THE COMMON DENOMINATOR – A MEDIATOR OF THE RELATIONSHIP BETWEEN DIFFERENT TEMPO MARKINGS

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ABSTRACT

We have tried to define what we mean by the concept of common denominator by synthesizing its underlying principles, namely: **the set of values and the pulse.** These two join together two different tempos that have different metric patterns. The common denominator is therefore a **mediator** of the transition moments. In this context we have presented several musical examples that reflect the instances of occurrence of the common denominator. They include the symphonic poem *Till Eulespiegels lustige Streiche* by Richard Strauss, the *Roman Carnival* Overture by Hector Berlioz and the first movement of Tchaikovsky's *Symphony No. 4*.

We have presented the common denominator from two perspectives, i.e. graphic and aural, each with its specific instances of occurrence. We have established that they represent the fundamental features of the common denominator. In this context we have determined the fundamental category with five common denominator subtypes. Other instances of

occurrence of the common denominator have been included in a particular category where we have identified three subtypes.
Tempo and tempo changes are, in our opinion, utterly essential to developing a valid interpretative concept and, therefore, using the ***common denominator*** to achieve the transition from one tempo to another consciously and in accordance with the reality of sound events comes as a natural consequence.

Keywords: tempo, common denominator, pulse, relationship, aural perspective, graphic perspective

The concept of common denominator was for the first time used as a mediator of the tempo changes by American teacher and conductor Gustav Meier[93], in his book entitled *The Score, the Orchestra and the Conductor* [3]. In the few pages dedicated to this topic, Gustav Meier reveals the common denominator as an effective means for decoding the tempo changes and provides a few examples of its applicability. The author used the mathematical term to identify and clarify the tempo changes. He explains: *"The common denominator connects two different tempos by means of a common rhythmic unit and is therefore one of the conductor's most useful tools in ascertaining a composer's intent. Some composers indicate clearly that a note value in a new tempo is to be equal in duration to a note from the previous one. However, other composers notate tempo changes differently, less clearly, or not at all."* The author then presents several examples of common denominators, accompanied by musical examples.

In our research we intended to continue the development of this idea. The concept of common denominator results from the correlation of two different tempos. Inexperienced performers deal with tempo relationships in a somewhat mechanical and rigid manner, and therefore the unit suffers, it is not alive or convincing. A detailed analysis of the common denominator will enable us to elucidate this subtle phenomenon.

[93] Gustav Meier is director of the Orchestra Conducting program at the Peabody Institute of the Johns Hopkins University in the United States. He also served as professor of conducting at the Tanglewood Music Center and at Yale University (1960-1973), Eastman School of Music (1973-1976), University of Michigan, Ann Arbor (1976-1995). He presents regular master classes in North America, Europe and Asia. In 2009 he published a treatise on conducting entitled *The Score, the Orchestra and the Conductor*, in which he explained the concept of common denominator.

The common denominator as concept

After analyzing a wide range of musical works, from Baroque to recently written ones, we found that the variety of situations in which the common denominator occurs is huge, but that in certain circumstances there are also similarities between them. We therefore undertook the task of developing a system of analysis meant to capture the diversity of situations, as well as to clarify and establish explicit benchmarks.

Thus, we defined the common denominator from two perspectives:

A – graphic

B – auditory

A. From a graphic perspective, by common denominator we understand the set of rhythmic values that unites two different tempos of different metric patterns.

B. From an auditory perspective, by common denominator we understand the pulse that connects two different tempos through a set of values of different metric patterns.

A. Returning to the graphic perspective of the common denominator, the set of values can take two distinct forms:

A_1 the set of values can consist of two different values

 etc.

A_2 the set of values can contain the same rhythmic value on both sides of the transition moment

 etc.

