A neural oscillator model of binaural auditory selective attention

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It has been proposed that listeners separate an acoustic mixture by auditory scene analysis (ASA) in which a perceptual description of each sound source is formed – a stream (Bregman, 1990). Typically, ASA is seen as a precursor to attentional mechanisms which simply select one stream as the attentional focus. However, recent work by Carlyon et al. (2001) has suggested that attention plays a key role in the formation of streams.

A model of auditory grouping is described in which auditory attention plays a key role. The model is based upon an oscillatory correlation framework (Wang, 1996), in which neural oscillators representing a single perceptual stream are synchronised, and are desynchronised from oscillators representing other streams. The model suggests a mechanism by which attention can be directed to the high or low tones in a repeating sequence of tones with alternating frequencies.

The model accounts for a number of interesting phenomena including the subconscious re-direction of attention by the onset of a new, loud stimulus; the streaming effect of alternating tone sequences (van Noorden, 1975) and associated build-up effect (Anstis and Saida, 1985); the failure of streaming to occur when attending to a distractor task (Carlyon et al., 2001); the grouping of a mistuned harmonic and complex (e.g. Darwin et al., 1995); and the capture of tones from a complex which demonstrates the old-plus-new heuristic (Bregman, 1990).

References