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Toward a formalization of musical relevance

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Abstract

This study is a tentative essay of formalization of the concept of Musical Relevance. Even if it is conceived in the framework of computationalism, until now Sperber and Wilson's Relevance Theory has no implementation. Moreover it has never been applied to the case of musical thinking.

Our claim is that the application of the concept of Cognitive Relevance to music would permit to partially explain hearers' behavior and composers' choices. An efficient implementation could also give a support to the compositional decisions. The investigation of the plausibility of a computational model of Musical Relevance could contribute to the formulation of a general theory of musical cognition.

We suggest to unify Relevance Theory with Generative Theory of Tonal Music, in order to formulate an algorithm for the calculation of Musical Relevance, approximating a model of relevance-guided musical reasoning (understanding/ creating). Finally we analyze some aesthetical consequences of applying Relevance Theory to music.

Keywords: Generative Theory of Tonal Music; Tonal Pitch Space; tonal tension; musical effect; Relevance Theory; processing effort.

A Generative Theory of Tonal Music, Tonal Pitch Space, Relevance Theory

This study is a tentative essay of formalization of the concept of Musical Relevance. Even if it is conceived in the framework of computationalism, until now Sperber and Wilson's Relevance Theory (Sperber & Wilson 1986/2005) has no implementation; neither it has been applied to musical cognition. In our opinion the application of the concept of Cognitive Relevance to musical theory would allow to partially explain hearers' behavior and composers' choices; an efficient implementation could give a support to the compositional decisions. Moreover, if musical cognition is seen as part of the general human cognition, and if Relevance Theory has anything to say about it, the investigation of the plausibility of a computational model of Musical Relevance could contribute to the formulation of a general theory of musical cognition. In order to formulate an algorithm for the calculation of Musical Relevance we suggest to combine Relevance Theory with Generative Theory of Tonal Music (Lerdahl & Jackendoff, 1983).

The Generative Theory of Tonal Music describes the musical comprehension of an expert hearer. It postulates the existence of mental representations of music, structured on four levels: two "horizontal" structures, meter and grouping, and two hierarchical vertical structures, which can be formalized as binary branching trees (Hamanaka, M., Hirata, K., & Tojo, S., 2006), called *time-span reduction* and *prolongational reduction*. Generative Theory of Tonal Music finds in Lerdahl (2001) a partial readjustment, especially concerning quantification and formalization of musical parameters.

Relevance Theory was initially formulated as cognitive-pragmatic theory of communication (Sperber & Wilson, 1986/2005), but lately has been developed as a general theory of human cognition (Wilson & Sperber, 2004). The relevance of an input to an individual is defined as the optimal ratio between processing effort and cognitive effect: "a. Other things being equal, the greater the positive cognitive effects achieved by processing an input, the greater the relevance of the input to the individual at that time. b. Other things being equal, the greater the processing effort expended, the lower the relevance of the input to the individual at that time." (Wilson & Sperber, 2004).

An input is relevant for an individual in a certain context when it can be related with the information registered in memory and accessible, and the relation yields a "positive cognitive effect".[1] Relevance of an input is a continuous (non-categorical) variable, and the relative concept is comparative and non quantitative ("x is more relevant than y, for P in the context C").[2] The greater the cognitive effects are, the greater the relevance of a given input is (*ceteris paribus*); on the other side, the smaller is the processing effort, the greater is the relevance of a given input (*ceteris paribus*).

It is true that Relevance Theory has a lot of opponents. For example, in a rude footnote Jerry Fodor let us know that according with his opinion a Relevance Theory doesn't even exist: "As for a theory of relevance, saying that if we had one it would solve the frame problem is as pointless as saying that if we solved the frame problem, that would give us a theory of relevance: Both are true, of course, because "assessing relevance" and "framing" are two terms for the same thing. … If cognition is to attain true beliefs with any efficiency, it's got to be the case both that what's importantly relevant is generally in the frame, and that what's not importantly relevant generally isn't. Maybe meeting these conditions is tractable within the assumptions of Classical

[1] "A positive cognitive effect is a worthwhile difference to the individual's representation of the world – a true conclusion, for example. False conclusions are not worth having. They are cognitive effects, but not positive ones" (Wilson & Sperber, 2004)

[2] On the comparative/quantitative notion of relevance, see Sperber & Wilson (1986/1995), §3.2, §3.5, §3.6. On the distinction of comparative and quantitative concepts see pp.79-81, pp. 124-32, referring to Carnap (1950)

theories, but I don't know of any current proposal for a cognitive architecture, Classical or otherwise, that seems likely to tract it" (Fodor, 2000).