B. From the auditory perspective, the essence of the transition moment is the pulse, or, more exactly, the way it relates to the new tempo. We can therefore encounter two distinct cases:

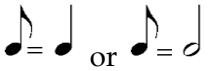
B_1 the pulse can remain the same

B_2 the pulse can change with the transition to the new tempo

B1 Regarding the maintenance of the pulse, it should be noted that the pulse gains different qualities according to the metric pattern and tempo in which it is performed. Thus, in a composition written in slow

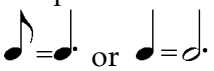
tempo and in 2/4 time, the pulse can have the equivalent of an eighth note, while on transition to a proportionally faster tempo, the same 2/4 time will have a quarter-note or half-note pulse.

Graphically, this implies:



The pulse can also be maintained between measures with a different inner organization, i.e. between binary and ternary measures, such as 4/8 and 9/8.

Graphically, this implies:



In this context, the unaltered continuity of the pulse between two moments with different tempos implies the change of the functionality of the pulse. Here we refer to the case in which in the initial tempo, the pulse defines each beat of the measure, whereas in the new tempo, the same pulse represents an entire measure as a whole.

B_2 The pulse change from one tempo to another covers several aspects:

- it can be augmented proportionally, resulting in a pulse twice or four times slower than the basic pulse
- it can be diminished proportionally, resulting in a pulse twice or four times faster than the basic pulse
- it can be augmented or diminished by ternary divisions, resulting in a pulse three times faster or slower than the basic pulse

Based on the analysis of a large amount of musical works, we realized that the two perspectives of the common denominator, i.e. graphic and auditory, though each contains several characteristic features, interact in two possible situations:

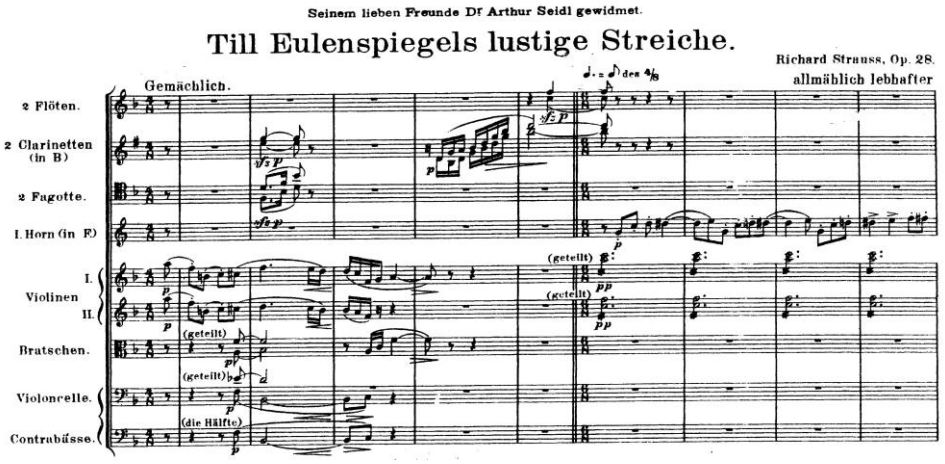
S1● if the set of values consists of two different values – the pulse can remain the same ($A_1 = B_1$)

S2● if the set of values consists of the same rhythmic value on both sides of the transition moment – the pulse can change with the transition to the new tempo ($A_2 = B_2$)

In the course of our research, we came across cases in which neither the set of values, nor the pulse between two moments with different tempos falls within any of the two situations described above. Due to the substantial difference between these situations, we have categorized them as particular.

For clarification purposes we would like to illustrate the two forms of occurrence of the common denominator, ($A_1 = B_1$) and ($A_2 = B_2$). To illustrate the case in which A_1 is equal to B_1, i.e. the set of values consists of two different values – the pulse remains the same, we chose the beginning of the symphonic poem *Till Eulenspiegels lustige Streiche* by Richard Strauss.

