

A neural oscillator model of binaural auditory selective attention

S.N.Wrigley and G.J.Brown, Department of Computer Science, University of Sheffield, 211 Portobello Street, Sheffield, S1 4DP

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

- Anstis, S and Saida, S (1985). *J Exp Psychol Human* 11:257-271.
Bregman, AS (1990). *Auditory Scene Analysis*. MIT Press.
Carlyon RP, Cusack R, Foxton JM, Robertson IH (2001). *J Exp Psychol Human* 27(1):115-127.
Darwin CJ, Hukin RW, Al-Khatib BY (1995). *J Acoust Soc Am* 98(2)Pt1:880-885.
van Noorden LPAS (1975). *Temporal coherence in the perception of tone sequences*. Doctoral thesis, Institute for Perceptual Research, Eindhoven, NL.
Wang, DL (1996). *Cognitive Sci* 20:409-456.