The major problem of Relevance Theory is for sure the impossibility to formalize it without some major limitations, but in a restrained and formal domain like music is, this seems to be possible. Our aim is at demonstrating that the effort to apply Relevance Theory to music is psychologically plausible (and relevant).

Because the definition of the "context" is more framed and formal in the case of music than the linguistic context (Zanette, 2006), and because the hearer contemplated by Generative Theory of Tonal Music is an expert one (of some musical idiom), the concept of Relevance seems such as to be quite easily applied to tonal music understanding.

Sperber & Wilson (1986/2005) do not propose any method for calculating relevance. In order to offer a computational version of musical relevance we have to make relevance a quantitative variable. The formulation of an algorithm approximating the value of Musical Relevance is an important step for improving the computational nature of the Principle of Cognitive Relevance. This principle is so formulated: "Human cognition tends to be geared to the maximization of relevance." (Wilson & Sperber, 2004). If Relevance Theory is plausible, and if the musical mind yields a sort of thought comparable with other forms of mental life, Relevance Theory *has* to apply also to musical thinking.

Calculating the Processing Effort

According to Relevance Theory, in order to be more relevant than another, a musical work has to offer a greater cognitive/emotional effect[3] than another work that requires an analogous processing effort. Therefore, in order to figure out the relevance of an input it is necessary to quantify both variables that constitute it: the Processing Effort and the cognitive/emotional effect. Regarding the Processing Effort (PE), no methods to calculate it are given in Lerdahl & Jackendoff (1983) nor in Sperber and Wilson (1986/2005). Instead, regarding the Musical Effect (ME), meant as the cognitive/emotional effect produced on the listener by the musical piece, several algorithm are formulated in Lerdahl (2001) to calculate the tension and the tonal attraction: tension and attraction are probably the core of the musical effect, even though they are not all of it.

We can identify two dimensions of processing effort: one "horizontal", based on the musical time flow, and a "vertical" one, which is structured and hierarchical. The comprehension of the structural properties of a musical act is a key element for its understanding; we can then therefore assume that a portion of processing effort is involved in detecting the structural components of the heard music.

Because memory needs to store an increasing number of musical acts, we can assume an increase in processing effort as musical time goes by. Due to the limited capabilities of the short-term memory store, processing effort won't increase linearly by the simple increment of the musical acts: we suppose there is a cognitive filter processing the sum of groups-phrases, meant as *Gestalten*.

The theory of musical grouping has a number of experimental confirmation (Deliège, 1987), and there probably is a superposition with linguistic grouping (Patel, 2008).

Since the Generative Theory of Tonal Music group's structures are being recursively upgrading starting from minimal units, we assume that a decent and psychologically acceptable default level could turn out to be the level of the minimal group, i.e. the one at the lowest hierarchical level, often identified with a phrase of the Western Music tradition.

Under our model, each group-phrase is assigned a progressive number that measures the linear increase of Processing Effort, assuming that the mind is counting the progressively edge away from the structural beginning of the piece: to this number we shall add the values of the hierarchical component of PE.

In their reinterpretation of the Generative Theory of Tonal Music, Katz & Pesetsky (2009) observe that both the time-span reduction and the prolongational reduction help to get some important systemic feature of music: after comparing the two structures, they reach the conclusion that only the concept of "root distance" of a node in a pecking order of sound events has a formal momentum. This distance is measured through a "RD number": "The *RD number* of an event *e* in a structure K, RD(*e*), is the number of nodes that nonreflexively dominate the maximal projection of *e* (i.e. *e*P) in K" (Katz & Pesetsky, 2009).

