Mode classification in Renaissance and Baroque polyphony using 'Dissonance Pitch Class Profiles'

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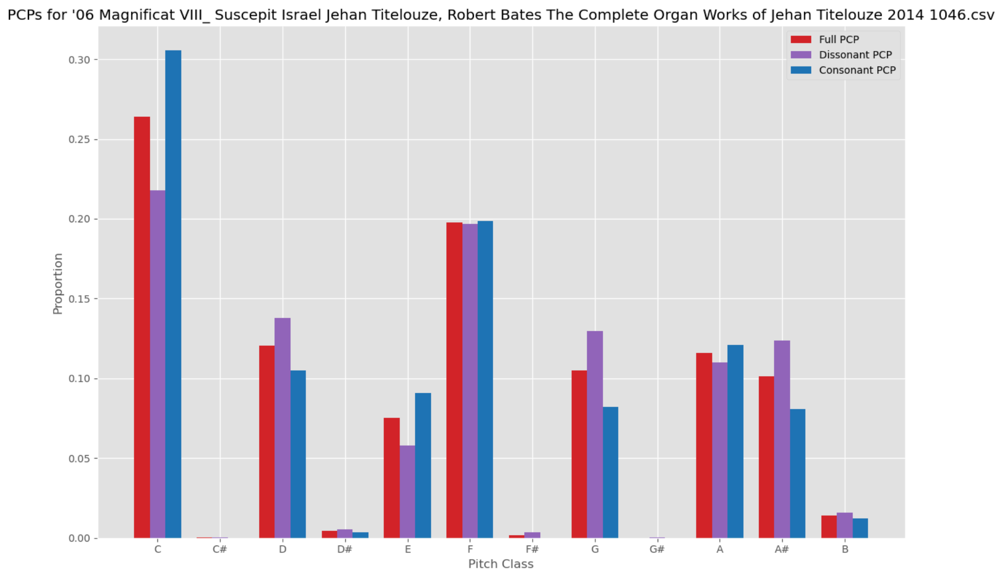

How can we classify modes of compositions using recordings of Renaissance polyphony?

Cornelissen defines two approaches for modal classification of monophonic symbolic encodings of plainchant[1]. These are

- Classic approach: Using the final, initial and note range
- Profile approach: Using Pitch Class Profiles (PCPs) - popular in key and mode classification across symbolic and audio domains[2,3].

Since the classic approach does not readily fit audio, this project explores the profile approach. More specifically, the effectiveness of using dissonance as a means to locate cadence tones, and whether these cadence tones - or proxies thereof - can serve as reliable mode indicators. This is done through the creation of a 'dissonance PCP' - a PCP constructed specifically from the areas in a piece with detected dissonant intervals. By comparing these dissonance-based profiles to conventional, unfiltered PCPs, the project investigates whether cadential material offers improved insights for mode classification.

Cadences in Renaissance polyphony typically follow a three-part framework: dissonance - imperfect consonance - perfect consonance[4,5]. Whilst these cadence patterns reflect stylistic norms of the period, the specific tones and their relation to the final is thought to be mode-specific. Analysing these tones offers a novel approach for mode classification. Since dissonances reliably occur at cadences[4], they can be used as a locator for cadence tones in audio extractions.

The dataset for this project contains Multiple F0[6] pitch extractions from recordings of performances representing 86 of the 475 classified modal cycles detailed in Wiering's 'The Language of the Modes'[4]. The 'Fuzzy Frequencies' paper by Visscher and Wiering[7] serves as a data processing roadmap.

Random Forest models provided the best classification, with F1 Scores of 0.49 for mode classification and 0.74 for modal family classification.
The results from this project indicated no performance improvement from the use of dissonance PCPs.

I would like to present this work as a poster.

[1] Bas Cornelissen, Willem Zuidema, and John Ashley Burgoyne. “Mode classification and natural units in plainchant”. In: International Society for Music Information Retrieval Conference. 2020. doi: 10.5281/ZENODO.4245572. url:https://api.semanticscholar.org/CorpusID:228941308.

[2] Christof Weiß and Maximilian Schaab. “On the Impact of Key Detection Performance for Identifying Classical Music Styles”. In: Proceedings of the 16th International Society for Music Information Retrieval Conference. 2015. doi: 10.5281/zenodo.1416246.

[3] Michalina Kania et al. “A Comparison of the Music Key Detection Approaches Utilizing Key-Profiles with a New Method Based on the Signature of Fifths”. In: Applied Sciences 12 (Nov. 2022), p. 11261. doi: 10.3390/app122111261.

[4] Frans Wiering. The Language of the Modes. Studies in the History of Polyphonic Modality. 1st ed. Routledge, 2002. doi: 10.4324/9781315053271.

[5] Fabrice Fitch. Cambridge Introductions to Music Renaissance Polyphony. Cambridge University Press, 2020. doi: 10.1017/9781139017299.

[6] Cuesta, H.; McFee, B.; Gómez, E. Multiple f0 estimation in vocal ensembles using convolutional neural networks. In Proceedings of the International Society for Music Information Retrieval Conference, Montréal, Canada, 2020

[7] Mirjam Visscher and Frans Wiering. “Fuzzy Frequencies: Finding Tonal Structures in Audio Recordings of Renaissance Polyphony”. In: Heritage 8 (5 May 2025), p. 164. doi: 10.3390/heritage8050164.