Example 1: Richard Strauss, *Till Eulenspiegel*, bars 1-8



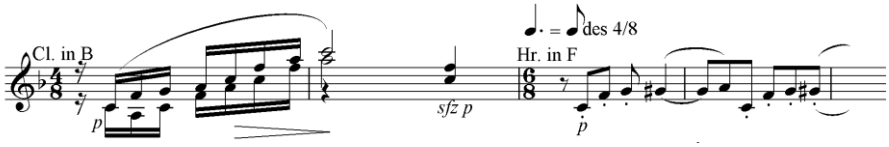
The work begins in slow tempo (*gemächlich* is the equivalent of the Italian *comodo*) and the first 5 measures are written in 4/8 time. A sudden change of tempo occurs in measure 6, containing the indication $\dot{\text{♩}} = \text{♪}$ des 4/8. This indication implies both a change of tempo and a change of meter.

We notice that from a graphic point of view, the rhythmic values are different before and after the tempo change, i.e. eighth note and dotted quarter note respectively, or, more exactly, the eighth note of the section in 4/8 time is equal to the dotted quarter note of the section in 6/8 time. In this context, the common denominator is graphically represented by the equivalence between the two different values  .

From an auditory perspective, in 4/8 time the pulse is represented by the eighth-note value, whereas in the new tempo, it is represented by the dotted quarter-note value.

For a clearer illustration we have selected only measures 4-8, i.e. two measures before the tempo change and two measures of the newly established tempo. At the same time, for the consistency of the discourse, we have chosen to present the sound effect of the clarinets *in B* and of the horn *in F*.

Example 2: Richard Strauss, *Till Eulenspiegel*, bars 4-8

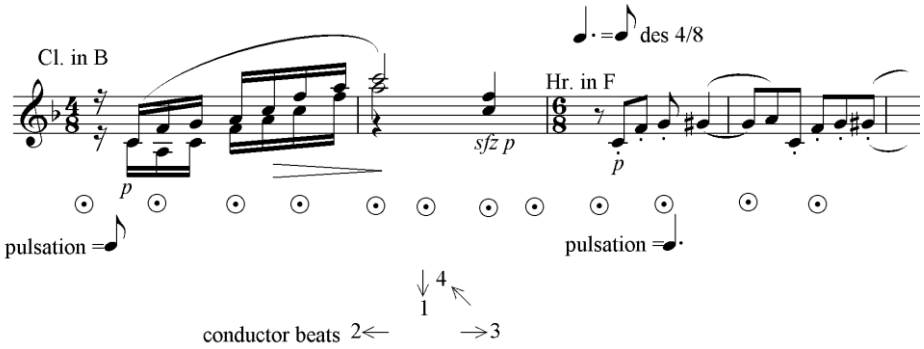


The transition between the two moments is made by continuing the unaltered eighth-note pulse, which in the new tempo becomes a dotted quarter note. Thus, from an auditory point of view, the pulse remains the same. In the new metric configuration, the functionality of the pulse will undoubtedly change, i.e. while in 4/8 time the pulse designates each beat, in 6/8 time the pulse will designate the two main pillars of the measure.

We intend to complement our research with interpretive and technical suggestions arising from the experience gained up to the time of writing of this paper. In this context, in terms of conducting gestures, we recommend that the first five measures should be conducted in 4, and that from measure 6 onwards, the beat pattern should change from 4 to 2. The 4-

measure passage presented above is accompanied by the graphic representation of the pulse and of the conducting gestures.

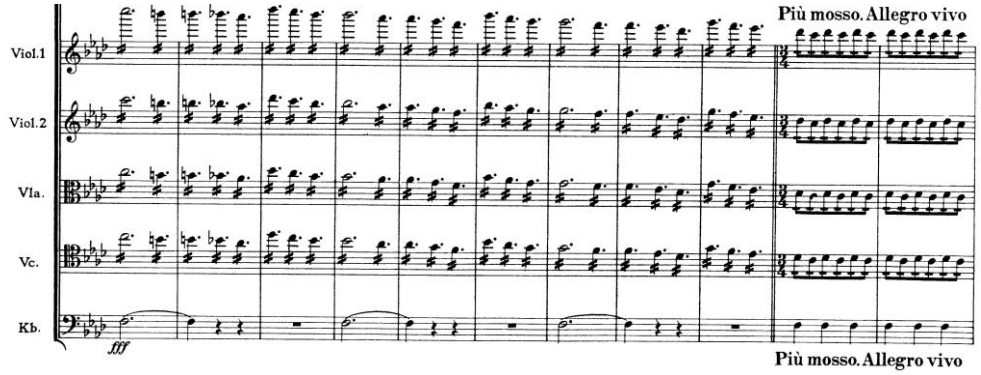
Example 3: Richard Strauss, *Till Eulenspiegel*, bars 4-8