The reinterpretation of Lerdahl and Jackendoff's theory is made within the framework of generative linguistics, and the concept of "projection" has a central function: "A constituent whose head is H is called a *projection of H*, and is conventionally labeled **H' ("**H-bar**")** if it is dominated by another projection of H; and **HP** otherwise. HP is called the **maximal projection** and H' is called an **intermediate projection** of H. H itself is sometimes called the **zero-level projection** of H" (Katz & Pesetsky, 2009).

As is showed in Figure 1, the linguistics notation allows a graphic translation of the structure of the General Theory of Tonal Music, which has also theorical consequences.[4]

[3] Sperber & Wilson (1986/1995) consider the cognitive and the emotional domains as homogenous

[4] "Variations in the notation with which one expresses a theory can influence one's thinking about the actual topics under investigation**.** Even when different sorts of diagrams represent exactly the same information (as is the case here), the differences among them may reflect and reinforce differing working hypotheses or hunches about the kinds of phenomena one expects to model. Differences of this sort between GTTM and common practice in linguistics arise in two important domains: the relevance of *projection level* and the amount of *information* that project from terminal nodes to the constituents that they head." (Pesetsky & Katz, 2009)

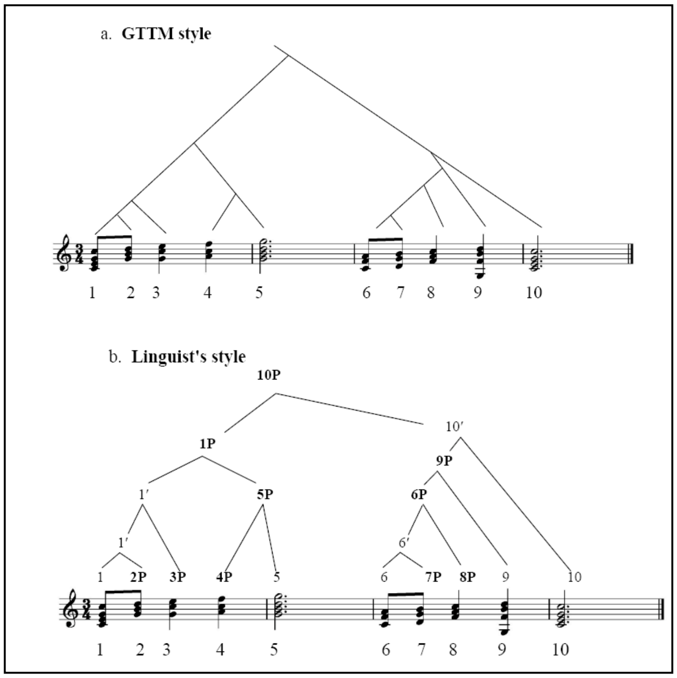

Figure 1: the structure of a toy melody represented in Lerdhal and Jackendoff's notation (a) and in standard linguistic notation (b) (reproduced from Katz & Pesetsky, 2009).

We will take into consideration the pecking distance of each sound event from its root, i.e. its RD number, as a part of processing effort. As in the formalization of Katz & Pesetsky, (2009) the RD number of a main event – the head of a musical phrase – is equal to 0, and as it is not conceivable that the perception of the first in a series of musical events had no cognitive impact, we shall increase by 1 unit the RD numbers set according to the Katz and Pesetsky rule.

So, we shall measure the processing effort by using the rules of time-span reduction formulated in Lerdahl & Jackendoff (1983) and partially implemented in Hamanaka, M., Hirata, K., & Tojo, S. (2006). Once completed the segmentation of a musical piece with the rules of grouping, the algorithm will associate to each group-phrase a progressive number; just after this step we'll apply the Katz & Pesetsky rule to find the RD number of each sound event and, increasing it by 1, the algorithm will add it to a number – we'll call it "Pn" – typical of each phrase-group. Our simple algorithm able to describe the PE calculation process will look like:

PE = Pn + RD' (PE = processing effort; Pn = progressive group-phrase number; RD' = RD number augmented of a unit).

