INFLUENCE OF VIBRATION AND STAGE CONSTRUCTION ON THE PERCEPTION OF MUSICAL PERFORMANCE

By

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ABSTRACT

The constant pursuit of new architectural design methods and expanding use of multi-sensory music presentation calls for increased knowledge of human response to audio-tactile stimuli. This thesis presents an experiment to explore the human ability to distinguish differences in tactile signals generated by musical sources coupled with typical stage floor constructions. A contrabass is used to generate binaural audio and vibration signals. The mechanical impedance of several stage constructions is measured and used to synthesize tactile signals generated when coupled to the contrabass. The audio and tactile signals are reproduced using headphones and a calibrated motion platform. Test participants are asked to identify differences in tactile signals given a fixed audio environment. Multidimensional scaling is used to identify perceptual dimensions in subjective responses. Results show that stage vibration exceeds the threshold of perception ranging with acceleration up to 0.04 ms^{-2} W_k peak on one construction. Vibration attenuation, propagation times and modal damping vary with construction type and direction of propagation with respect to beams and joists. Sensation level dominates perceived differences between tactile signals, while audio-tactile time delays of up to 74 ms have little to no influence on perceptual differences.