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GOING BEYOND WESTERN SCORES: AN ALTERNATIVE NOTATION SYSTEM FOR TRADITIONAL GEORGIAN VOCAL MUSIC

Abstract

The traditional notation of Georgian vocal music in Western 5-line notation presents various challenges, yet remains widely used. This practice impacts music practice and transmission to future generations. Beyond issues with tuning systems, Western notation fails to capture the dynamic 'vertical thinking' observed in Georgian singers, noted since Nadel (1933) and confirmed by recent acoustic analysis (Scherbaum and Müller, 2023). This ability is honed through immersive oral tradition, making it challenging for those unfamiliar. A novel solution, Harmonygrams, addresses this by integrating melodic and harmonic aspects into a single, intuitive graph. Harmonygrams offer several advantages: computational generation from traditional scores, correction of tuning distortions, easy perception of chord progressions, eliminating the need to read complex Western scores, and simplicity for users at all skill levels. As an accessible yet information-rich tool for singing practice and analysis, Harmonygrams provide a bridge for both novices and experts to appreciate and participate in this rich musical tradition.

Introduction

Chapter 6 of Bruno Nettl's famous 'red book' „The study of Ethnomusicology: thirty-three discussions" is devoted to the topic of 'Notation and Transcription' which he calls 'The Fundamental Skill' of ethnomusicologists. Although it is well known that transcriptions in ethnomusicology have a lot of issues, some of which are discussed in Nettl's book, the transcription of non-Western music into Western 5-line staff notation is still standard practice in ethnomusicology today and probably will be for quite some time. So instead of abandoning Western scores from consideration, I have asked myself how one could make use of them in ways which make them more appropriate for the representation of traditional Georgian music.

In this context, I have been focusing on three problems that I have tried to solve:

1) Not all practitioners of traditional Georgian music can read Western scores. This is true for a lot of singers all around the world and also for some teachers. Therefore, I believe that there is a need for alternative representations which are more intuitive than 5-line staff notation.

2) Western score notation forces traditional Georgian music into an inappropriate tuning system, a problem that has been the topic of scholarly discussion for a long time

(e.g. Tsereteli and Veshapidze, 2014, 2015; Scherbaum et al., 2020, 2022,2023). This can, for example, introduce artificial semi-tones into the transcribed music.

3) The third problem that I try to solve is that Western score notation also fails to capture the importance of the 'harmonic content' in traditional Georgian songs which is for example expressed in the way how singers interact harmonically. Traditional Georgian singers are well known for their remarkable ability to rapidly adjust their intonation, often to achieve pure harmonic intervals at particular locations in a song. This phenomenon has already been described qualitatively by Siegfried Nadel nearly a hundred years ago (Nadel, 1933). Recently it was also investigated in detail quantitatively in an acoustic analysis by Scherbaum and Müller (2023).

For traditional Georgian singers, the perception of the harmonic content of a song, sometimes referred to as 'vertical thinking', is an intuitive and natural process which is favored through the mechanism of oral transmission, through many years of practice and continuous exposure to the music. In contrast, for singers who are used to learning songs from Western 5-line staff notation, rapidly recognizing chords is often a major challenge.

Part of the problem is related to what we actually see when we look at a score. Independent of our score reading skills, I strongly conjecture that melodic information is the first thing we all perceive. Even if we can't read scores at all, we can recognize the rough melody contours from the ups and downs of the notes in the individual staffs. The determination of the exact pitches takes already some efforts, because we first have to identify the kind of clef of each system and the number and type of accidentals. But when it comes to deciphering the harmonies we have to think even harder, because we have to scan the score sequentially and determine the harmony for each harmonic state one by one.

So in terms of Daniel Kahnemann's model of human thinking (Kahnemann, 2012), the recognition of melodies from a score would, at least for experienced score readers, belong to the fast category while the perception of harmonies belongs to the slow category of thinking. That's a pity, because for singing practice and music analysis, it would be very convenient to access the harmonic information about a piece of music at the same speed and ease as the melodic information. And that's exactly what the new notation system tries to solve.

