

9th International Conference on Music Perception and Cognition

Alma Mater Studiorum University of Bologna, August 22-26 2006

SRA: An online tool for spectral and roughness analysis of sound signals

Pantelis Vassilakis¹, Kelly Fitz²

¹*School of Music, ITD Libraries, DePaul University, Chicago, USA*

²*School of Electrical Engineering and Computer Science, Washington State University, Washington, USA*

SRA is the only application of its kind available online

[<http://www.acousticslab.com/roughness/index.html>]. It is included in Musicalgorithms

[<http://musicalgorithms.ewu.edu/algorithms/Roughness.html>], a database of music composition/analysis algorithms hosted by Eastern Washington University. In this web-based application, users can submit 250- to ~1000ms-long portions of uncompressed sound files (.wav and .aif formats) for spectral and roughness analysis.

The spectral analysis uses an improved STFT algorithm, based on reassigned bandwidth-enhanced modeling [Fitz, K. and Haken, L. (2002). "On the use of time-frequency reassignment in additive sound modeling," *Journal of the Audio Engineering Society* 50(11): 879-893], and incorporates an automatic spectral peak-picking process to determine which frequency analysis bands correspond to spectral components of the analyzed signal. It is implemented using the Loris open source C++ class library, developed by Fitz and Haken (CERL Sound Group). Users can manipulate 3 spectral analysis/peak-picking parameters: (a) frequency bandwidth (10Hz or 20Hz), (b) spectral amplitude normalization (Yes or No), and (c) spectral amplitude threshold (user-defined). To ensure the reliability and validity of the analysis results, every step of the file submission process includes detailed descriptions of the parameters, as well as suggestions on the settings appropriate to the submitted file(s) and the question(s) of interest.

The spectral parameters obtained from the analysis (frequency and amplitude values of the identified spectral components) are fed to a roughness estimation model [Vassilakis, P. N. (2005). "Auditory roughness as a means of musical expression," *Selected Reports in Ethnomusicology (Perspectives in Systematic Musicology)*: 119-144], outputting a roughness estimate for the submitted sound file as well as estimates of the roughness contribution of each individual sinepair in the sound file's spectrum. The model includes 3 terms that represent the dependence of roughness on a sine-pair's (a) intensity (related to the combined amplitude of the sine-pair), (b) amplitude fluctuation degree (related to the amplitude difference between the sines in the pair), and (c) amplitude fluctuation rate (frequency difference between the sines in the pair) and register (frequency of the lower sine).

A detailed outline of the roughness estimation model will be followed by a demonstration of the tool, a discussion of research studies that have employed it, and an outline of future possible research applications.

Key words: Roughness, Spectral analysis, Computer model

pantelis@acousticslab.com

In: M. Baroni, A. R. Addessi, R. Caterina, M. Costa (2006) *Proceedings of the 9th International Conference on Music Perception & Cognition (ICMPC9)*, Bologna/Italy, August 22-26 2006. ©2006 The Society for Music Perception & Cognition (SMPC) and European Society for the Cognitive Sciences of Music (ESCOM). Copyright of the content of an individual paper is held by the primary (first-named) author of that paper. All rights reserved. No paper from this proceedings may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information retrieval systems, without permission in writing from the paper's primary author. No other part of this proceedings may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information retrieval system, without permission in writing from SMPC and ESCOM.