

# Diversity of the tonal structure of Chopin's Etudes

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**Background.** The revealing and original sound of Chopin's music results from his special approach to harmony (Tomaszewski 1999). In Chopin's time, the term 'tonal unity', was understood as an absolute domination of the main key in a piece. A piece characterised by tonal unity had to be distinguished by an identical key in its opening and closing part. In the second half of 1830s and early 1840s, some trends for 'off-key' treatment of the form appear in Chopin's output, which was caused by a discrepancy between the initial and the ending key (Golab). Certain deficiencies in application of Riemann harmonic analysis method in studies on the Chopin harmonics have been noticed by Ludwik Bronarski (1935), author of "The Chopin Harmonic", since side triads, often characterized by significant independence, get crammed into functional inter-dependencies.

**Aims.** My presentation concerns the application of an original analytical method (Majchrzak 2005, 2007, 2008) for the purpose of studying the tonal structure of Chopin's Etudes. My presentation also includes the description of selected pieces of early Romanticism (miniatures by Schumann and Mendelssohn), and as a result we can compare the tonal structure of Chopin's Etudes with other pieces composed in the same period.

## Main contribution

**Method.** By using an original analytical system, the quantitative prevalence of chords classified by ranges of a given key in a musical piece can be determined. The method of analysis enables arranging a given set of keys, in a hierarchical order, under which chords have been classified versus the main key in which the piece is maintained (in key range 2 – D major and B minor– the following chords are classified, for example: DF#A, AC#EG, BDF#, AC#EGB, DF#AB, C#EG or DEF#GABC#).

**Results.** Early-Romanticism miniatures (several miniatures by Schumann and Mendelssohn) appear to be of a similar tonal structure: one-modal type of diagram, a low number of key ranges, frequent symmetry in the distribution series construction. The tonic key range (in F Major and D Minor – KR -1; in A Major and F sharp Minor – KR 3) dominance is characteristic to all pieces. Noticeable in the Chopin Etudes is that the main key range sometimes tends to be marginalized.

**Conclusions.** I distinguish various types of diagrams of tonal structure of Chopin's Etudes. The tonal structure of selected Etudes is much remindful of the tonal structure of miniatures by composers of the former half of 19th century. However, different a situation is to be met with others pieces. The analysis explains great originality of the tonal structure of Chopin's Etudes as compared to the pieces composed in the same historical period.

**Implications.** My paper suggests a new approach to music analytical comparisons between Chopin's Etudes and the miniatures of early Romanticism. The analytical method will enable us to observe transformations in the structure of tonal harmony.

## Introduction

As Andrzej Tuchowski (1996) says, a one-sided image of Frederic Chopin as a typical romanticist who referred to emotional rather than intellectual aspects of creative work was a stereotypic view that - handed over from one generation to another - influenced the perception of Chopin's forms. "This image, aggravated by suggestive and not infrequently exalted utterances of personages of the format of Schumann or Liszt, made Chopin commentators' focus on the spectacular - that is, the strength of emotional influence, all the more that features such as structural cohesiveness of

grand forms was popularly included in attributes of the effect of his production." Attempts were made at contradicting this tradition, though. Elzbieta Dziebowska (1973) found that "Hundreds of pages were written on emotional content and expression of Chopin's music, the intellectual aspect of his output being neglected"; the same author wrote that "analyses of rough drafts of Chopin's compositions indicate that the intellectual element played the primary part in [his] creative process." Attempts at applying new analytical methods to studies on Chopin's music appeared among Polish musicologists. Zofia Lissa (1970) spoke of the

need to perceive Chopin's composing technique through the prism of techniques characteristic to music of later periods, including music of 20th century, with an enormous role of intellectual elements to it.

This present paper attempts to compare the tonal structure of Chopin's Etudes with pieces of other composers who were active in the same period, using an inventive research method. Displayed will be remarkable diversities in the way Chopin's pieces, representing a single genre, are structured. The research method applied will enable us to answer the question whether in Chopin's music, apart from chords not related to the main key which at times appear at the opening and closing section of pieces, any such chords are actually dominant across a piece (not only at its beginning and end). Answering this question seems important in light of transformations of tonal pieces of music evolving over centuries. A relevant investigation will give us insights into the Etudes' historical position and their importance to music written in later periods (importance of the introduction to Wagner's *Tristan und Isolde*, where chords related to the clef key are pushed to the background, is widely known: the A minor chord).

