

Embodied Music Cognition and Mediation Technology

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Musical Experience and Signification

During the twentieth century, there was a dramatic change in the way people had access to music. Originally, music was accessible only in an environment where it was played. There needed to be a direct transfer of sound energy from musician to listener. However, since the late nineteenth century, music recording technology has made it possible to encode the sound energy on a material substrate. As a result, access to music has become mediated by technologies. The encoded energy can be purchased in a shop and reproduced as audible music at home, using an appropriate player.

Since the mid-1990s, with the advent of electronic media and communication networks, the economic chain involving music has developed to a level where access to the production, distribution, and consumption of music has become fast, individualized, and, above all, mediated by electronic technology. The major outcome of one century of technological development is that music is available in huge amounts, just a few computer mouse clicks away from our ears.

Yet, while music may be available in large quantities just a few mouse clicks away, it is far from evident which mouse clicks should be used in order to find and retrieve the music one really wants to purchase. Music is still accessed in terms of metadata such as the name of a composer or the title of a song, but not in terms of how it sounds or how it feels. Technologies for content-based access to music—that is, for access to the inside of music, as exists for texts—are still in development. Access to music from a personal, experience-based point of view is in the research phase. At this moment, there is a media technology which can provide a stream of musical information in just a few seconds, but there is no mature mediation technology based on content and experience. Nor is the technology always very transparent. In many cases, the technology is an obstacle that makes access to music difficult for many users.

Hence the paradoxical situation that music is available in abundance, but it is barely accessible by using existing descriptions and obtrusive technologies. Similar problems occur in relation to interactive music systems. These systems are equipped with sensors and sound synthesizers, and they allow the transformation of all possible gestural controls into sounds. Yet musicians often have the feeling that a fine-grained control over the music performance is missing, and that mediation technology stands between what they want and what they get.

What is needed is a transparent mediation technology that relates musical involvement directly to sound energy. Transparent technology should thereby give a feeling of non-mediation, a feeling that the mediation technology “disappears” when it is used. Such a technology would then act as a natural mediator for search-and-retrieval purposes as well as for interactive music-making.

I believe that the apparent non-mediation of mediation technology is a very challenging problem that cannot be solved by technology alone. It calls for a more general solution in which an overall theory of the human mind, body, and sound is needed.

How such a theory and technology of music mediation should look, and how an intermediary relationship between encoded musical information and the intentional use of that information should be worked out, is the major topic of this book. Given the challenge and interdisciplinary grounding of the problem, technological aspects should be sorted out in collaboration with engineering specialists. Note that what I am going to offer in this book is just a theory, or perhaps just a viewpoint, not techniques or technical specifications related to technology. My focus will be on mind/body/matter relationships rather than on the tools that implement their connections.

However, as always, a good understanding of the problem is half-way to the solution. Therefore, the first thing needed in order to build the theory is an understanding of the practice of music signification: of how humans engage themselves with music and why they do so. From there, it will be possible to outline the main themes that should be taken into account. Accordingly, this chapter introduces the problem of music signification and aims at analyzing the main themes of a theory of music mediation. Section 1.1 introduces the distinction between direct involvement with music and description of this involvement. In both cases, it seems that subjective engagement with music is important. The section 1.2 considers to what extent a subjectivist approach can contribute to a technology of music mediation. In section 1.3 it will be

argued that the position of subjectivism is difficult to maintain because of its weak philosophical foundation in skepticism, but an alternative subject-oriented account, based on human action, can be proposed. In section 1.4, this action-oriented alternative is considered in terms of three foundations: linguistic descriptions, corporeal descriptions, and the call for a transparent, technology-mediated access to music. These three foundations will form the framework for the chapters that follow.

1.1 Experience and Description

Musical sound can have a large impact on a human being, and this impact may be beneficial or, in some cases, harmful. For example, music can be beneficial for personal development, such as the forming of a personal self or identity, or for social bonding, such as the forming of a group identity (Hargreaves and North, 1999). Music may enhance sports activities and consumption (Wilson, 2003), and it can have healing effects (Thaut, 2005). On the other hand, there is evidence that certain types of music can have a harmful effect, even driving people to self-destruction and suicide (e.g., Maguire and Snipes, 1994; Wintersgill, 1994; Gowensmith and Bloom, 1997; Scheel and Westefeld, 1999; Stack, 2000; Lacourse et al., 2001; Rustad et al., 2003).