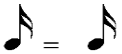
Later in this paper we will return to a more detailed analysis of this part. At this point we will present only the last tempo change, in order to provide a straightforward illustration of the type of common denominator in which the pulse changes, but the rhythmic value remains the same. The change occurs between measures 411 and 412.

We have selected these 10 measures (403-413) to illustrate the presence of a *tremolo ostinato* written out in sixteenth-note values. This *tremolo* continues in the new tempo as well, which leads us to believe that this is the key to the tempo change at this moment. We consider it natural for this *tremolo* to continue unhindered and thus its unaltered maintenance clarifies the relationship between the two tempos.

Example 4: Piotr Ilyich Tchaikovsky, *Symphony No.4* , Mov. I, bars 403-413



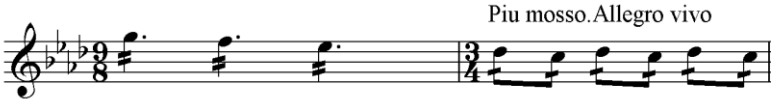
Consequently, from a graphic perspective, the common denominator between the two distinct metric patterns, i.e. 9/8 and 3/4, is represented by the identical value of a sixteenth note. In this context, the common denominator is represented by the relationship  .

From an auditory perspective, the determination of the common denominator  implies a change of pulse. This will contain 6 sixteenth notes in the former case and only 4 in the latter.

We would like to make some practical suggestions as to how we see the unfolding of this tempo change. The 1st movement of the Symphony is an alternation between two metric patterns, 3/4 and 9/8. In terms of conducting gestures, these tempo changes seem quite unspectacular, as the entire part is conducted in the 3-beat pattern. However, although the 3-beat pattern is maintained, the pulse alternates between subdivisions of 3/8 and 2/8, and of 6/16 and 4/16, respectively. Consequently, the conductor's gestures will indicate these alternations by providing longer beats in 9/8 and shorter ones in 3/4. These alternations are not performed at random, and therefore for their materialization, the conductor should operate the subdivision mentally, one measure before the tempo change.

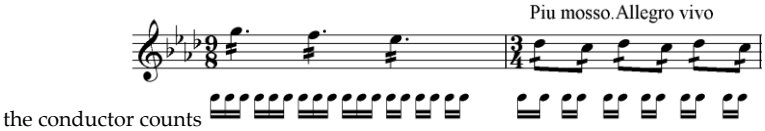
The 10 measures illustrated above are meant to provide as much of the context of this moment as possible. In the example below we have selected only the two junction measures, i.e. 411 and 412.

Example 5: Piotr Ilyich Tchaikovsky, *Symphony No.4* , Mov. I, bars 411-412



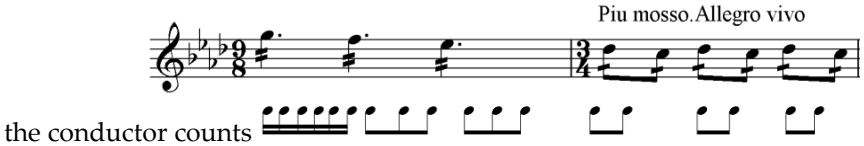
Thus, in measure 411, which precedes the tempo change, we recommend the mental subdivision of the sixteenth notes. We suggest that the 6 sixteenth notes should be split into groups of three on the first two beats of the measure, and into groups of two on the last beat of the measure. Thus, the last beat will contain 3 pairs. By keeping in mind the grouping of the sixteenth notes into twos, the transition to the new tempo unfolds naturally and organically.