Finally, the Musical Relevance (MR) will be defined as tha ration between Musical Effect (ME) and Processing Effort: MR = ME / PE

Calculating the cognitive Musical Effect.

Concerning the three types of tonal tension (tension of surface, sequential, hierarchical) individuated by Lerdhal (2001), experimental tests demonstrate that the sequential tension isn't sufficient for representing the effective musical understanding, and that hearers perceive hierarchical tension as well (Lerdahl & Krumhansl 2007).

The Musical Effect yielded by the tonal tension is complemented by the tonal attraction[5]: in other words the "forces" that constitute musical effect are both tensional and attractive.

In order to calculate the musical effort we will apply some of Lerdhal's rules[6] which has been formulated in Lerdahl (2001) and have than found an experimental corroboration (Lerdahl, F., & Krumhansl, C. L., 2007). We hypothesize that these rules can represent an approximation of musical effort: in the global calculation of musical relevance it will be necessary to have an aggregate value of the local tension plus the global tension plus the harmonic attraction (Lerdahl, F., & Krumhansl, C. L. (2007) employ multiple regression).

Our final algorithm will calculate a first approximation of Musical Relevance: this approximation should confront with concrete possibilities of implementation and psychological experimental tests that will try or refuse its cognitive plausibility.

An adaptation of Krumhansl "probe-tone method"[7] could be a good method for testing the perception of different

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[5] Lerdhal and Krumhansl model is a quantitative theory of tonal tension made out of four components: "1. A representation of hierarchical (prolongational) event structure. 2. A model of tonal pitch space and all distances within it. 3. A treatment of surface (largely psychoacoustic) dissonance. 4. A model of voice-leading (melodic) attractions". (Lerdahl & Krumhansl, 2007)

[6] The rules we will apply for calculating the Musical Effect are the followings:

Surface tension rule: $T_{diss}(\mathbf{y})$ = scale degree + inversion + non-harmonic tones (summed over all the pitch classes in y's span), where scale degree = 1 if 3^ or 5^ in the melodic voice, 0 otherwise; inversion = 2 if 3^ or 5^ in the bass, 0 otherwise; non-harmonic tone = 3 if a pitch class is a diatonic non-chord tone, 4 if it is a chromatic non-chord tone, 0 otherwise

Sequential tension rule: $T_{seq}(\mathbf{y}) = \delta(x_{prec} \rightarrow y) + T_{diss}(\mathbf{y})$ where **y** is the target chord, x_{prec} is the chord that immediately precedes **y** in the sequence, $T_{seq}(\mathbf{y})$ is the tension associated with **y**, and $\delta(x_{prec} \rightarrow y)$ is the distance from x_{prec} to **y**

Hierarchical tension rule: $T_{loc}(\mathbf{y}) = \delta(x_{dom} \rightarrow y) + T_{diss}(\mathbf{y})$; $T_{glob}(\mathbf{y}) = T_{loc}(\mathbf{y}) + T_{hin}(x_{dom})$, where y is the target chord, x_{dom} is the chord that dominate directly the prolongational tree; $T_{loc}(\mathbf{y})$ is the local tension associated to y; $\delta(x_{dom} \rightarrow y)$ = the distance from x_{dom} to y; $T_{glob}(\mathbf{y})$ is the global tension associated to y; $T_{hin}(x_{dom})$ = is the sum of the values of the distances inherited by the chords that dominate x_{dom}

Harmonic attraction rule: $\alpha_{rh}(C_1 \rightarrow C_2) = c[\alpha_{rvl}(C_1 \rightarrow C_2)/\delta(C_1 \rightarrow C_2)]$, where $\alpha_{rh}(C_1 \rightarrow C_2)$ is the harmonic attraction of C_1 toward C_2; the constant c = 10; $\alpha_{rvl}(C_1 \rightarrow C_2)$ is the sum of the attraction of the leading voices for all the voices in C_1; $\delta(C_1 \rightarrow C_2)$ is the distance of C_1 a C_2, with $C_1 \neq C_2$

[7] For a discussion of the method see Huron (2006)

degrees of relevance of some musical variations of a given input: if "normal listener" could perceive variations of relevance, and if the ranking assigned to relevance variations would be similar to that predicted by our method of calculation, then it would be proved that our algorithm is psychologically plausible.