In this book, I take it for granted that music can have a powerful effect on humans, and I focus on a better understanding of this effect. This is necessary for two reasons: first, for the development of technologies for music mediation, and second, for improving our involvement with music and our use of music. Obviously, technologies for music mediation may facilitate access to music and, therefore, contribute to a better involvement with music. Technologies will be treated in the last two chapters of this book. Before that, we need to know what is meant by “being involved with music.”

Involvement assumes a relationship between a person (henceforth also called a subject) and music. This relationship may be either direct or indirect. Figure 1.1 provides a schematic view of the subject/music relationship in terms of direct and indirect involvement.

First consider the notion of direct involvement with music. Many people try to get in direct contact with music. Why do they do so? Why do people make great efforts to attend a concert? Why do they invest so much time in learning to play a musical instrument? What is so attractive about music that all cultures have music, and that people want to repeat the musical experience many times?

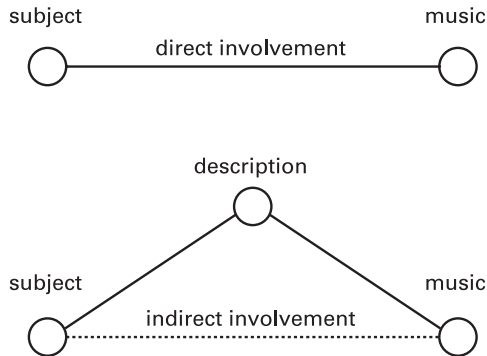


Figure 1.1

Schematic representation of the relationship between a subject and music in terms of access.

One plausible answer is that people try to be involved with music because this involvement permits an experience of behavioral resonance with physical energy. People seek such an experience with sound energy (among other types of energy) because they are moved by it and get absorbed by it, thereby attaining a particular feeling of unification with reality (Jourdain, 1997; Lowis, 2002). It may be assumed that this behavioral resonance gives a feeling of self-reward which is beneficial for their self-identity, interpersonal relationships, and mood (Hargreaves and North, 1999). Being involved with music may take the mind away from the routines of everyday life. It may contribute to mental order, and the general effect is happiness, consolation, and well-being. The effort is likely to be based on self-motivation, and the reason people try to reach this level of direct involvement may be largely for its own sake (Csikszentmihalyi, 1990).

This type of involvement is direct in the sense that it is a matter of corporeal immersion in sound energy, which is a direct way of feeling musical reality.¹ It is less concerned with cognitive reflection, evaluation, interpretation, and description. This involvement is a purely subjective activity based on personal opinions and feelings and on social musical activities such as being part of an audience listening to music at a concert or being part of an ensemble playing music. In essence, the feeling of being directly involved is something personal, experienced only by the subject. It does not require great skills to have direct involvement with musical reality, but if they are desired, great skills can be developed. In

fact, the skills needed to deal with musical reality may vary largely—depending, for example, on whether it is just listening to music or playing it.

Next, consider the indirect way of being involved with music. This way proceeds by means of a mediator, such as a linguistic description of music, a score, or an audio player. The score and the linguistic description are examples of symbolic mediators. They mediate access to music as mental representation, but not access to music as sound energy. In contrast, the audio player is an example of a physical mediator. It mediates access to music as sound (or physical) energy, and via this way it is possible to form a mental representation of the music that is heard.²

1.1.1 Behavioral Resonance, Awareness, and Description

The relationship between direct involvement and indirect involvement, or between behavioral resonance and description, is peculiar in that the one does not exclude the other. In fact, it often happens that direct and indirect involvement reinforce one another. In this relationship, awareness (or consciousness) plays a central role.