Example 6: Piotr Ilyich Tchaikovsky, *Symphony No.4* , Mov. I, bars 411-412



By finding the sixteenth-note value as a common denominator we have managed to figure out how the tempo change unfolds. We find it a useful tool both for the score learning stage and for the practical execution stage. Having had the opportunity to conduct this work on many occasions, I have discovered still another practical alternative to achieving the tempo change. This is due to the fast tempo in both moments, *Allegro* and *Più mosso. Allegro vivo*. Thus, we could consider the eighth-note value  as the common denominator. Consequently, although we start in measure 411 with sixteenth-note subdivisions, beginning with the second dotted quarter note we concentrate the pulse in three eighth-note values and we continue this way in 3/4 time, while mentally grouping them into groups of two instead of three.

Example 7: Piotr Ilyich Tchaikovsky, *Symphony No.4* , Mov. I, bars 411-412



The two musical examples above have helped us define the concept of common denominator from the two perspectives, i.e. graphic and auditory, as well as the two situations resulting from their interaction:

S1● the set of values consisting of two different values – the pulse remains the same ($A_1 = B_1$)

S2● the set of values consisting of the same rhythmic value – the pulse changes with the transition to the new tempo ($A_2 = B_2$)

We believe that the two situations define the fundamental traits of the common denominator. In this context we have conducted an in-depth foray into music literature. In the course of our research we have encountered the common denominator in several circumstances the starting points of which are the two situations ($A_1 = B_1$) and ($A_2 = B_2$), but which contain certain individual features as well. This observation has helped us understand the need to develop a categorization system to reveal and systematize the common denominator. The identification of the fundamental features of the common denominator through ($A_1 = B_1$) and ($A_2 = B_2$) has determined us to develop a category called fundamental category.

The two situations, ($A_1 = B_1$) and ($A_2 = B_2$), resulting from the connection of the forms relevant for the graphic and auditory perspectives, define the basic features of the common denominator.

Types of common denominators

We have identified five distinct types within the fundamental category:

1. common denominator by graphic equality
2. common denominator by metronome marking in normal division
3. common denominator by simultaneously connected metric units
4. common denominator revealed by identical compositional material
5. common denominator revealed by the communion of pulse units

Although each of the five different types features specific elements, they all share one of the two fundamental characteristics of the common denominator: the pulse or the set of values.

In our foray we encountered still other forms of occurrence of the common denominator than those listed above. Due to the particularities encountered, we decided to create a distinct category from the fundamental one, which we suggestively called particular category.

The particular category presents the common denominator in three different forms of occurence:

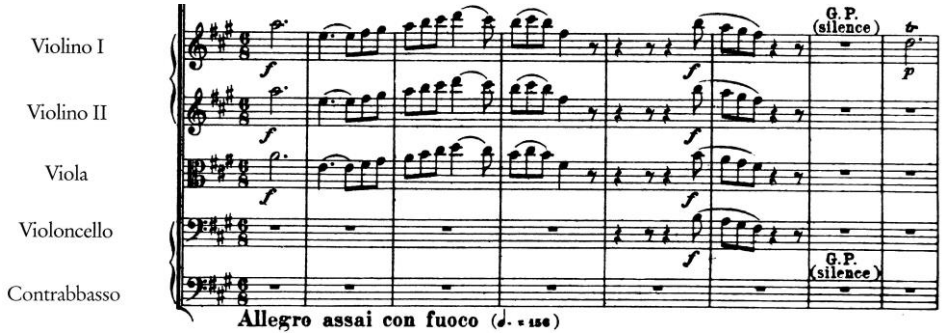
The first form identifies the common denominator in a less direct relationship to the main pulse, finding its root in the smaller subdivision values. A second form includes the situations in which the transition from one tempo to another does not create a perfect parity between values, as in the types of common denominator of the fundamental category. In the third form, the material lying at the boundary between the two tempos is supple or can consciously be made more flexible in order to find the common denominator of the two tempos.

