From Mozart to MIDI: A Rule System for Expressive Articulation

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ABSTRACT

The propriety of articulation, especially of notes that lack annotations, is influenced by the origin of the particular music. This paper presents a rule system for articulation derived from late Baroque and early Classic treatises on performance. Expressive articulation, in this respect, is understood as a combination of alterable tone features like duration, loudness, and timbre. The model differentiates global characteristics and local particularities, provides a general framework for human-like music performances, and, therefore, serves as a basis for further and more complex rule systems.

Keywords

Articulation, Historically Informed Performance, Expressive Performance, Synthetic Performance

1. INTRODUCTION

For so called historically informed performance (HIP) it is to know what annotations mean in particular, but, above all, how *non*-annotated notes are performed. Baroque treatises on music performance include many rules of expression. Books written by Leopold Mozart [13], Johann Quantz [14], Carl P. E. Bach [2], and contemporaries serve as a great source for musicians who are devoted to HIP.

Now, the question is: Do these Baroque sources include sufficient rules for a synthetic expressive performance system, or, in other words, is it possible to derive an adequate expressive Baroque articulation out of rules taken from historical treatises? An answer is important in many respects: The main articulations that are used today refer to Baroque annotations. Knowledge about historical performance styles and their diversity will give an insight into the evolution of performances. Since HIP asks what we really know about ancient performance styles, performance analysis always has to separate strict rule playing and creative personal enrichment.

One way to "sonificate" performance theory objectively is to simulate expressive performances. With progress in human-like performance simulation powerful tools are now available, the parameters of which "only" have to be tuned right. This paper collates German late Baroque treatises

to expound a model for the expressive articulation of non-annotated notes. Section 2 motivates this work from a historical point of view. How musical structure influences duration, loudness, and timbre of a tone is demonstrated in Section 3. There an overview of general and basic rules is further complemented by specifications given in Tables. Section 4 attends to musical characters and directions, followed by a general discussion in Section 5.

2. BACKGROUND

The more we are informed about Baroque music the better we apprehend Classic [4]. Moreover, our understanding of what music is and how, where, and in which context composed music is performed and also perceived was mainly defined in the Baroque era: In the 17th and 18th century social changes led to new musical achievements like the public and private concert, chamber music and dilettantes. Today's major/minor tonality took shape at that time, not to mention musical forms like the sonata and symphony Baroque music pioneered.

Apart from timing, dynamics (loudness) and timbre, research on expressive performance focused on articulation but merely as a duration feature [3, 9, 12]. With regard to accents and the variety of playing techniques, investigations into articulation should rather concern the whole shape of a tone. This would conform with the behaviour of human musicians who cause changes in duration, loudness, envelope, timbre, and probably pitch by varying articulation [6].

Composers inserted annotations only if the articulation they intended differed from a clear common knowledge or practice. Fortunately, composers, musicians, and musicologists wrote down these rules, which was motivated by the demand of educated laymen who appeared at this time.

3. ARTICULATION FEATURES

By articulation, the note (a musical symbol) becomes a tone (the physical counterpart of the note). One problem, in this respect, is the influence of musical structure on tone features like duration, loudness, and timbre. This Section compares the most prominent German performance treatises from late Baroque and early Classic.[1]

Articulation features are often fused. Additionally, rules refer to either global articulation characteristics or local particularities. The former refer to the whole movement, whereas the latter deal with deviations caused by distinct structural phenomenons.

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[1] All authors knew and cited each other; see the commending reference to CPE. Bach, Mozart, Quantz and Rousseau in Reichardt [15], p.28 and 92, to Quantz in Türck [17], p. 108, to Quantz and CPE. Bach in Agricola [1], p. VII and 234 et seq.

3.1 Duration

	Global Duration
increase	well elaborated, serious, religious pieces [17]
	large meter [17]
	in case long notes prevail [17]
	German music (also Italian) [17]
decrease	in case short notes prevail [17]
	lively dances [17]
	Local Duration
increase	notes of the theme [17]
decrease	short notes in fugues [15]
	notes previous of grace notes [14]
	fast passages [17]
	last notes of musical ideas [14]
	lively, joyful affects [17]
	last notes under a slur [14]

Table 1: Influences on tone duration.

The duration of a tone is the time between its onset and its offset. The standard (global) duration depends on tempo and note length. Long notes should be played *legato* [1], especially in slow movements [15, 2]. Midtempo notes (normally eighths) in the accompaniment have to be played short [2, 13, 15, 17], especially in fast movements [14]. The fastest notes are played *staccato* [14].

Apart from these general instructions, there are additional rules as shown in Table 1. Because the performer must further separate musical ideas, the last tone of every idea has to get shorter and, therefore, never be a *legato*.

3.2 Loudness

	Local Loudness
increase	dissonances [2, 14, 17], esp. sharpened [13]
	overdotted notes [1, 15]
	first notes of an idea [1]
	long notes in fugues [15]
decrease	flattened notes with ♭ or ♮ [13]
	the principal to a grace note [13, 14, 15]

Table 2: Local influences on loudness.