### Analytic method

The research method applied herein enables strict determination of quantitative relations between keys within which diatonic chords have been classified (Majchrzak 2005, 2007). The method can serve musical analysis, as a tool used to determine the main key in pieces of music based upon various musical formats (Majchrzak 2008), or it can be helpful in discussions on the eternal dispute regarding validity of two modes: the major and the minor (Majchrzak 2008). Keys are marked with consecutive integers, as illustrated in the table below:

Sign	...	-4	-3	...	0	2	...	5	...
Keys	...	A flat major F minor	E flat major C minor	...	C major A minor	D major B minor	...	B major G sharp minor	...

Table 1. Keys

Minor keys appear in their natural variety. Hence, the '2' key is a set of the following tones: D, E, F sharp, G, A, B, C sharp<sup>1</sup>.

Subject to our tonal structure analysis are only diatonic chords. Non-diatonic (N-D) chords are broken down in a separate line. Each diatonic chord has its own numeric value attached, which is calculated according to the arithmetical mean formula.

$$\text{Arithmetic mean} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

where:

$x_1, x_2, x_3, \dots, x_n$  – keys wherein the tones of a given chord appear,

$n$  – number of all keys.

#### Example 1:

Let us take any chord, e.g. the G-B-D chord. The tones of this chord appear in the following keys:

G – (-4, -3, -2, -1, 0, 1, 2)<sup>2</sup>

B – (0, 1, 2, 3, 4, 5, 6)

D – (-3, -2, -1, 0, 1, 2, 3)

The number of all keys where the G-B-D chord tones appear equals 21 ( $3 \times 7$ )<sup>3</sup>.

$$\text{Arithmetic mean} = 0,66\dots$$

$$\frac{(-4, -3, -2, -1, 0, 1, 2) + (0, 1, 2, 3, 4, 5, 6) + (-3, -2, -1, 0, 1, 2, 3)}{7+7+7}$$

#### Example 2:

Let us take any dyad, e.g. C-E.

The tones of this dyad appear in the following keys:

C – (-5, -4, -3, -2, -1, 0, 1)

E – (-1, 0, 1, 2, 3, 4, 5)

The number of all keys where the C-E chord tones appear equals 14 ( $2 \times 7$ )<sup>4</sup>.

$$\text{Arithmetic mean} = 0$$

$$\frac{(-5, -4, -3, -2, -1, 0, 1) + (-1, 0, 1, 2, 3, 4, 5)}{7+7}$$

The numerical value of the arithmetic mean of each diatonic chord will enable us to classify it within a given key range. Conditional upon the arithmetic mean for a given chord, it is

<sup>1</sup> The above set of tones can be arranged in a different sequence, producing the B minor key in its natural variety: B, C sharp, D, E, F sharp, G, A.

<sup>2</sup> Keys: (A flat major and F minor), (E flat major and C minor), (B flat major and G minor), (F major and D minor), (C major and A minor), (G major and e minor), (D major and B minor).

<sup>3</sup> As for diatonic triads, one always deals with the value of 21, naturally.

<sup>4</sup> As for diatonic dyads, one always deals with the value of 14.

classified within the range of a given key. The table below depicts selected key ranges:

Keys	Bb major G minor	C major A minor	G major E minor	A major F# minor
Key Range	KR -2	KR 0	KR 1	KR 3
from	-2,5	-0,5	0,5	2,5
to	-1,5	0,5	1,5	3,5

**Example:**

The arithmetic mean of F#-A-C chord equals 1. It thus fits within the KR 1, being the key range for the G major and E minor keys.

When analysing a piece, we compare the degree of dominance of given key ranges within which all the diatonic chords have been classified. Metrical values are assigned to each chord, depending on the rhythmic value. Longer rhythmic values have, proportionally, larger metrical units than shorter ones. The arithmetic average for certain chords is on the borderline of two key ranges (divided by 2). E.g., the arithmetic average of the F-A-C-E chord is -0,5; the chord belongs to both KR -1 (F major and D minor) and KR 0 (C major and A minor).

