Abstract

We explore the visual world through saccadic eye movements, but saccades also present a challenge to visual processing, by shifting externally-stable objects from one retinal location to another. The brain could solve this problem in two ways: by overwriting preceding input and starting afresh with each new fixation, or by storing a representation of pre-saccadic visual features in memory and updating it with new information from the spatiotopically-matched location. When multiple objects are present in a scene, the planning of eye movements profoundly alters the precision of their working memory representations, transferring memory resources from fixation toward the saccadic target. Here we show that enacting a saccade updates not only the precision of representations but also their contents. When multiple item colours are shifted imperceptibly during a saccade, the perceived colours are found to fall between pre- and post-saccadic values, with the weight given to each input varying continuously with item location, and fixed relative to saccade parameters. Increasing sensory uncertainty, by adding colour noise, biases updating towards the more reliable input, consistent with an optimal integration of pre-saccadic working memory with a post-saccadic update signal. We recover this update signal and show it to be tightly-focused on the vicinity of the saccade target. These results reveal how the nervous system accumulates detailed visual information from multiple views of the same object or scene.
Meeting abstract presented at VSS 2015