The loudness dimension of Türk [17] and others is the dimension of strength. Reichardt [15] generally relativized the intensity of Quantz' accents, but backed the system itself [14]. Certainly, one reason for this is the instrument that every author focused on, for the same loudness change on a flute (Quantz' instrument) needs a stronger accentuation than a violin [15]. Table 2 summarizes rules of local influences on loudness.

Rules concerning the loudness progression within long tones are both local and global. Long tones usually start quiet with an increase of loudness, which, at the center of the tone, turns into a decrescendo until the end [1, 13, 14]. Accentuated long tones already start loud. Table 3 lists the referring rules of loudness progression.

3.3 Timbre

The physics of overtones and their combinations have been described since the 19th century, most notably started with Helmholtz [5]. Thus, it is hardly surprising that treatises of the 18th century rarely deal with this. Nonetheless, they do

Global Envelope Specification
quiet < loud > quiet
allegro (standard, see [14])
adagio (standard, see [13])
always, except strong expression or written accent [1]
medium > quiet
slow tempo [13] (for dotted notes an accent on the position of the dot is only necessary for unskilled beginners)
Local Envelope Specification
loud > quiet
expressive slow tempo before a pause (esp. in maestoso, affettuoso, mesto and grave)[15]
one sudden single long note in fast tempo [13, 14]
long notes, if mixed with short notes [13]
tied dotted notes [13]
notes tied over the bar [13]

Table 3: Loudness progression within long tones.

deal with the quality of sound. All authors preferred a clean sound that mimics a singing voice. This is not very informative, for we do not know when a sound was perceived as clean enough. Some original gut string sounds may not be received as very clean with today's demands. More meaningful instructions refer to sound changes: In Mozart's book on violin playing [13] a single-tone crescendo is achieved by a stronger bow pressure instead of an increased speed of the bow stroke. This it at least one indication for a sound influence.

Reichardt [15] wrote in a sentence about the andante: The bow must have the lightness of the allegro bow without its sharpness. The upbow can play two fast notes shortly detached (i.e., *staccato*).[2]

Table 4 summarizes all sound statements. To what far the sharpness of a tone had been tolerated remains speculative. It is also an individual decision of the musician.

Multitude of Overtones: Global	
increase	decrease
faster tempo [15]	slower tempo [15]
weak character [17]	strong character [17]
Multitude of Overtones: Local	
increase	accentuated note [13, 14, 15]
decrease	short note after a *legato* [13]
	last note under a slur [14]
	the principal to a grace note [13, 14, 15]

Table 4: Influences on timbre.

3.4 Summary

Figure 1 simplifies the expressive articulation model described in this Section. The principal finding is easy: The faster the tempo and the shorter the note length, the shorter the duration proportionally to the note length. Furthermore, with an increased tempo a less clean sound is supposed. In an adagio the standard articulation is *legato*. For the andante the *legato* is just used for long notes. Fast notes in the andante are played slightly accentuated. Definitely that is the proper articulation of medium notes in an allegro and so on. The Baroque *prestissimo* is not faster than an
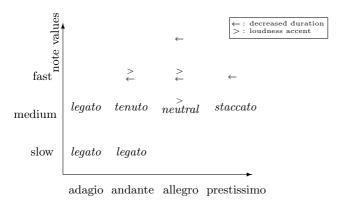
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[2]see Reichardt [15], p.26.

Figure 1: Tempo dependent articulation.

allegro by any means. It is rather a fast *allegro* that stresses out the fast character of the piece.

Of course, should these descriptions be used to set parameters in a synthetic performance, it is still to distinguish fast, medium, and slow notes. For this purpose the historical rules are compared with experimental recordings of human musicians (see Table 1 in Hähnel and Berndt [6], this proceedings): Articulations are of two kinds referring duration: (a) **absolute** articulation types, particularly short articulations like the *staccato*, show a mean envelope in absolute time (particularly with respect to the maximum loudness), and (b) the envelope of **proportional** types, like *tenuto* or *neutral*, is proportional to the IOI. Hence IOIs can be found, where the proportional types match the absolute (see Figure 2).

The standard articulation of fast notes is *tenuto*. Consequently, at 167 quarter notes per minute the duration of sixteenths that are played with a mean *tenuto* proportion matches the mean attack time of a *staccatissimo* . A faster tenuto is hardly thinkable. As Quantz [14] wrote, the fastest sixteenth notes should not exceed a tempo of 150-170 quarter notes per minute. This perfectly corresponds to the developed tempo limit.

In the referring literature accompanying eighths often exemplify medium notes. Because they have to be played short (i.e., *neutral* articulation in Figure 2), the IOI must enable a tone to maintain a clear shortness, which is a *staccato* at least .

Within larger IOIs the performer can shape the loudness progression of the tone more consciously. Since this is necessary for long notes, the threshold in Figure 2 is also consistent with Quantz' [14] instructions, for the shortest exam-
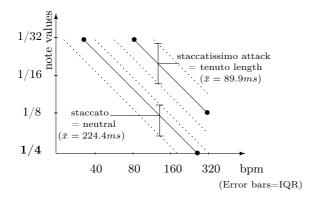

Figure 2: Thresholds to separate fast, medium and slow notes. $\bar{x}$=median IOI.

ples of long notes he demonstrated were dotted sixteenths in an adagio, which is to play at 37–43 quarter notes per minute.