Awareness can be seen as the subject's knowledge of the state of the environment in which music occurs. This knowledge may be a key factor in establishing behavioral resonance with music. In a concert hall, it may involve a process of mutual adaptive behavioral resonances (called entrainment; see Clayton et al., 2004) between musicians and the audience in the concert hall. The shared focal point, the attention of the audience directed toward the performers, the movements of other people: all may contribute to the “magic” atmosphere that facilitates direct involvement with what happens on the scene.

Yet, being too much aware, being too conscious of the musicians and the audience, may engage the mind in thinking and reasoning about the others. Activities such as reasoning, interpretation, and evaluation may disturb the feeling of being directly involved because the mind gets involved in a representation of the state of the environment, which distracts the focus and, as a result, may break the “magic spell” of being entrained. That is why the measurement of musical involvement by introspection is so difficult. Asking a subject to move a slider according to the self-evaluated degree of resonance with music engages the subject's mind in a process that may break direct involvement. As soon as direct

involvement is self-evaluated and mentally represented in a conscious way, it seems to disappear. Verbal description is even worse because it requires that the situation first be mentally interpreted and then made explicit in verbal terms.

It is a likely assumption that awareness and immersion have to be balanced in order to be effective. As soon as awareness becomes too dominant and turns into a mental activity involved in representation and description, it may disturb behavioral resonance and entrainment.

1.1.2 The Need for Description

It would seem that direct involvement is what most people are looking for in music, whereas description is a disturbing factor in our relationship with music. Yet descriptions of music have a strong appeal to human communication needs as well. After all, the sharing of experiences by means of descriptions, shapes social bonding and is self-rewarding.

Information from other persons can establish the cognitive apparatus required to be able to make sense of music and thus to be involved with it. For example, modern music can be difficult to understand, but a proper description of the cultural context in which the music has been created may help greatly in appreciating it. Thus, description can open the ears to unknown aspects of the music. That is why talk about music is a daily occurrence. Even when the descriptions are incomplete, vague, and even partly incorrect, talk is often the only vehicle by which we can communicate about musical experiences, share our experiences, and make sense of them. While description of music may be secondary to the real world of music, it may serve as a tool to get involved with it. Description may set the resonance filters, deepen the involvement, and provide a signification. Therefore, it would be very useful to integrate that property into a music mediation technology.

The fascinating issue here is that a description may be of interest even if it is largely incomplete. For example, most descriptions of music are fairly general and abstract, such as “a melody which goes right to the heart,” “wonderful colors,” or “energetic rhythms.” Yet these descriptions may be sufficient for other people to want that music, to purchase it, and to get involved with it.

In talking about descriptions it is important to note that what most people hear in music is often determined largely by the cultural context in which the music is heard. Often, the cultural context is rarely mentioned. Nevertheless, incomplete description works because the users of

this description share common experiences and probably a common cultural context as well. This common cultural background is often known tacitly and, therefore, it need not be made explicit in the description. If the shared cultural context is an experienced context, then only a few words may be needed for people to understand each other. It can be assumed that descriptions work rather well with music, because, as humans, we share the experience of music, and often we also share the context in which music is happening.

Another important observation is that most descriptions of music are normally not directly observable in the sound energy that makes up the musical signal. Even if properties of sound energy are visualized, descriptions often cannot be directly associated with them. Indeed, how could we relate the term *beautiful* to some pattern in the sound energy? Many descriptions of music stem from subjective experiences which involve personal memories and interpretations of the cultural environment and social functions in which music appears. This tension between music and its linguistic description is well known in musicology. It has led to the widespread belief (in musicology) that description of music is all about this subjective involvement. People communicate about music because it is an essential aspect of life, giving meaning to the surrounding world, and because of shared musical experiences and musical contexts. Description forms part of a signification practice in which it helps people to get access to music. Therefore, it has been suggested that musicology should address signification practice. Musicology would be most useful for setting the cognitive resonance filters necessary for having access to music.

Yet, the type of description discussed so far is mainly based on abstraction, conceptualization, and verbalization. One may question whether this so-called linguistic description is the only possible form of music description, and whether alternative forms of description—nonlinguistic—should be considered which involve different levels of awareness and different perspectives of observation and signification. For example, a graphical description based on body movements of subjects involved in direct experiences with music could become an item for nonlinguistic description and further use in technology. In this book, I intend to show that embodied involvement with music may offer new possibilities for music description that challenge the role of linguistic description in music signification practice. The sections that follow explore the difference between linguistic descriptions and nonlinguistic descriptions of music in more detail.

