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Audiovisual synchrony: tempo and cross-modal transients

Andrew Rogers

Dr. Ian Gibson

*Department of Computing and Engineering, University of Huddersfield,
United Kingdom*

Background

What are the considerations of the composer when designing music to accompany a visual? Music is purposefully included within audiovisual products with considered reason; motivic, thematic, emotive, semantic or otherwise. Ultimately, music is employed to affect an audioviewer¹, yet the consequences of this multi-modal interaction lacks clarity. Investigating cross-modal interaction at the level of basic exposure to audiovisual works provides a foundation in understanding the audioviewer's percept.

The moving image and music are intrinsically temporal and consequently carry rhythmic potential. In the context of concurrent non-literal music (often referred to as 'background' or 'non-digetic' music) and moving images, our unified perception of the presentation is structured upon the interpretation of intrinsic audiovisual rhythms. Such rhythms are constructed via the periodic structure of transients within their individual modalities, and crucially cross-modally as auditory and visual transient patterns interact.

Multimodal integration studies have shown that synchronous audiovisual stimuli will bind, creating a unified percept functioning to increase the 'transientness' of such events. Dynamic attending theory understands that attention is subject to internalised oscillations, following peaks and troughs to create an oscillation of attentional magnitude cycles. The potential for auditory rhythmic manipulation to influence the unified audiovisual percept is engaging.

Aims

This investigation investigates the facilitation or inhibition of synchronous and asynchronous audiovisual processing using a modification of the reaction time (RT) paradigm utilised by Escoffier et al. to include evaluation of effect at varying tempi. It was hypothesised that RT would

reduce at tempi common to popular music and in synchronous rather than non-synchronous conditions.

Main contribution

Method

Nineteen British undergraduates (mean age = 18.5, SD = 0.8) voluntarily participated in the study. Neurobs Presentation software recorded RT as subjects responded via a computer keyboard stating the orientation of visual stimuli (incorrect answers were excluded). Trials were delivered in a randomised order with no rhythmic entrainment (silence) or with synchronous and non-synchronous rhythmic structures of 25 to 300 BPM (a simple bass-snare repeating pattern).

Results

RT decreases linearly with increasing tempo.

Silence and non-synchronous conditions inhibited RT compared to synchronous instances.

Conclusions

The inverse relationship of RT and tempo implies an increased effect of dynamic attending at higher frequency oscillations. Additionally, the synchronous trials further reduction of RT shows a cumulative influence of both dynamic attending and multisensory integration.

Implications

The application of music in audiovisual media is common practice. Music has the potential to move us emotionally, that entrains an audioviewer's dynamic attending, and then additionally synchronises with the visual modality, thus facilitating concurrent stimulus processing, is an effective method of increasing the salience and ultimately the attentional leverage of an audiovisual product. Controlled manipulation of attention has prominent benefits in promotional media, but uses extend far beyond this first example to all composed audiovisual media.

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Biography

Andrew Rogers is a research student based in the School of Computing and Engineering at the University of Huddersfield. His research explores audiovisual interactions, focusing on the consequences of musical transient structure in audiovisual media.

Contact

andrew.rogers@hud.ac.uk

i In agreement with Michel Chion, when engaged with an audiovisual stimulus one does not simply 'watch' as this disregards the auditory elements, hence use of the term 'Audioviewer'