Model-based-analysis of Preview Search

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