1.2 Description as Subjective Interpretation

Musicology is traditionally concerned with musical signification practices in which linguistic-based description plays a central role. Musicologists tend to assume that direct involvement with music has an individual and subjective bias which can be given a meaningful interpretation in relation to a cultural and historical context. The nature of this interpretation process is worth considering in more detail. To what extent does this musical signification practice (and derived hermeneutic methodology) provide access to music? And how can it be linked with technology?

1.2.1 Signification Practice

The basic rationale of signification practice is that interpretations of music can be turned into verbal descriptions that help people to get in contact with the meaning of music. Descriptions reveal hidden meanings. They provide access to signification, and hence may enhance the level of direct involvement with music.

The task of musicology is to reveal the meaning of music by linking the subjective experiences with a broader historical and cultural context. The method for doing this consists of a speculative pursuit of potential interpretations (Hatten, 1994).

Description as Subjective Interpretation

According to Tarasti (2002, p. 117), “Music has always a content, and this content has a conventional, arbitrary relationship with its signifier, i.e. the aural and physical embodiment of the musical sign.” In similar words, Hatten (1994, p. 275) says, “Meanings are not the equivalent of sounding forms. The linkage between sound and meaning, though mediated by forms, is also mediated by habits of association that, when stylistically encoded, produce correlations, and when strategically earned (inferred through a stylistically constrained interpretive process) produce interpretations.” Monelle (2000), for example, speaks about cultural temporalities and themes whose functions we can understand in particular contexts.

However, reference to a broader historical and cultural context does not necessarily imply that the clarification of musical meaning is just a discourse about something outside music. Rather, what counts is the interaction between the experience of involvement and the cul-

tural context (Scruton, 1997). This dynamic interaction draws on subjective grounds. It means that the interpretation, and hence the description, may change, depending on the subjective bias of the moment. Indeed, the cultural context is an extramusical reality which is shaped through arbitrary conventions that form part of our background and through which we have direct access to music. We use context to experience music, and we give significance to experienced music with reference to that context. A proper musicological interpretation, and associated description therefore should be based on a well-informed cultural and historical background.

1.2.2 Hermeneutic Methodology

A description of the fourth movement of Beethoven's Piano Sonata in A (op. 101) (Hatten, 2003; based on Hatten, 1994) makes it easier to understand the methodology of cultural musical signification (and its associated approach to music description) in more detail. The example aims at clarifying the way in which music may create figurative meanings (metaphors) in the eight-bar theme of the opening of the fourth movement (figure 1.2):

The fanfare-like allusion to victory in the first four bars is made authoritative by the *simultaneous* use of a 2–3 suspension chain from the learned style. The *successive* use of musette-like sixteenth-note swirls over a pedal in the next four bars evokes the pastoral, tropologically elevated by the juxtaposed learned style to a “high” pastoral emblematic of the spiritual or sublimely serene. The pastoral is



Figure 1.2
Beethoven, Piano Sonata in A (op. 101), beginning of the fourth movement.

contiguous with the fanfare and learned style in the narrow confines of a thematic period, and the result of their implied interaction is a fresh, emergent meaning that draws upon elements of each of the topics—something along the lines of “authoritative inner victory of the spirit,” as opposed to the more familiar “heroic outer victory of the will.” (Hatten, 2003, p. 82)

Hatten’s description involves correlations of elements of musical structure with stylistic categories, all embedded in semantic interpretations that are driven by subjective experience. Hatten distinguishes no fewer than three stylistic categories: in the first four bars, the heroic style which is fanfare-like, based on a diatonic scale, played forte; the learned style, which uses imitation and implied 2–3 suspensions; and, in the last four bars, the pastoral style based on a soft, musette-like syncopated pedal point, flowing sixteenth notes in simple stepwise motion. According to Hatten, a first metaphor, or figurative meaning, emerges through the synchronic interaction of the heroic style with the learned style, such that the learned style enhances the heroic style to become authoritative. A second metaphor then is formed by the diachronic interaction of the learned-heroic (first four bars) and the pastoral style (second four bars). The learned-heroic style has an effect on the interpretation of the pastoral in that it becomes an inward spiritual victory instead of an outward heroic triumph.

