

Chord-Class Detection and Tonal-Key Determination for Analyses of Folk, Classical (Art) or Popular-Music Songs in MIDI Format

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Abstract

The poster will offer brief explanations of the main procedures of the software and tables with results of computer analysis of three different sets of songs. The conclusion will also include some interpretations of results and possibilities of further usage both of the software and its results.

Examined songs present three genres of music – adapted (Slovak) folk music, classical art music and popular music. Computational data of music information are processed in MIDI format. Some songs in MIDI format were converted from scores (printed or in pdf) using PhotoScore software for computational reading of scores and Sibelius software for conversion of them to MIDI. Other songs are free downloaded from internet.

Description of sets of songs:

1. a) 200 pieces of folk songs from Slovakia, adapted for piano by Slovak-American composer Miloslav Francisci, originally in scores of cycle of compositions named Travnice
b) 25 pieces of Slovak folk songs adapted for singing with piano accompaniment by Russian composer Vladimir Rebikov. originally in scores.
2. a) 38 composed songs by Slovak composer Ján Levoslav Bella
b) about 30 famous songs by Franz Schubert, both sets as classical (art) music.
3. About 50 compositions and songs of popular music by various pop music composers and bands as The Beatles, The Pink Floyd, The Bee Gees, or composers as George Gershwin, Scott Joplin, Andrew Lloyd Weber, etc. downloaded from internet

We would like also to present the original software (developed by musicologist and programmer). It is developed for computer detection of 11 basic chord classes in composition, and for determination of major/minor tonal key and its changes in the process of every song. It allows also for an assignment of harmonic function to detected chords (Ist degree as tonic, Vth degree as dominant, IV degree as subdominant etc.).

The poster will include the following tables:

1. **The table 1** will present 11 types of **basic chord classes**, which are defined according to its structure of interval classes (i.e. major triad is defined as 4-3, minor triad is defined as 3-4, diminished triad as 3-3, dominant seventh as 4-3-3, etc. where every numeral value means the number of semitones in the intervalic structure of the sound from its root). The table will include also the current English name and sign of every chord class
2. **Tables 2-6** will show the statistical **occurrences of chord classes** in every analysed song in about mentioned sets of songs of different genres.

3. **Table 7** will show the **structure of diatonic scales** – major, major harmonic, minor, minor harmonic, minor melodic. Determination of their occurrence in every song of examined sets is the output of the original software.
4. **Table 8** will show results of the **statistical evaluations of the chord classes occurrences** and statistical and temporal run/change of the hegemony of tonal key (or the tonal ambiguity)
5. Attached **Figures** will present scores of some songs with signs of detected chord classes and **determined tonality under every bar of the score** under every score system used.

Usage of MIDI data causes complications in determination of tonal key because of the same MIDI number of the (acoustically) same pitch may have in scores (enharmonically) different name and note. Our software is adapted for MIDI data processing with passing these complications.

Except the interpretation of output results, the poster will briefly explain the procedure, which helps to exclude the MIDI data difficulty. Other explanations or questions will be answered by authors within the poster session.

Differences and similarities of analysed songs and song sets and its genres will be described in attached musicological conclusions and theoretical interpretations. Finally we would like to anticipate further possibilities of usage both of the software and the results of it's work.

References:

- Ferková, E. – Urbancová, H. (2017). Adaptations of Slovak Folk Songs for Piano in the Context of (Ethno) Musicological Analysis. Malaga *FMA 2017 Proceedings*
- Ferková, E. (2017): Computer Analysis and Visualisation in the Music Theory Research. in: *Clavibus Unitis 2017*. http://www.acecs.cz/media/cu_2017_06_ferkova.pdf
- Ferková, E. (2009). Computer-Aided Investigation of Chord Vocabularies: Statistical Fingerprints of Mozart and Schubert in: *Mathematics and Computation in Music. Communications in computer and information science, 2009, Volume 37, I, Part 8*, pp. 250-256
- Ferková, E. – Šidlík, P. – Ždímal, M. (2007). Chordal Evaluation in MIDI-Based Harmonic Analysis: Mozart Shubert and Brahms. In: *Computing in Musicology 15. Tonal Theory for the Digital Age* Stanford CCARH pp. 186-200
- Selfridge-Field, E. (1997). *Beyond MIDI*. Cambridge, Massachusetts, London The MIT Press
- Piston, W. (1987). *Harmony*. Revised by DeVoto. M. New York-London: W. W. Norton & Company
- Tymoczko, D.: (2010) *What Makes Music Sound Good?* MUSIC 105, Handout <http://dmitri.mycpanel.princeton.edu/files/pdfs/MUS105handouts.pdf>