Based upon the system discussed above, let us try and analyse a fragment of the Prelude in C minor by Frederic Chopin:



**Figure 1.** Example; Frederic Chopin, Prelude in C minor

Following the above example, let us now write down the data to be used for the present analysis:

Chords	1	2	3	4	5	6
KR	KR 0	KR -1	KR -3	KR -4	KR -3	KR 1
Metrical units	4	4	3	1	4	4

**Table 3.** Analysis

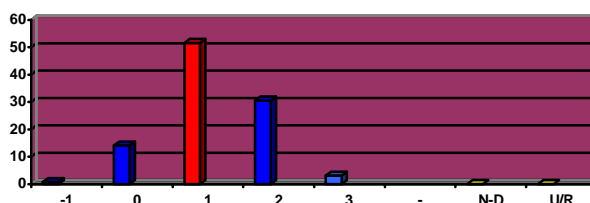
In the above example, KR -3 prevails over the other key ranges. None of the groups N-D and U/R (unison/rests) is to be found in the quoted fragment.

## Tonal structure of miniatures dating from the former half of the 19th century

Before passing on to analysing the tonal structure of Etudes by Frederic Chopin, let us take a closer look at pieces from the first half of the nineteenth century. Our analysis has been applied to several miniatures by Robert Schumann and Felix Mendelssohn.

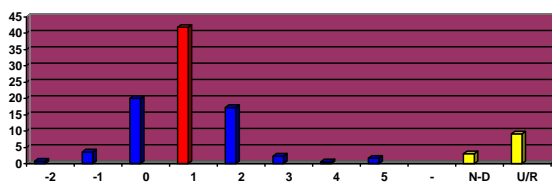
### Robert Schumann

The graph below shows the tonal structure of Chorale No. 1 from R. Schumann's Album for the Young.



**Figure 2.** Robert Schumann, Album for the Young, Chorale No. 1, (G major, KR 1)

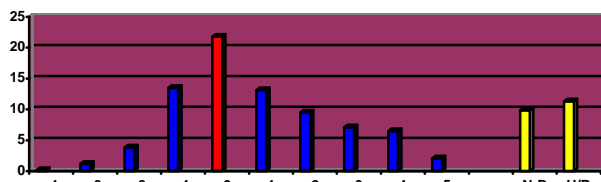
The dominant key range is 1 (G Major and E Minor). Chords such as: G-B-D, D-F#-A-C, G-B-D-E, E-G-B are classified under this particular range. The G major tonic is among chords so classified. Let us refer to the range where the given key's tonic is classified as the keynote (tonic) range. To further describe the tonal structure of the piece under analysis, the tonic range is characterised by very high frequency of appearance (almost a half of all the piece's chords being classified in the keynote range). The range in question is situated symmetrically versus the key's other ranges, whose frequency of appearance gradually decreases as they recede from KR 1. No undiatonic chords appear in this piece. This tonal structure proves characteristic to pieces under analysis, dating back to the classicist period. Other works by Schumann have a similar tonal structure. The tonic range is predominant across those pieces. A similar number of key ranges upward and downward the circle of fifths is to be most frequently found in these pieces, as versus the main key range – i.e. the keynote range.



**Figure 3.** Robert Schumann, *Scenes from Childhood, About Strange Lands and People, No. 1*, (G major, KR 1)

### Felix Mendelssohn-Bartholdy

For the Mendelssohn miniatures, tonal structure diagrams look very similar to those for Schumann. The tonic range is predominant across those pieces. A similar number of key ranges upward and downward the circle of fifths is to be most frequently found in these pieces, as versus the main key range – i.e. the keynote range, e.g.:

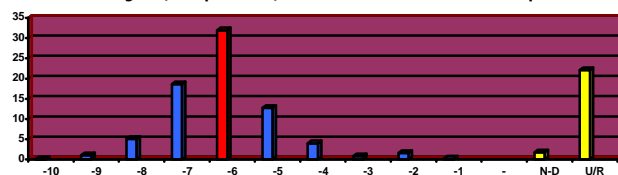


**Figure 4.** Felix Mendelssohn-Bartholdy, *Songs Without Words, Op.19, No. 2* (A minor, KR 0)

## Chopin's Etudes

### Types of tonal structure diagrams for Chopin's Etudes

Frederic Chopin has authored twenty-seven Etudes. Only a few of them have a tonal structure similar to that of pieces by Schumann or Mendelssohn or pieces written in the classicist period. Let us use the Etude in G flat major, Op. 10, No. 5 as an example.



