

# Sensitivity to musical instrument noise in harmonics plus noise modelling

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## **Abstract**

### *Background to the research or performance/installation*

The harmonics plus noise model is commonly used in the analysis and synthesis of harmonic musical instruments. In this model, an instrument sample is transformed into the time-frequency domain using the Short Time Fourier Transform. The harmonics are then identified and subtracted and the residual signal is classified as the 'noise'. The amplitudes of the harmonics are known to be perceptually salient, however less is known about the perceptual sensitivity to the noise.

### *Interdisciplinary issues*

This work has implications for musical instrument synthesis, audio coding, source separation and music perception.

### *The issue/hypothesis under investigation*

In this paper, we explore the discrimination thresholds of the noise in harmonic instruments by attenuating various bands of noise with difference bandwidths and center frequencies in a 2AFC experiment.

### *Findings/description*

The results indicate that the noise discrimination thresholds vary depending on the noise content of the different instruments. Thresholds vary as a function of frequency and bandwidth.

### *Conclusions/future directions*

The noise component of harmonic instruments is perceptually salient and discrimination thresholds vary as a function of frequency and bandwidth, however not to the degree of their harmonic counterparts such as the spectral envelope. Future work should also investigate such discrimination thresholds with time-varying filters that account for attack transients.