

Perceived simultaneity with crossmodal pairs of stimuli

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Human observers acquire information about physical properties of the environment through different sensory modalities. Temporal coincidence of sensory information has been identified as an important cue to aid the organization of signals into a coherent representation of events. Perceived simultaneity, successiveness, and temporal order are thus important properties when dealing with multiple signals. Perceiving the correct timing of stimuli might seem a trivial problem, however stimuli in different sense modalities generated in synchrony by the same distal event could be perceived as being successive because of different physical transmission speed and processing latency. To complicate things even further there are stimulus dependent delays, stimulus interferences, compensations for differential delays, effects of adaptation, and biases due to the task that complicate the relation between physical timing of stimuli and the simultaneity measured in psychophysical experiments.

This tutorial comprises a lecture that outlines several basic methods to characterize perceived simultaneity of crossmodal stimuli. We will describe the necessary steps to set up an experiment. Some of the common pitfall and shortcoming of different experimental designs will be discussed. Data analysis for simultaneity and temporal order judgments will be sketched, as well as possible conclusions that could be achieved from their comparison.

The second part of the tutorial will be a practical demonstration where students will set up an experiment to measure perceived simultaneity between stimuli in the auditory, visual, and tactile modality. Interested participants should bring their own laptop with a working copy of Matlab. The laptop needs to have a 3.5mm stereo headphone plug. All three kinds of stimuli will be generated in pairs using the audio card, an additional headphone amplifier (provided), and LEDs, speakers, and tactors. Matlab code will be provided to generate stimuli, collect the responses and analyze the data.

Suggested reading:

Vroomen & Keetels (2010). Perception of intersensory synchrony: A tutorial review. *Attention, Perception, & Psychophysics*, 72(4), 871-884. doi:10.3758/APP.72.4.871.

Can be downloaded here: <http://spitswww.uvt.nl/~vroomen/Pubs/70.pdf>