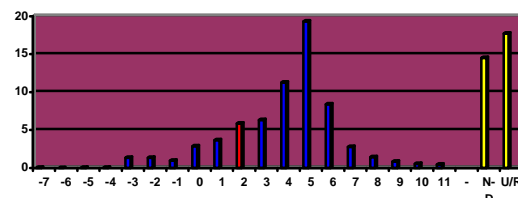
**Figure 5.** Frederic Chopin, *Etude in G flat major, Op. 10, No. 5*

Clearly dominant in this piece is the tonic range (KR -6). More than 30% of chords appearing in this piece rank within KR -6. The piece's tonal structure is characterised by symmetry; only at the right side of the tonic range can we find one more key range (the

frequency of its appearance being inconsiderable).

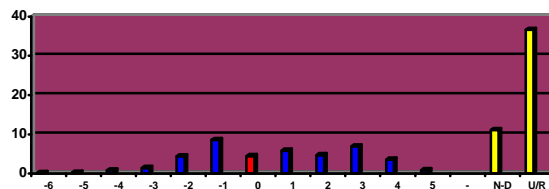
Among the Chopin Etudes are such in which the tonic range is not given the primary rank. No such case would have appeared in early-romanticist miniatures or classicist pieces. (Majchrzak 2005).

### Example:



**Figure 6.** Frederic Chopin, *Etude B minor, Op. 25 No. 10*

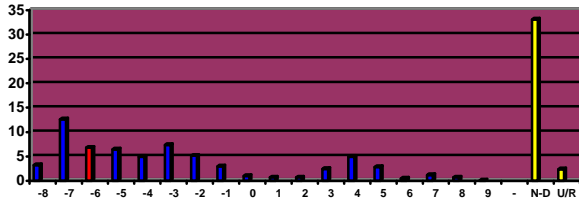
Amongst all the key ranges, the tonic key range is only attached the seventh rank (KR 3, KR 4, KR 5, KR 6, N-D and U/R appearing with higher frequency). Let us notice that the tonal structure of this Etude is characteristic by the B major key (KR 5 being the tonic range for B major key), rather than B minor. Among Chopin's Etudes, there are also such whose key ranges tend to appear not frequently at all. Let us take a look at Etude in A minor, Op. 10, No. 2:



**Figure 7.** Frederic Chopin, *Etude in A minor, Op. 10, No. 2*

Similarly as in the Etude in B minor, Op. 25, No. 10, in the Etude in A minor, Op. 10, No. 2, the tonic range is pushed backwards. Groups N-D and U/R appear with quite a high frequency, with the result that the frequency of appearance of each particular key range is not in excess of 10%.

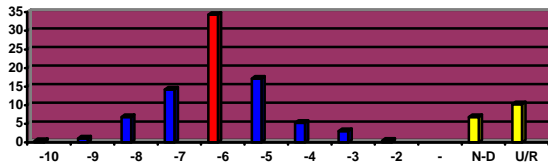
Among the Chopin Etudes are such where key ranges are distributed most unsymmetrically against the main key range – i.e. the tonic range. Let us take a closer look at Etude in E flat minor, Op. 10, No. 6:



**Figure 8.** Frederik Chopin, Etude in E flat minor, Op. 10, No. 6

Striking in this particular piece is seemingly the frequency at which undiatonic chords appear. As was the case with the two previously discussed Etudes, the keynote range itself is not afforded the first rank. Several tonal centres can be found in the diagram: as compared with classicist pieces, the Etude in E flat major under analysis has highly asymmetric distribution of key ranges as against the tonic range. Left of the tonic range, we can only find two key ranges, with as many as fifteen of them appearing right thereof. Such a situation seems quite natural, due to the E flat minor key. If we dealt with a piece written in a multi-sharp key, it would seem natural to have more ranges identifiable left of the tonic range.

