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Objective quality measurement of the excitation of impact sounds in a source/filter model

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For the modeling of percussive (non-sustained) sounds, the excitation signal can be estimated from an original sound in several ways, usually by a time-domain deconvolution process. The source signal obtained by such a process cannot be compared with the original excitation because it is usually unknown. Hence in most of the approaches available in the literature, the validation of the deconvolution process is quantifed in terms of spectral flatness, i.e. a source signal is considered as a good estimation of the excitation when most of the resonant content has been removed. However, the excitation signal is usually a percussive burst, the time domain properties of which are known to be very important, at least perceptually speaking. To evaluate the time domain properties of the estimated excitation, we propose in this paper to compare the estimated excitation to the recording of the acceleration of the hammer hitting a plate. In the recordings considered, the evolution of the acceleration of the hammer has a specifc pattern with several peaks due to the bouncing of the hammer on the suspended plate. This specifc pattern allows us to propose a metric that can be useful for objectively measuring the quality of the estimation process.