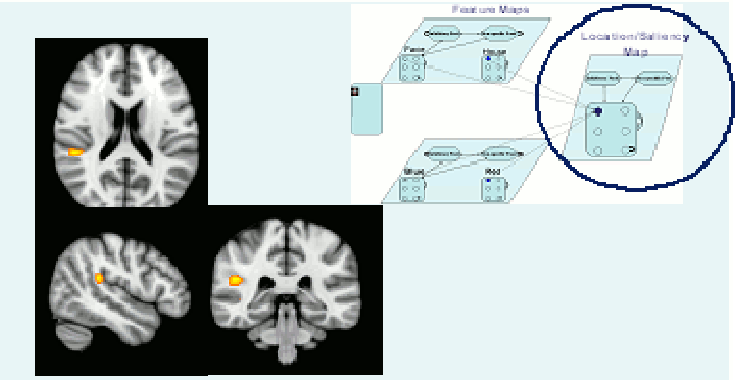
IT Services

Case Study

BlueBEAR provides a substantial computing resource that properly supports the research work of research staff and students at Birmingham. It provides a cost effective facility that optimises the effectiveness of research and ensures the University continues to be a world-class academic learning and research environment.

Model-based-analysis of Preview Search



Areas where activity pooled across the search conditions correlated with activity in the Location/Saliency Map in sSoTS. The area shown is the right TPJ (Z=3.46, p<0.005, 717 voxels, co-ordinates of centroid: 49, -36, 20).

Challenges

To compare efficiently fMRI with computational data in order to understand the underlying processes of visual search.

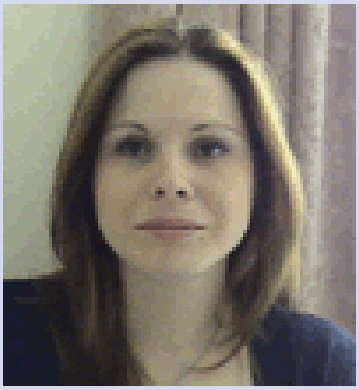
Background and Results

The neural circuits involved in human attention are very complex and very difficult to be decomposed. To solve this problem we used the visual search over time and space model (sSoTS) that incorporates different synaptic components (NMDA, AMPA and GABA) and the IAHP current. In previous work we have shown [1,2] that, when coupled with a process of active inhibition, new items can be successfully prioritised over time periods matching those found in psychological studies. The activity related to excitatory guidance and inhibitory suppression was extracted from the model and related to different brain regions. The results show that sSoTS pulls-apart discrete brain areas involved in excitatory attentional guidance and active distractor inhibition.

Furthermore, our results suggest [3] that the right TPJ responds to stimulus saliency, playing a key role in guiding subsequent actions to that location. In addition, separate networks of areas in parietal and occipital cortex were linked to the top-down prioritisation of target features and the active suppression of distractors. These networks, in acting together, facilitate visual search particularly under preview conditions where biases towards targets and away from distractors can be established prior to search taking place.

References

1. *Mavritsaki E., Heinke D., Deco G. and Humphreys G.W. (2006) "A computational model of visual marking using an interconnected network of spiking neurons: The spiking search over time & space model (sSoTS)." Journal of Physiology Paris, 100, 110-124.*
2. *Mavritsaki E., Heinke D., Deco G. and Humphreys G.W. (2007) "Suppressive effects in visual search: A neuron-computational analysis of preview search" Neurocomputing, 70, 1925 -1931.*
3. *Mavritsaki E., Allen H. A. And Humphreys G.W. (in press) Decomposing the neural mechanisms of visual search through model-based analysis of fMRI: Top-down excitation, active ignoring and the use of saliency by the right TPJ.*



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