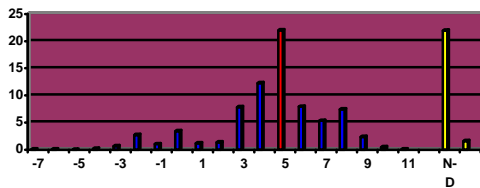
However, Chopin does not stick to this rule, an emphatic example for which being the Etude in G flat major Op. 25, No. 9, under analysis:



**Figure 9.** Frederik Chopin, Etude in G flat major Op. 25, No. 9

However, tonic key range dominates in this piece.

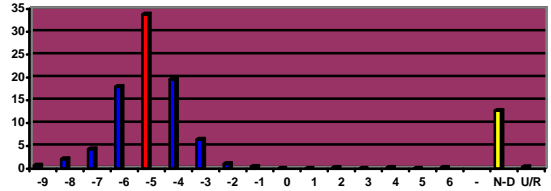
Another Etude having several tonal centres is Etude in G sharp minor, Op. 25, No. 6 – where, however, the keynote range appears predominant over other key ranges.



**Figure 10.** Frederik Chopin, Etude in G sharp minor Op. 25, No. 6

A similar frequency of appearance is the case with the N-D group only.

Yet another example is offered by pieces where empty ranges or ranges with insignificant appearance frequency appear between individual key ranges. Let us have a look at Etude in D flat major, Op. 25, No. 8:



**Figure 11.** Frederik Chopin, Etude in D flat major, Op. 25, No. 8

Key ranges – from KR -9 to KR-2, situated closest to the keynote range, form an ideally classical tonal structure. The composer would sometimes (very rarely indeed) use here chords classified in key ranges much remote from the tonic range, between which empty key ranges can be found. Despite differentiated numbers of key ranges appearing left and right of the tonic range, the aggregate frequency of appearance in this piece of all chords classified left and right of the tonic range is very similar.

### Etudes

The previous chapter discussed the main types of tonal structures appearing in the Chopin Etudes. There are obviously various departures from the models quoted. The table below specifies information on structure of individual Etudes. Each column provides the most important information on the tonal structure of each Etude. The consecutive columns offer us the following data:

**I** – Degree of dominance of the tonic key range. In case that the tonic range appears with the highest frequency, it is afforded the value of '1'<sup>5</sup>; if the frequency is the third highest the value is '3'<sup>6</sup>, etc.

5

1 ...%

6

**II** – Degree of dominance of non-diatonic chords – N-D. (Correspondingly with the previous point, the determinant will be the integer standing for the chord group’s rank).

**III** – Degree of dominance of the (U/R) group. For the first three columns (I, II, III), quoted will be also the (approximate) percentage value of a given group.

**IV** – Number of all key ranges.

**V** – Percentage frequency of appearance of chords classified left of the tonic range.

**VI** – Percentage frequency of appearance of chords classified right of the tonic range.

Etudes	I	II	III	IV	V	VI
<b>Etudes Op. 10</b>						
Etude Op.10 No. 1 C major	3   15%	11   2%	1   25%	14	35 %	25 %
Etude Op.10 No. 2 A min	7   5%	2   10%	1   35%	12	15 %	20 %
Etude Op.10 No. 3 E maj	1   30%	5   10%	10   2%	10	35 %	25 %
Etude Op.10 No. 4 C sharp min	3   10%	2   15%	1   30%	18	20 %	25 %
Etude Op.10 No. 5 G flat min	1   30%	2   20%	3   20%	10	25 %	20 %
Etude Op.10 No. 6 E flat min	3   5%	1   30%	13   2%	18	15 %	40 %
Etude Op.10 No. 7 C maj	1   30%	4   10%	8   2%	11	35 %	25 %
Etude Op.10 No. 8 F maj	2   20%	6   4%	1   26%	14	25 %	30 %
Etude Op.10 No. 9 F min	2   15%	7   5%	1   25%	18	20 %	30 %
Etude Op.10 No.10 A flat maj	1   20%	5   10%	4   10%	22	25 %	30 %
Etude Op.10 No.11 E flat maj	1   30%	2   20%	8   3%	14	30 %	15 %
Etude Op.10 No.12 C min	2   15%	5   5%	1   35%	17	15 %	25 %
<b>Etudes Op. 25</b>						
Etude Op.25 No. 1 A flat maj	1   25%	12   1%	2   20%	16	25 %	30 %
Etude Op.25 No. 2 F min	1   25%	6   5%	3   10%	12	20 %	35 %
Etude Op.25 No. 3 F maj	2   15%	13   3%	5   10%	15	35 %	40 %
Etude Op.25 No. 4 A min	2   15%	11   3%	1   20%	13	30 %	30 %
Etude Op.25 No. 5 E min	3   15%	4   10%	2   15%	12	10 %	50 %
Etude Op.25 No. 6 G sharp min	1   20%	2   20%	11   2%	19	30 %	25 %