The methodology thus becomes visible: particular musical configurations, made up of melodic, rhythmic, harmonic, durational, and textural elements, are related to knowledge of stylistic categories (called topics or themes). This forms the reference framework for the creation of stylistic opposition whose markedness gives rise to figurative meanings that are called musical metaphors or tropes. A narrative is thus constructed which relates musical structure to cultural meanings. In this method, subjective experience forms the basis of selecting the proper correlations and interpretations.

The method is known as the hermeneutic method. It is a speculative method because it is hard to prove that an interpretation (and its description) may be true. Several interpretations of a single musical fragment are possible. At best, an interpretation can be argued to be relevant given the cultural and historical context.

1.2.3 Dealing with Intentionality

In this approach, a description is conceived as a description of the music’s intentionality, that is, a description of musical configurations

having (presumed) intentions. This relates to human intentional actions, providing a natural level at which musical meaning can be accessed. Through the description, music can be understood in relation to subjective actions. Examples are configurations that express the “inner victory of the will” or that point to cultural contexts, such as “the heroic” or “the pastoral.”³

Interestingly, the observation that the description of subjective experience draws strongly on the notion of intentionality is not new. It has been addressed by musicologists from the continental European hermeneutic tradition (see, e.g., Faltin and Reinecke, 1973; Stefani, 1975). The main idea is that musical intentionality shows itself in musical configurations that, in a goal-directed way and through convention, are related to certain stylistic categories having a foundation in history and culture. The hermeneutic method is assumed to reveal this relationship. The method can be conceived as a projection of musical structure onto stylistic-conventional categories through the lenses of subjective interpretation. Compared with structuralist trends in musicology, this approach entails a liberation of the subjective interpretation beyond the confines of mere formal descriptions.⁴

For some musicologists, the uncovering of the music’s intention is the main goal of music descriptions. Tarasti (2002, p. 24), for example, expresses this point of view clearly when he says that the reduction of a musical phenomenon to a statistical fact is anti-semiotical in nature: “For semioticians to model a phenomenon in *hard-science* terms is a kind of mystification, since we deal primarily with human, cultural, and social behaviours—not physical laws.” The music’s intention is considered to be a category that belongs to the mental world. Any engagement with music is a signified engagement in that it is about personal experiences, intuitive judgments, and interpretations, which are hardly accessible with scientific methods. What musicology can do is provide descriptions which are grounded in a subjective ontology of experienced musical intentions. The discourse on music thus fosters the beliefs (a) that we engage with music exclusively in the mental sphere, (b) that description has a subjective bias, and (c) that what is described is the interpreted intentionality of music.

1.2.4 Mediating Access to Music

The speculative pursuit of potential meanings has been the basis for a multitude of approaches that draw on music analysis, introspection,

phenomenological analysis, and historical and cultural contextualization (Tarasti, 2003). The question which concerns us here is to what extent these approaches can be of practical value in a technological environment that mediates access to music. I am thinking in particular about two important contexts of mediation that form the topics of two chapters in this book: interaction with musical instruments (chapter 6) and search for and retrieval of music (chapter 7). To what extent can music description, perhaps one that is based on a speculative pursuit of potential meanings, be relevant in human–machine interactions and interactive music-making? To what extent can such a description be taken as a starting point for applications that aim at finding music in a large database? What other types of description are possible in relation to mediation technologies?

Two entirely different approaches can be considered here. One approach, attributed to subjectivism, states that the involvement with music is so subjective that it cannot be related to mediation technology. An alternative approach, which is action-based, states that aspects of subjective involvement may subsume certain regularities which can be related to mediation technologies.