Relevance of similarities

The calculation of cognitive effort and musical effect which we have here suggested should allow for some exception, as the case of repetitions or similarities. If the same musical phrase is presented twice, it seems plausible that its effect will be not computed as the effect of a new phrase. Here two main problems arise: the first is the formalization of identity/similarities in general and particularly in the case of music, the second is the study of the impact that identity/similarities could have on musical listening.

We cannot account for these problems in this paper, but starting from the existing literature we can try to suggest a direction of research.

Similarities and repetitions in music are a frequent and important structural phenomenon: they can deserve at least the definition of some important musical feature like style (Meyer, 1989) but they permit also to affirm that "without similarity, music would not be possible, would not exist. … Without similarity and difference music would be merely an acoustic blur; essential things such as pitch, timbre and time itself would fade away and disappear. It would not be possible to say what precedes and what follows, what "moves" to what. Music would be imperceptible" (Cambouropoulos, 2009).

In the perspective of the present study, our question is weather repetitions and similarities have an effect on the calculation of the musical relevance, as seems very plausible. As for the case of the context, *similarity in general* is not a theoretical object that is easily tractable from a computational point of view, but in the case of the musical domain it seems possible to formalize it.

Accepting that similarity has an impact on the relevance of the sound events, there are at least two possibilities to account for: first hypothesis, an event B, similar to a precedent event A, has *the same relevance of A in proportion to the similarity with A*; second hypothesis, an event B similar to a precedent event A, has *a relevance similar of that of A*, where the similarity does not depend solely on the degree of similarity but also on the structural properties of B (perhaps the relevance of B could be a sort of average of the relevance of A and the relevance B would have if it *would not be* a similar occurrence of A),

We prefer the second hypothesis, as "the vast majority of exact repetitions in a piece of tonal music do, in fact, go unnoticed by listeners" (Meredith, Lemström &Wiggins, 2003): only relevant similarities are perceived by listeners, and their relevance must be a complex variable.

Aesthetical Consequences

In this last section we propose some philosophical consideration concerning the application of the concept of relevance to the case of musical aesthetics.

Lerdahl and Jackendoff (1983) do not express any aesthetical point of view connected with their cognitive theory of the musical mind. Nonetheless, in some more recent papers Lerdahl (1985; 1988; 1997) has derived some cognitive principles of musical composition from Generative Theory of Tonal Music. Even if these principles are not a closed set of aesthetical rules, they are presented as "cognitive constraints" for the composition.[8] Good music, Lerdahl says, has to be grounded on human "capacity for music" (Jackendoff & Lerdahl, 2006), i.e. on *nature*[9]. In Lerdahl's opinion, a great deal of XX century music has adopted compositional grammars which are far from the "listening grammars" implicit in the musical mind. The result is musical works artistically defective: for example,

[8] For sake of completeness, the cognitive constraints in Lerdahl (1988) are listed in the following: Constraint 1: The musical surface must be capable of being parsed into a sequence of discrete events. Constraint 2: The musical surface must be available for hierarchical structuring by the listening grammar. Constraint 3: The establishment of local grouping boundaries requires the presence of salient distinctive transitions at the musical surface. Constraint 4: Projection of groups, especially at larger levels, depends on symmetry and on the establishment of musical parallelisms. Constraint 5: The establishment of a metrical structure requires a degree of regularity in the placement of phenomenal accents. Constraint 6: A complex time-span segmentation depends on the projection of complex grouping and metrical structures. Constraint 7: The projection of a time-span tree depends on a complex time-span segmentation in conjunction with a set of stability conditions. Constraint 8: The projection of a prolongational tree depends on a corresponding time-span tree in conjunction with a set of stability conditions. Constraint 9: Stability conditions must operate on a fixed collection of elements. Constraint 10: Intervals between elements of a collection arranged along a scale should fall within a certain range of magnitude. Constraint 11: A pitch collection should recur at the octave to produce pitch classes. Constraint 12: There must be a strong psychoacoustical basis for stability conditions. For pitch collections, this entails intervals that proceed gradually from very small to comparatively large frequency ratios. Constraint 13: Division of the octave into equal parts facilitates transposition and reduces memory load. Constraint 14: Assume pitch sets of n-fold equal divisions of the octave. Then subsets that satisfy uniqueness, coherence, and simplicity will facilitate location within the overall pitch space. Constraint 15: Any but the most primitive stability conditions must be susceptible to multidimensional representation, where spatial distance correlates with cognitive distance. Constraint 16: Levels of pitch space must be sufficiently available from musical surfaces to be internalized. Constraint 17: A reductionally organized pitch space is needed to express the steps and skips by which cognitive distance is measured and to express degrees of melodic completeness.