The Harmonygram concept

The proposed solution, Harmonygrams (Scherbaum, 2024), addresses this by integrating melodic and harmonic aspects of a song into a single, intuitive graph. Individual voices are represented as note sequences in Andrew Killick's "Global Notation" (Killick, 2020). Subsequently, the vertical spaces between the individual voices are color-coded to indicate the corresponding harmonic intervals. The interval between the lowest voice and the highest voice is portrayed as a vertical mirror image below the lowest voice, with the note trajectory of the lowest voice serving as the reference curve. This system allows users

with minimal training to grasp both individual melodies and harmonies more or less effortlessly. Most importantly, the Harmonygram contains essentially the same information as the musical score, but offers several additional noteworthy features:

- The simplicity of Harmonygrams eliminates the need to read complex Western scores, making them an accessible yet information-rich tool for singing practice, providing a bridge for both novices and experts.
- Harmonygrams can be generated computationally from traditional musical scores.
- The perception of the whole chord progression structure of a song becomes easily possible with Harmonygrams, even for lay people, since it all boils down to recognizing simple visual patterns.
- Harmonygrams are not restricted to musical scores, but can also be calculated directly from the pitch trajectories of audio signals and used in the analysis of ethnomusicological field recordings (Mzhavanadze und Scherbaum, 2020; Scherbaum and Mzhavanadze, 2020).

From 12-TET tuning to Georgian tuning

Another nice property of Harmonygrams and Melodygrams is that by three simple steps they can partially be corrected for the distortions of the tuning system during the transcription into Western notation (Scherbaum et al. 2024):

- First the scores are transposed into an accidental-free key.
- Subsequently, all remaining accidentals are removed. This maps all related harmonic non-pure intervals to neutral ones.
- And finally, in order to be able to compare different songs, all note pitches are converted into relative scale-degree indices with respect to a chosen reference note, for which we choose the final bass note.

This results in a sequence of voice states in Scale-Degree-Index (SDI) notation plus their durations which can now easily be converted into an Harmonygram again. The only difference to the 12-TET version is that the vertical axis is no longer in Cents but in scale-degree indices. In other words, in integer numbers. As a consequence, the differences between minor and major intervals disappear. What used to be written as minor and major 3rds in Western notation, becomes a generic 3-rd, and the same for the other non-pure intervals.

If one has information about the original tuning system in which a song was performed, it is now straightforward to convert the Harmonygram in SDI notation into an Harmonygram in that tuning system.

The only assumption that needs to be made in this context is that there is a 1:1 mapping of the scale-degree indices in the accidental-free score to the pitch-group indices in the actual tuning system. This is obviously true for the complete family of heptatonic tuning systems. For more details, cf. Scherbaum et al. (2024)

Applications

In the following, I shall discuss the use of Harmonygrams in singing practice. Their use for structural analysis is demonstrated in (Mzhavanadze und Scherbaum, 2020; Scherbaum and Mzhavanadze, 2020) and Arom and Scherbaum (2024).

First and foremost, the simplicity of Harmonygrams eliminates the need to read complex Western scores. A Harmonygram-based song collection of several tenths of traditional songs has been made available, together with information regarding the use of Harmonygrams for singing[1] and some exercises[2] through the GVM project website at the University of Potsdam[3].

The exercises based on Harmonygrams range from very simple ones with two-part songs to practice the perception of harmonic intervals, to more complicated ones where Harmonygrams can be useful to identify one‘s place in a song. One of the biggest advantages of using Harmonygrams for singing is that a singer can always see which harmonic intervals he/she is contributing to. This allows one to check whether one is in tune with his/her fellow singers at the points where the intervals are easily recognizable, such as octaves, fifths, unisons, or to simply enjoy the beauty of singing in just intonation. Another type of Harmonygram-based exercises which I found interesting are listening exercises where Harmonygrams can be used to train one’s perception of chords and chord progressions.

In conclusion, the properties of Harmonygrams such as the ability to make use of traditional scores which can be corrected for the distortions of the original tuning system, the fast and easy perception of chord progressions, and the elimination of the need to read complex Western scores make Harmonygrams an accessible yet information-rich tool for users at all skill levels, providing a bridge for both novices and experts.

[1] https://www.uni-potsdam.de/fileadmin/projects/soundscapelab/Harmonygrams/Songbook_English_Harmonygrams.pdf

[2] https://www.uni-potsdam.de/fileadmin/projects/soundscapelab/Harmonygrams/Songbook_English_Exercises.pdf

[3] https://www.uni-potsdam.de/en/soundscapelab/computational-ethnomusicology/from-western-scores-to-harmonygrams

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