1.3 The Subjectivist Approach

Subjectivism holds that experiences can provide a basis for speculative interpretations of how music feels and what it means. Yet such descriptions are not based on any plan or principle because the cultural bias and the personal interest of a subject do not obey such principles. For that reason, music descriptions are assumed to be highly arbitrary with respect to physical reality. Consequently, if there are no regularities that govern the relationship between experience and physical energy, then there is no ground for the development of a mediation technology. For that reason, subjectivism is rather skeptical about possible mind/matter interactions (e.g., Välimäki, 2003).

I believe that subjectivism has a point in stressing the particular subjective nature of the musical experience. Yet skepticism with respect to possible correspondences between mind and physical reality may be unjustified.

1.3.1 Dualism

First, consider the idea that the individual subjective experience is detached from a physical reality. This viewpoint is difficult to maintain in

the light of recent insights. In particular, neuroscience has provided compelling arguments that the Cartesian division between mind and matter can no longer be maintained and that a disembodied mind as such does not exist (see, e.g., Damasio, 1999; Jeannerod, 2002; W. Singer, 2002). The brain has no center that connects the parallel worlds of mind and matter, as Descartes once suggested. In contrast to dualism, the concept of mind is seen as an emergent effect of the brain perceiving its own actions in relation to a physical environment (Erneling and Johnson, 2005). From that perspective, the subjective world of mental representations is *not* an autonomous category but a result of an embodied interaction with the physical environment.

In addition, evolutionary biologists do not find any evidence in support of a sudden qualitative difference between animals (in particular, primates) and humans. Instead, they assume a fluent evolutionary process from sensory to mimetic to more symbolic activities (Rizzolatti and Arbib, 1998; Fitch, 2005). In this evolutionary process, the body, or motor activity, is seen as the natural mediator which finally realized the development of mental representations, or mental models, of the physical environment. In other words, the mental world is not something of a different order to which humans suddenly gained access. Instead, it is the result of a gradual evolutionary process in which gradations of mental involvement, from animal to human, can be distinguished (Tomassello, 1999; Dautenhahn and Nehaniv, 2002; Meltzoff and Prinz, 2002).

By focusing almost exclusively on a disembodied mind, subjectivism puts itself into a difficult position with respect to modern insights. And apart from that, the latent fear that the subjective experience of music would be less important in an approach which considers mediation processes between physical energy and mental representation is totally unjustified, as modern science fully acknowledges the role of subjective factors in human action.

1.3.2 Relativism

A second point concerns the arbitrary character of musical descriptions. The idea that music descriptions relate in an arbitrary way to physical reality follows from a disembodied mental perspective and its implied neglect of a relationship with physical reality. This position may ultimately lead to a kind of relativism which holds that music descriptions cannot be argued about, that descriptions are incommensurable, and that all opinions have equal value. In other words, that there is no truth, or no

truth correspondence, for music descriptions, and therefore all opinions are equally arbitrary.

I tend to avoid this kind of relativism by arguing that there are aspects of music experience that can be described and can be useful in mediation technology. Not all aspects of subjective experiences may be grasped in descriptions, yet there is sufficient room for considering particular correspondences between subjective experiences and physical reality that could be useful in a context of music mediation. The proof of this statement is contained in the subsequent chapters of this book.

1.4 The Action-Based Approach

A way to proceed is based on the idea that action may play a key role in mediation processes between the mental and the physical worlds. The concept of action allows sufficient room for taking into account subjective experience and cultural contextualization, as well as biological and physical processes. Actions indeed are subjective: they can be learned, they often have a cultural signification, and they are based on the biomechanics of the human body. In that sense, actions may form a link between the mental and the physical worlds.

In what follows, I argue that the action-based approach calls for a reconsideration of the notion of music description which, so far, in music signification practice, has merely been associated with linguistic-based descriptions. Three viewpoints are introduced: (a) a reconsideration of the role of linguistic music descriptions, (b) the possibility of having non-linguistic descriptions of music, and (c) the role of action in media technology, particularly in technology-mediated access to music. These three viewpoints define a general framework for an action-based account of musical involvement which will be worked out in subsequent chapters.

1.4.1 Linguistic Description

First consider the role of linguistic description of music. It is of interest to reconsider the basis for having linguistic descriptions of music. What is the essence of a linguistic description? What can it handle, and what does it hide? In what follows, linguistic description is approached from three different perspectives: the facts that it is proposition-based, that it is socially embedded, and that it is referentially flexible (Tomasello, 1999).