We have therefore named the identified subcategories as follows:

1. common denominator revealed by inner rhythmic values
2. common denominator adjusted by bringing values closer together
3. common denominator obtained by flexibilizing the intermediate musical material

We would like to illustrate one of the above forms, in order to provide a more general overview of what the common denominator implies. To this purpose we will present the first 8 measures of the *Roman Carnival* Overture by Hector Berlioz. The overture begins in a fast tempo, with the indication *Allegro assai con fuoco*  . Due to scarcity of space, out of the full score we have selected only the strings parts.

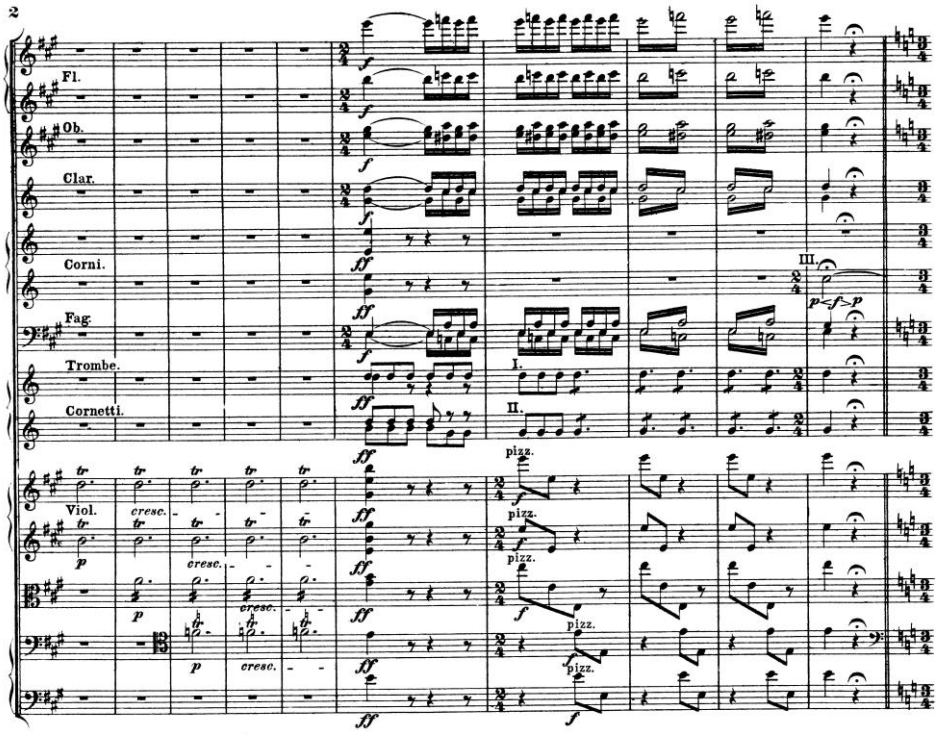
Example 8: Hector Berlioz, *Roman Carnival* Overture, bars 1-8



Beginning in measure 21, the theme of the overture is announced by the English horn in *Andante sostenuto* ♩=52. Although the composer clearly indicates the relationship between the two tempos by assigning each its own metronomic marking, the relationship between them is not obvious at a first glance and therefore must be sought. The issue at stake is finding a relationship between the two tempo indications: ♩.=156 and ♩=52.

From the full score, we will illustrate below the moment of transition from one tempo to another. The first fragment consists of measures 9-18, written in the original tempo: *Allegro assai con fuoco.* Although the reason for selecting this example is to capture the transition from *Allegro assai con fuoco* ♩.=156 to *Andante sostenuto* ♩=52, we would also like to draw attention to the metric change from 6/8 to 2/4, which takes place beginning with measure 14. This 5-measure fragment (mm. 14-18) clarifies the relationship between the two tempos.

