Merge and Move in tonal harmony

Oriol Quintana Sanfeliu
Centre de Lingüística Teòrica – Universitat Autònoma de Barcelona (CLT-UAB)

In the last decades, there has been a notable increase of the interest in applying the generative perspective of the study of linguistic structure to the study of music structure. Lerdahl and Jackendoff's (1983) Generative Theory of Tonal Music (GTTM) can be considered the foundational endeavour oriented to this task, and few attempts have followed it (Katz, 2017; Katz and Pesetsky, 2011; Rohrmeier, 2007, 2011). This work continues this enterprise, by discussing how the notions of *Merge* (which is the basic operation of syntax building within the current Minimalist Program of generative linguistics) and, especially, *Move* (which is actually a subclass of Merge, also called *Internal Merge*) could be applied to tonal music.

Rohrmeier's (2011) model derives the hierarchical structure of tonal music sequences by means of a set of generative rules that have much resemblance to the transformational rules of early generative grammar (Chomsky, 1965). The Minimalist Program (Chomsky, 1995) substituted these rules by a single recursive operation called Merge, which builds syntactic structures from the bottom upwards instead of from the top downwards. I propose to apply this change of paradigm also in the generative modelling of tonal harmony in order to enhance the alignment of the two theories.

In transforming Rohrmeier's generative rules into applications of a merging operation, it turns out that these can be reduced into two classes that, in Rohrmeier's terminology, can be named as follows:

(i) *preparation*: two items of different categories merge and the category of one of them projects: $[\text{B A}]_{\text{A}}$. The non-projected item is hierarchically subordinated to the other one, which is called the *head*. This corresponds to the typical form of Merge postulated for linguistic syntax.

(ii) *prolongation* or *expansion*: two items of the same category merge and their category projects: $[\text{A A}]_{\text{A}}$. The two merged items are hierarchically equivalent.

These two classes of musical Merge account for the hierarchical structure of a simple standard cadential sequence such as t – s – d – t, assuming that the subdominant (s) is subordinated to the dominant (d), because it *prepares* it tonally speaking, and that the same kind of relationship is established between the dominant and the final tonic (t). The initial tonic is added to the top of the structure via prolongational Merge, creating an overarching Tonic Region (TR) containing the whole sequence:

(1) $[\text{t}_{\text{TR}} [[\text{s}_{\text{SR}} \text{ d}]_{\text{DR}} \text{ t}]_{\text{TR}}]_{\text{TR}}$

While Rohrmeier's rules are plainly transformable into External Merge applications, there are no explicit rules in his model that could correspond to linguistic Internal Merge or movement. There has been some discussion in the literature about whether syntactic movement is applicable or not in tonal harmony. Katz and Pesetsky (2011) give arguments to defend full cadence as an instance of head-movement, although other authors like Zeijlstra (2018) show strong counterarguments to them.

The present work proposes that syntactic movement can be used to account for other instances of tonal music phenomena. Concretely, for those cases of chords displaying a double function in two different tonal domains at the same time. Rohrmeier (2011) proposes double generation of chords or exceptional adjacent branching generation as possible solutions for these cases, but Internal Merge offers a much neater solution for the same problem, since, as a theoretical mechanism, it is a version of the same basic operation of structure building, which results much more economical in theoretical terms.

To illustrate this implementation of Internal Merge in tonal music, I reanalyse the same examples analysed by Rohrmeier (2011) in terms of syntactic movement. One of these

examples is Beethoven's *Waldstein sonata* op. 53. The initial 13 measures of this piece use the sequence of chords represented in (2):

(2) $C – D^7 – G – B♭ – C – F – Fm – G^7$

The initial C chord of this sequence displays a double function: it is at the same time the subdominant of the local tonic domain of G, and the prolongation of the overarching Tonic Region of C. To see this functional duality clearly, the two tonal domains can be isolated in two different tonal sequences, as shown in (3):

(3) a. $[C\ D^7\ G]_{TR(G)}$

b. $[C\ \ldots\ G^7\ Ø]_{TR(C)}$

An analysis of this case in terms of syntactic movement is shown in (4). The initial C chord is generated in the most embedded of these two domains, which is the local tonic domain of G. It is generated in its subdominant position (represented by t_i) and moves from there to a higher structural position (represented by C_i) out of the base domain, where it receives its other tonal interpretation as a prolongation of the overarching Tonic Region of C. The *t* symbol represents the trace left by the chord after moving, and the $_i$ subscript indicates the identity relationship between the moved chord and its trace.

(4) $[C_i\ [t_i\ D^7\ G]_{TR(G)}\ \ldots\ G\ Ø]_{TR(C)}$

The initial phrase of the jazz standard *Autumn leaves* (whose chord sequence is shown in (5)) also contains instances of double function chords. The initial Am and Dm chords receive a tonal interpretation both within the local tonic domain of C and within the overarching tonic domain of Am. Within the domain of C, they are interpreted as *vi* and *ii* respectively, while, within the domain of Am, they are interpreted as *i* (i.e., as a tonic prolongation) and *iv*. Again, this double interpretation is shown by the isolation of each tonic domain, as represented in (6):

(5) $Am – Dm – G^7 – C – F – Bm^{Ø7} – E^7 – Am$

(6) a. $[Am\ Dm\ G^7\ C]_{TR(C)}$

b. $[Am\ Dm\ \ldots\ E^7\ Am]_{TR(Am)}$

An analysis of this case in terms of syntactic movement is shown in (7), where the generation position of these chords is represented by the trace symbols, and the subscripts indicate the identity between the chords and their trace:

(7) $[Am_i\ [Dm_j\ [[t_i\ t_j]_{SR(C)}\ G^7\ C]_{TR(C)}\ F\ Bm^{Ø7}]_{SR(Am)}\ E^7\ Am]_{TR(Am)}$

Finally, I propose that the cases of modulating passages that use pivot chords and that come back to the initial key are instances of movement of not single chords but of entire groups of chords. The beginning of Bach's chorale 'Ermuntre Dich, mein schwacher Geist' (whose chord sequence is shown in (8)) is an example of this.

(8) $G – C – D^7 – G – A^7 – D – \ldots – D^7 – G$

Its corresponding analysis is shown in (9). The sequence $[G\ C\ D^7\ G]$ constitutes a local tonic domain of G generated in the subdominant position of the tonic domain of D. As the sequence continues and it comes back to the initial tonic domain of G, the entire initial Tonic Region moves to the prolongational position of the overarching Tonic Region of G.

(9) $[[G\ C\ D^7\ G]_i\ [t_i\ A^7\ D]_{TR(D)}\ \ldots\ D^7\ G]_{TR(G)}$

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