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Opycleid: A Python package for transformational music theory

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Software

- Review
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Summary

Transformational music theory (TMT) is a branch of mathematical music theory which usesmodern mathematical structures (such as groups, monoids and categories) to study and characterize musical objects (such as tones, chords, durations, rhythms) and their relations. More precisely, transformational music theory has progressively shifted the music-theoretical and analytical process from an "object-oriented" point of view to one where the transformations between musical elements are emphasized. The field originated in the work of David Lewin (Lewin, 1987) (Lewin, 1982) who pioneered the use of groups and group actions (Fiore & Noll, 2011), and has later been extended to monoids (Noll, 2005), and category theory (Mazzola & Andreatta, 2006) (Popoff, Andreatta, & Ehresmann, 2015) (Popoff, Agon, Andreatta, & Ehresmann, 2016). It has proved useful in analysis, from late romantic music (Gollin & Rehding, 2010) (Cohn, 2012) to recent film music (Lehman, 2018). The algebraic and combinatorial nature of musical transformation make them prone to easy computer implementations. However, general frameworks for creating and applying musical transformations (for example using category theory) are scarce if not non-existent, and are instead focused on specific and restrained areas (for example, neo-Riemannian operations).

Statement of need

`Opycleid` is a Python package for transformational music theory, allowing the definition and application of musical transformations in the broadest way possible. The API for `Opycleid` was designed in order to take a very general approach to TMT by considering category actions in **Rel**, i.e. faithful functors from a small category to the 2-category **Rel** of finite sets and relations between them. At the same time, `Opycleid` provides ready-to-use classes for the common groups and monoids encountered in TMT (such as the T/I group or the PRL group usually found in neo-Riemannian theory), allowing the analysis of chords with just a few Python lines of code.

`Opycleid` was designed to be used by both researchers and by students in music theory (see for example https://www.mathsstudents.leeds.ac.uk/fileadmin/user_upload/Current_Maths_UG_Students/2017_Dr_R_Sturman.pdf). The source code for `Opycleid` has been archived to Zenodo with the linked DOI: (TO BE COMPLETED)

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