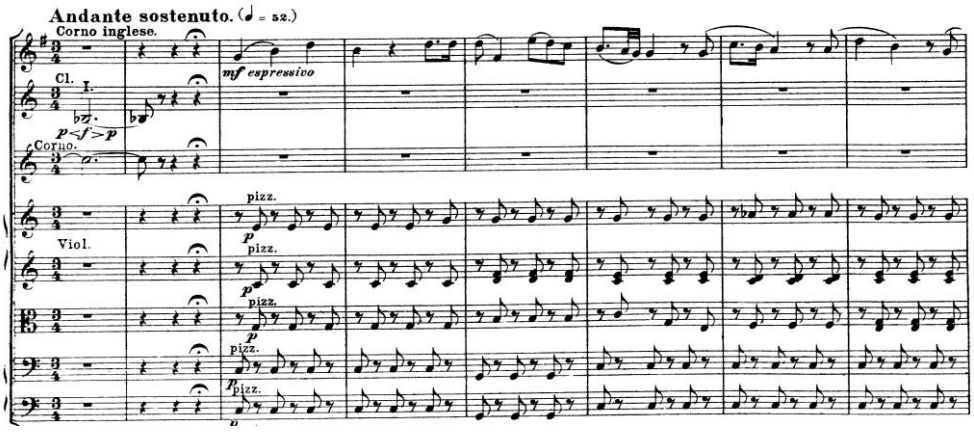
Example 9: Hector Berlioz, *Roman Carnival* Overture, bars 9-18



Although measure 14 indicates a metric change, given the lack of other indications we can infer that the entire 18-measure introduction of the overture falls under the indication *Allegro assai con fuoco* ♩.=156. Thus we have reached the conclusion that this metric change represents a 5-measure "buffer" section that makes the transition from *Allegro assai con fuoco* ♩.=156 to *Andante sostenuto* ♩=52. An equivalence is thus created between the dotted quarter note of the 6/8 time and the quarter note of the 2/4 time.

Thus, the common denominator is represented by the relationship ♩.= ♩=156 and falls within the form: ($A_1 = B_1$) set of values consisting of two different values – the pulse remains the same. We will exemplify with measures 19-26, which continue the preceding example and illustrate the establishment of the new tempo *Andante sostenuto*.

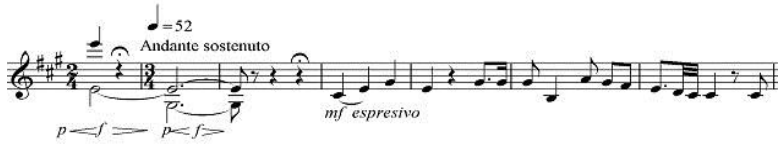
Example 10: Hector Berlioz, *Roman Carnival* Overture, bars 19-26



Once the relationship $\dot{\text{♩}}=\text{♩}=156$ was found, we tried to make the connection between it and the *Andante sostenuto* section $\text{♩}=52$, more exactly between $\text{♩}=156$ and $\text{♩}=52$.

For greater clarity we selected the moment of junction of the two tempos. At the same time, for the fluidity of the discourse, we noted the effect of the present theme on the English horn.

Example 11: Hector Berlioz, *Roman Carnival* Overture, bars 18-26

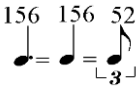


We noticed that there is no normal division relationship between the two values $\text{♩}=156$ and $\text{♩}=52$, and therefore we tried to find an indirect common denominator, which the conductor could use to establish a proportional relationship between the two tempos.

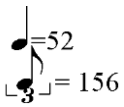
We noticed that if 52 is multiplied by 3, the result is 156, which leads to the following result: the eighth-note value in the triplet of the

Andante sostenuto ♩=52 is 156. This means that the quarter note in ♩=156 and the dotted quarter note in ♩.=156 are equal to the eighth-note triplet in ♩=52.

