

# Apparent motion through electrotactile stimulation

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## Context

Electrocutaneous stimulation holds the potential to provide a rich pallet of haptic feedback by directly stimulating the nervous system. This could be used to augment virtual environments to increase their realism and suitability for serious applications such as trainings.

## Introduction

The apparent motion illusion is a phenomenon where two or more spatially separated stimulation sites can, when activated in sequence, result in the sensation of a continuous movement between the sites. This phenomenon has been frequently researched using vibrotactile stimuli. In this exploratory research we focused on applying electrotactile stimuli and exploring the effects of stimulus duration and stimulus onset asynchrony (SOA) on the emergence of the electrocutaneous apparent motion illusion.

## Method

Five stimulations sites were used on the forearm. Each site was subsequently activated starting at the wrist. The SOA value varied between 5 and 130ms in 9 intervals. The stimulus duration at each site varied between 10 and 160ms in 7 intervals, resulting in 63 combinations to explore. Each combination of Duration x SOA was presented three times. Participants had to indicate the presence of a sensation of movement, amidst simultaneous and successive stimuli.

12 people participated in our study which received approval from the TNO ethics board.

## Results

It was possible to consistently generate the apparent motion illusion using electrocutaneous stimulation. Figure 1 shows an interaction effect for specific Duration and SOA values. Where the orange colour indicates the prevalence of perceived apparent motion for each combination of duration and SOA. It seems that the longer the duration of each pulse, the larger the range of acceptable SOA values where apparent motion is perceived.

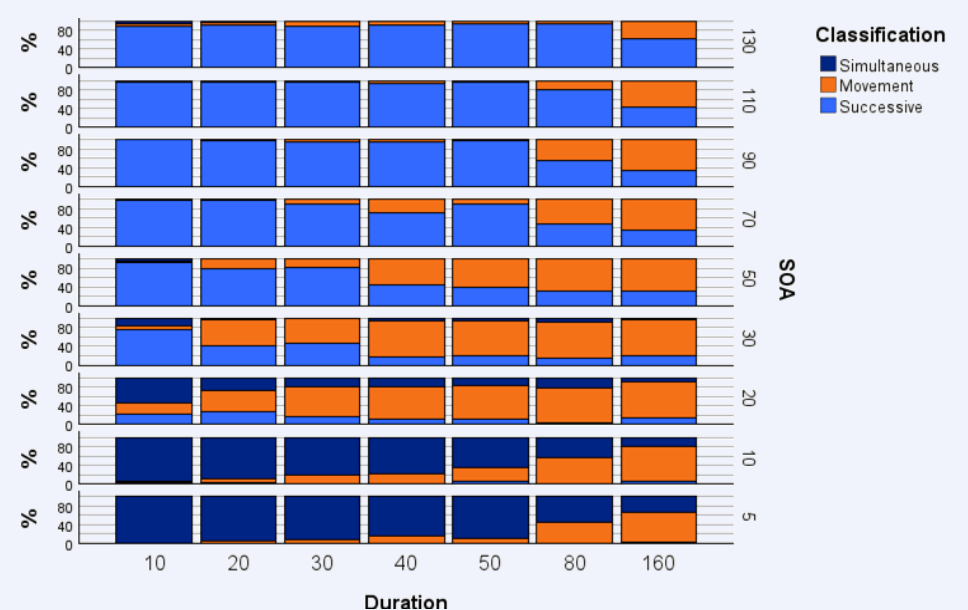


Figure 1 Distribution of quality of movement

Want to connect?

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## References

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- 2 Lederman, S. J., & Jones, L. A. (2011). Tactile and Haptic Illusions. *IEEE Transactions on Haptics*, 4(4), 273–294. <https://doi.org/10.1109/TOH.2011.2>