[9] "My second aesthetic claim in effect rejects this attitude in favor of the older view that music-making should be based on "nature". For the ancients, nature may have resided in the music of the spheres, but for us it lies in the musical mind" (Lerdahl,1988).

the structures of twelve-tone music haven't any perceptual reality, as many psychological tests have demonstrated[10].

Lerdahl (1985) states : "nous ne portons aucun jugement esthétique [...]. La relation entre perceptibilité et valeur est oscure; personne n'a vraiment de théorie sur de telles questions". Nonetheless this remark is weakened just after: "Cependant, ces remarques comportent une sorte plus subtile de sous-entendu esthétique". This "sous-entendu" is the typology of music we will discuss in this paper. Lerdahl's claim is meta-aesthetical, in the simple sense that cognitive constraints derived from Generative Theory of Tonal Music represent *the basis* on which aesthetical judgments can be formulated. Lerdahl (1988) says: "Following them [the cognitive constraints] will not guarantee quality. I maintain only that following them will lead to cognitively transparent musical surfaces, and that this is in itself a positive value; and, conversely, that not following them will lead in varying degrees to cognitively opaque surfaces, and that this is in itself a negative value". In other words, there are many possible kinds of music with "cognitively transparent musical surfaces", and this surface transparency is only the first level of a musical work "well formed"[11].

The musical typology suggested in Lerdahl (1985) and repeated afterwards (1988; 1997), is grounded on the existence of a double structure in every musical work, as in chomskyan linguistic "standard model": there is a "musical surface", *i.e.* all the sound events the mind can perceive, and a "deep structure", *i.e.* the hierarchical relations the mind can detect under the musical surface. If the surface "has numerous non-redundant events per unit time" (Lerdahl (1988) the music is *complicated*. If the structures inferred from musical surface are rich, as their unconscious derivation by the listener, the music is *complex*.

Problems come with the third and last type of music cited only *en passant* by Lerdahl (1988; 1997): the *simple* one, *i.e.* music with a simple surface and a shallow hierarchy/deep structure, or, in a negative way of definition: "simplicity" is the absence of both complicatedness and complexity (Lerdahl, 1997).

In our opinion, problems raised from this typology come in connection with the axiology implied in the typology: complexity is better than simplicity. It is true that Lerdahl attributes an aesthetically neutral value to the complicatedness (music with a complicated surface) and a positive one to the complexity (music with a rich deep hierarchy). But third qualification, simplicity, is implicitly considered negative, as Lerdahl makes it clear: "Balinese gamelan falls short with respect to its primitive pitch space. Rock music fails on grounds of insufficient complexity" (Lerdahl, 1988).

This determination of the cognitive-aesthetical failure of some kinds of music actually existent sounds quite odd and not well justified. This claim raises some problems: in the following we'll sketch three of them.

a. Lerdahl hesitates between the possibility of grounding aesthetics on a cognitive basis and the admission that this would be nonsensical. Even if he explicitly refuses this cognitive-aesthetical foundation[12], it is quite evident that Lerdahl thinks Generative Theory of Tonal Music *does have* aesthetical consequences. Lerdahl (1988), for example, derives from Generative Theory of Tonal Music some "cognitive constraints" for musical composition[13]. If these constraints are not directly "aesthetical"[14], they have at least a meta-aesthetical content, while they determine, on a cognitive basis, some precise restrictions of the compositional possibilities. In Lerdahl's opinion, a good musician has to respect these cognitive constraints in order to compose a "natural" music, i.e. a music compatible with our "capacity of music" (Jackendoff & Lerdahl 2006), in harmony with the musical mind[15].