3 | ...%

Etude Op.25 No. 7 C sharp min	1   30%	5   5%	4   10%	15	25 %	25 %
Etude Op.25 No. 8 D flat maj	1   30%	4   10%	11   1%	16	25 %	30 %
Etude Op.25 No. 9 G flat maj	1   30%	5   5%	4   10%	9	25 %	25 %
Etude Op.25 No.10 B min	7   5%	3   15%	2   15%	19	10 %	50 %
Etude Op.25 No.11 A min	1   20%	4   10%	2   15%	15	20 %	35 %
Etude Op.25 No.12 C min	3   10%	9   3%	1   25%	12	20 %	35 %
<b>Nouvelle Etudes</b>						
Nouvelle Etude No.1 F min	2   15%	8   5%	1   30%	13	25 %	30 %
Nouvelle Etude No.2 A flat maj	1   25%	6   10%	5   10%	15	25 %	35 %
Nouvelle Etude No.3 D flat maj	1   30%	6   5%	15   1%	13	30 %	35 %

Table 4. Chopin's Etudes

The above table shows that the highest diversity and departures from a classical tonal structure are to be met in Etudes Nos. 10 and 25.

A different situation can be found in the last three Etudes, composed in a later period of Chopin’s creative work. As versus the Etudes from collections Op. 10 and Op. 25, Etudes without an opus number have a tonal structure closer to that of classically structured pieces. Let us quote Etude D flat major, No. 2, as an example:

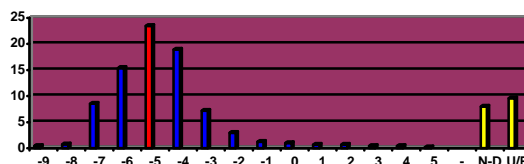


Figure 12. Frederic Chopin, Etude D flat major, No. 2

Although the piece appears to contain a high number of key ranges, the frequency of appearance of extreme ranges is almost insignificant at all. Despite the main key with as many as five flats, the tonal structure of eight key ranges situated closest to the tonic range is quite similar to that of pieces having a classical tonal structure.

### Tonal structure of Chopin’s miniatures viewed historically

The aforementioned examples of Chopin’s Etudes have proved quite an innovative treatment of

tonal structure. It is not easy to find other pieces with much similar data values, based whereupon tonal structure diagrams are produced.

Richard Wagner's *Tristan und Isolde*, written in the latter half of 19th century, is deemed to have crowned a certain period in the development of music and tonality. The introduction is set in A minor, yet the composer avoided using the tonic triad. Applying the present original analytical method, consisting in quantitative comparison of key ranges within whose confines all diatonic chords have been classified, the piece's main range (i.e. the A minor/C major key range, with its classified arrangements, e.g.: A-C-E; C-E-G; C-E; A-C-E-G) would definitely appear at less frequent a rate than other key ranges. In Chopin Etudes, however, the main key range is very often pushed to the background. Already in Chopin's music, i.e. in the first half of 19<sup>th</sup> century, we can encounter certain features characteristic for the decline of the tonal period, whereas pieces by other composers contemporary to Chopin display a tonal structure still identifiable as classicist or classical.

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