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Robustness of the Deep Chroma Extractor and Locally-Normalized Quarter Tone Filters in Automatic Chord Estimation under Reverberant Conditions

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Abstract : In MIREX 2016 (http://www.music-ir.org/mirex), the deep neural network (DNN)-Deep Chroma Extractor, proposed by Korzeniowski and Wiedmer, reached the highest score in an audio chord recognition task. In the present paper, this tool is assessed under acoustic reverberant environments and distinct source-microphone distances. The evaluation dataset comprises The Beatles and Queen datasets. These datasets are sequentially re-recorded with a single microphone in a real reverberant chamber at four reverberation times (0 -anechoic-, 1, 2, and 3 s, approximately), as well as four source-microphone distances (32, 64, 128, and 256 cm). It is expected that the performance of the trained DNN will dramatically decrease under these acoustic conditions with signals degraded by room reverberation and distance to the source. Recently, the effect of the bio-inspired Locally-Normalized Cepstral Coefficients (LNCC), has been assessed in a text independent speaker verification task using speech signals degraded by additive noise at different signal-to-noise ratios with variations of recording distance, and it has also been assessed under reverberant conditions with variations of recording distance. LNCC showed a performance so high as the state-of-the-art Mel Frequency Cepstral Coefficient filters. Based on these results, this paper proposes a variation of locally-normalized triangular filters called Locally-Normalized Quarter Tone (LNQT) filters. By using the LNQT spectrogram, robustness improvements of the trained Deep Chroma Extractor are expected, compared with classical triangular filters, and thus compensating the music signal degradation improving the accuracy of the chord recognition system.

Keywords : chord recognition, deep neural networks, feature extraction, music information retrieval
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