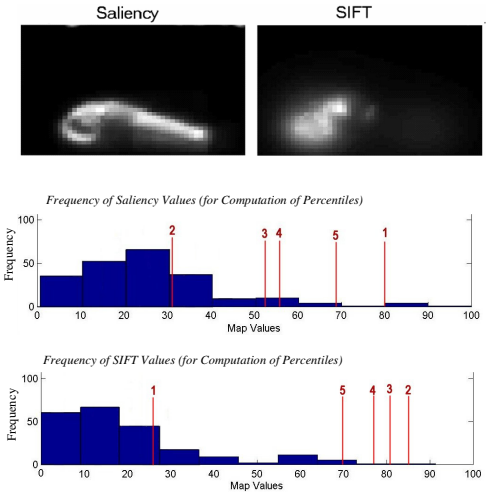
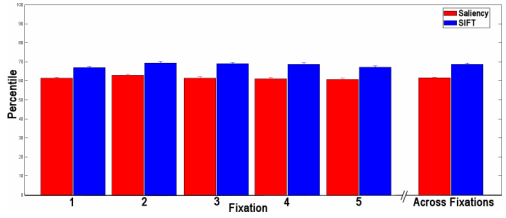


Figure 5: ***Comparing the Pre-attentional Maps***



Results

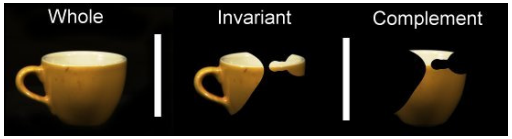
Figure 6: ***Comparison of the Saliency & SIFT Performance***



Discussion

These results suggest viewpoint invariant features of objects attract attention as reflected in eye movements. In a recent experiment we further explored whether these invariant features contribute to object recognition. We found that objects were more easily identified when the fragments contained more invariant features (Wolff, Still, Parkhurst & Dark, 2007).

Figure 7: ***Example Stimuli***



Our research supports the hypothesis that the default attentional selection strategy is biased to select visual features likely to be important for object recognition.

References

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