b. Lerdahl declares his aesthetical preference for complexity and his neutrality toward complicatedness: in Relevance Theory terms, it must be noted that a complex but not complicated music would be more relevant than a complex *and* complicated music, if we accept the idea that the complexity of musical surface determine the computational effort and the richness of deep structure cause the (hierarchical part of the) musical effect. These preferences are explicitly considered as idiosyncratic and personal[16], but the condemnation of simplicity seems to be presented as not exactly idiosyncratic ("Rock music fails on grounds of insufficient complexity"). Simplicity is "the absence of both complicatedness and complexity" and complexity is a positive aesthetical value, but the reasons for condemning simplicity are not so clear: it could be a neutral value, as complicatedness. Even if there could be good reasons for grounding aesthetical judgment on a cognitive basis, it seems to be not so self-evident why to declare "failed" a musical idiom, especially in the case of an idiom with a great popular success, like rock music, or in

[10] Diana Raffmann (2003).

[11] "All sorts of music satisfy these criteria - for example, Indian raga, Japanese koto, jazz, and most Western art music" (Lerdahl 1988).

[12] The most recent refutation is in an interview to Jackendoff and Lerdahl by Acotto & Viaud-Delmon (2010): "GTTM doesn't attempt to work out […] how and why listeners may find some auditory sequences attractive, independent of their musical structure. This is not a question we felt capable of addressing".

[13] An analogous idea is presented in Temperley (2001).

[14] "Il faut souligner que nous ne portons aucun jugement esthétique dans ces cas" (Lerdahl, 1985).

[15] "The avant-gardists from Wagner to Boulez thought of music in terms of a "progressivist" philosophy of history: a new work achieved value by its supposed role en route to a better (or at least more sophisticated) future. My second aesthetic claim in effect rejects this attitude in favor of the older view that music-making should be based on "nature". For the ancients, nature may have resided in the music of the spheres, but for us it lies in the musical mind" (Lerdahl,1988).

[16] "Lerdahl (1988) expresses an aesthetic preference for complexity and a neutral attitude toward complicatedness […] Others may have other preferences" (Acotto & Viaud-Delmon (eds.) 2010).

the case of a traditional idiom, like Balinese gamelan. A general cognitive theory of tonal music as Generative Theory of Tonal Music has to (try to) explain also demotic and exotic kinds of music really existent, not only classical style. And in these cases it would be insufficient to refer to sociological and cultural theories in order to explain why this “failed” kinds of music do exist and why people do like them.

c. It doesn’t seem too plausible to attribute – as Lerdahl (1997) does[17] – complexity (without complicatedness) *tout court* to Mozart’s or Schubert’s music, if this attribution is addressed to an author *in toto* and not to specific works. More than one Mozart’s minuet could be considered as an example of Lerdahl’s category of simple music more than of the category of complex music. The conceptually weak point here is that Lerdahl employs the tricotomy complex/complicated/simple as if they were be *classificatory concepts* (Carnap, 1950): something is complex/complicated/simple or not. It would seem more plausible to use these concepts (in an aesthetical function) as if they should admit degrees or, better, a comparison: something is more/less complex/complicated/simple than something else (in Carnap’s lexicon, *comparative* concepts).

Showing that the effort to formalize and calculate Musical Relevance could support this conclusion.

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[17] “Mozart and Schubert are complex but not complicated. Bach, Brahms, and much of Wagner are both complex and complicated. Donizetti is simple. In the 20th century, Debussy, Stravinsky, and early Webern are complex but not complicated. Schoenberg is both complex and complicated. Carter, Babbit, Xenakis, early Stockhausen, and the Boulez of *Le Marteau sans Maître* are complicated but not complex; the same holds for the composers of the “new complexity” such as Ferneyhough. Glass and Pärt are simple” (Lerdahl,1997).