4. GLOBAL CHARACTER

Many rules refer to the "Affekt" or a certain character, the knowledge of which is of importance but depends on musical structure with respect to particular and contemporaneous rules of composition. Though there is a fortunate circumstance to connect structural features and characters, for Baroque music leaves large space for improvisation, that is why most treatises simultaneously deal with performance and composition at the same time.

The predominant character of a piece is found in its main motifs [14], but there also has to be diversity in every piece [17]. Instructions like *sempre forte* or *sempre piano* must not be taken literally. A required strength does not refer to the entire performance. Quite the reverse, the same musical idea, if repeated, should be played with the opposite strength (weak-strong or strong-weak) [17, 2].

4.1 Musical Character

Character	Description	Infl.
lively △	fast, allegro [17, 2]	
sublime △	♯, dotted, long and short n. mixed [17, 14]	
grant △	dotted, long and short n. mixed [17]	accent
serious △	♯, long dotted n. [17, 14]	longer
pathetic	long, dotted n. [14]	
light	♯, large int. [14]	shorter
cheeky	♯, large int. [14]	shorter
tender ○	♭, small int., slow, adagio [14, 17, 2]	legato
sad ○	♭, small int. [17, 14]	legato
flattering	♭, small int. [14]	legato
-	large int., fast tempo [2]	staccato
-	passages, fast tempo [17]	light

Table 5: Characters and articulation:△=strong, ○=weak, ♯=major scale; ♭=minor scale; n.=note/s; int.=interval. Infl.=influence on tone features.

No author gave instructions for every note and every character. Besides, we can suppose that there are as many ideas of the same character as authors exist who write about it.

Table 5 lists characters being specified by at least two authors or several times by the same author. In his keyboard treatise, Türk [17] (con-)fuses tone duration and the recital in general. His dimension of heaviness refers to both, but it often remains unclear in what context which aspect is more important. Strong means a longer duration and lively, wild, angry, but also sublime, proud, and serious articulation. Weak he uses for a shorter duration and a soft, naive, sad, begging, innocent, and also wistful articulation. Türck's instructions again give further evidence that articulation was seen as a complex feature mixture. If he had not explicitly distinguished the loudness domain from this heaviness dimension, it would have been even more confusing.

4.2 Musical Directions

Figure 3 demonstrates the influences of the most common directions on duration and loudness. Directions, like *dolce*, *maestoso*, *affettuoso*, or *cantabile* are not strictly linked with tempo, although there is a certain coincidence (an "*adagio furioso*" or a "*prestissimo maestoso*" is quite unrealistic).

The influence of musical directions on tones depends on their referring note values, that is why fast, medium and

slow notes have again to be distinguished. Like characters do, musical directions often refer to emotion. Some systems for emotion and music [11] base on Russel's valence-arousal model [16], even if it is not uncontroversial [10]. Valence-like expressions and directions affect duration and loudness. Additionally, features related to emotion in music performances are to a higher degree found in timing and dynamics [8], which are correlated with articulation [7]. Seen in this light, articulation may rather be explained by an unidimensional valence-model, because, for instance, small intervals influence duration only if the tonality is minor and, on the other hand, large intervals cause a shorter duration if the tonality is major. Table 5 lists structural features that are associated with character terms.
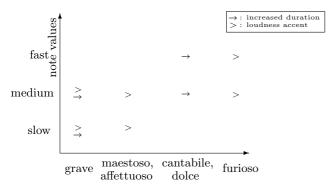

Figure 3: Influence of musical directions.

5. GENERAL DISCUSSION

This paper demonstrated a theoretical framework for synthetic expressive articulation. Exemplified on German late Baroque style it was shown that structural indicators like the frequency of certain intervals or note values, and, in addition, musical directions define an individual characteristic of articulation parameters for each movement. Further style annotations like *fugues* or *dances* cause alterations as well.

All given rules concern the readjustment of performance parameters and the direction of fine tuning that furnishes a lively, varied, and expressive articulation. The discrete values an implementation bases on cannot be derived from literature. They have to be detected by performance analyzes like those described by Hähnel and Berndt in this proceedings [6]. But even were both findings combined, no historical correctness could be guaranteed, because of an insuperable gap: We can read former books but only measure what happens now.

In this respect, of course, this model is not without difficulty: Words being 250 year old, may have been as exact as possible. Today they can only be interpreted. Early and late Baroque are as different as French and Italian Baroque. As they are not completely different [1], it is, indeed, possible to adjust single features. This is one of the future tasks. A next step towards an extended expressive performance model would be the definition of rules for particular instruments.

However, it is impossible to simulate HIP or even any human-like music performance by modeling articulation as the sole expressive feature. Unless timing and dynamics are added, any performance would rather be deficient.

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