The common denominator is therefore represented by the relationship



Seen in reverse, the relationship implies:

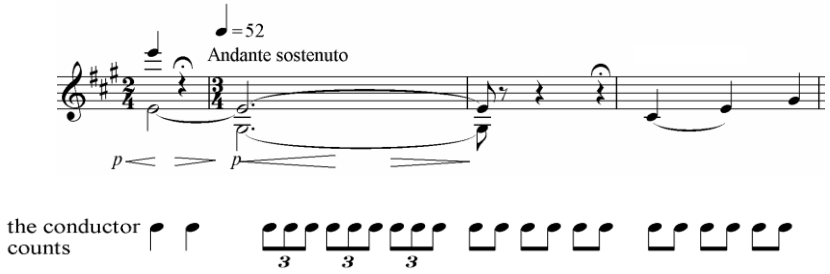


From a graphic perspective, this form of common denominator utilizes different values, whereas from an auditory perspective it implies a change of pulse. At the same time, the pulse change is not obtained through normal divisional values, but through exceptional ones, by finding the eighth-note triplet value as a common denominator. Consequently, this common denominator does not fit into any of the two situations ($A_1 = B_1$) or ($A_2 = B_2$) above, due to its characteristics which particularize it.

After finding the common denominator, our concern focused on explaining its practical applicability. Given the equivalence between the quarter note in *Allegro* and the triplet eighth note in *Andante* 

, we suggest that the conductor should maintain the same pulse on the long sounds in measure 19, while grouping the quarter notes in groups of three. The quarter notes grouped in threes will create the eighth-note triplet on one beat of the new tempo. Thus the new pulse ♩=52 is revealed. Once the new quarter-note pulse is created mentally, we suggest that in the following measure, the eighth-note triplets be replaced by groups of two equal eighth notes. This will clearly outline the on-beat/off-beat accompaniment assigned to the strings, over which the theme is played by the English horn.

Example 12: Hector Berlioz, *Roman Carnival* Overture, bars 18-21



The common denominator is: ♩ = ♪³

We suggest that this should be only a mental process, because from a gestural point of view, due to the long sound, held also beyond the bar line, the conductor needn't signal each beat of the measure, it is enough for him to indicate the first beat in measure 19 and the end of the sound in measure 20. This example is only one of the many exceptional cases in which the common denominator occurs.

We believe that the relationship between different tempos has been insufficiently exploited in the relevant literature, although there are numerous pages on tempo in general and on the relationship between tempo and rhythm in particular. In our opinion, one of the reasons why this topic has been addressed only summarily lies in the fact that the great masters of the baton do not find it useful to express themselves theoretically, since they believe that through the act of interpretation they have already expressed their point of view. Tempo changes within the same work or movement is a sensitive issue, because in practice they are very often realized arbitrarily, without regard to the signals that very clearly indicate the relationship between the two tempos. This phenomenon sometimes occurs due to the conductor's lack of a thorough training, or simply to their inability to relate the sound events to each other, or possibly to their sheer ignorance.

We have tried to define what we mean by the concept of common denominator by synthesizing its underlying principles, namely: the set of values and the pulse. These two join two different tempos that have different metric patterns. The common denominator is therefore a mediator of the transition moments, i.e. it mediates the transition from one tempo to

another. In this context we have presented several musical examples that illustrate the forms of occurrence of the common denominator.

We have presented the common denominator from two perspectives, i.e. graphic and auditory, each with its specific forms of occurrence. We have determined that they represent the fundamental features of the common denominator. In this context we have identified the fundamental category with five subtypes of common denominator. Other forms of occurrence of the common denominator have been included in a particular category where we have identified three subtypes.

Tempo and tempo changes are, in our opinion, utterly essential to developing a valid interpretative concept and, therefore, using the common denominator to achieve the transition from one tempo to another consciously and in accordance with the reality of the sound events comes as a natural consequence.

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