Propositional Basis

The propositional character of a linguistic description of a musical experience implies symbolic communication. The sender encodes the experience in a symbol, a formal entity chosen by convention which the receiver decodes and understands.

The main advantage of this approach is that instead of having to undergo the experience of the sender and feel what it is like to be involved with physical energy—with all the possible positive or negative consequences that can be associated with the experience—the sender can encode the experience in linguistic format and communicate about the experience. The meaning of the experience can be clarified by describing the event and the context, and an interpretation can be given with respect to these. By the sender's doing so, the knowledge, told as a narrative, can be of great interest to the receiver. The major advance is a rapid spread of knowledge which the receiver can exploit when confronted with similar events.

As this is applied to the Beethoven sonata, I may have listened to the sonata many times, and have enjoyed the music, but I may have missed the viewpoint that the two contrasting passages, which I experienced as being rather different in expression—the one violent and the other more calm—represent inner and outer victories of spirit and will. Thanks to a story about the romantic ideal of the pastoral and the heroic, I may be able to hear the music in terms of this potential intentionality. With this knowledge, I may enhance my direct involvement with music. Whereas before, I was engaged in the episodic nature of the note sequences, or in the mimetic character of the expressiveness of calm and forceful emotions, the narrative has disposed me to hearing the music in terms of potential goals. In that sense, the narration has changed my perspective of listening because I now hear the intentions of inner and outer victory. In this way, I have access to music at the level of an interpreted (or better, attributed) musical intentionality.

The narrative can be helpful in understanding the music in terms of previously unnoticed or unknown symbols and significations. It can set the filters for having direct involvement with music. Without the narrative, it might be difficult to access this particular potential meaning of the music.

Social Basis

The narrative discourse is furthermore a logical discourse, but being logical means that there exists a common social and cultural ground for the

receiver to understand the sender's use of symbols. This common ground is characterized by projections of personal experiences onto the narration, and these projections are understood because the receiver has similar personal experiences and works with similar projections or "language acts" (Searle, 1969).

Attention has been drawn to the fact that natural language is a symbolically embodied social institution that arose from previously existing social-communicative activities (Tomasello, 1999). The grounding of the logics, and the fact that we can communicate experiences in this way, are rooted in a social basis. It means that a linguistic narrative communication rests on an understanding of other persons as agents with characteristics similar to our own. What the sender says about musical experience can be important for the receiver, because the latter is a member of the same social group. Owing to that social context, the receiver can easily understand the intentions of the sender because they can be understood as projections of the receiver's own intentions.⁵

It can be speculated that during the course of evolution, the sharing of experiences through narration must have been a tremendously powerful tool that allowed humans to react in more efficient ways to the environment, to the benefit of their survival (Donald, 1991). In the context of technology-mediated access to music, there is no reason to believe that the linguistic format of communication, through speech or text, would become less important as a method of conversation.

Referential Accuracy

A most powerful property of linguistic descriptors is their ability to express the nuances of subjective interpretations. Much depends on the context of the signification practice, but melodies and rhythms can be brought into association with a whole world of extramusical meanings and significations. Expressing these interpretations in a clear way is one of the fundamental properties of language. Symbols are good at capturing the differences in interpretation. No other description format allows users to make distinctions between the often subtle meanings associated with music.

To sum up, the above considerations show that linguistic description has a number of attractive features that can be used in the context of modern technology-based access to music. Yet, in description of music, these features should be compared with features of the nonlinguistic description. It will turn out that linguistic description can capture only a limited aspect of the musical experience.

1.4.2 Nonlinguistic Description

Next, we consider the role of nonlinguistic description of music. From the above, it is clear that the linguistic description detaches, as Tomasello (1999) says, its vehicle of communication from its perceptual and sensorimotor basis. In other words, the symbols communicated from sender to receiver do not represent the involvement with music in a direct way. Symbols are not the source that gives rise to the experience. Instead, they are about the music and about the musical experience. Symbols provide a mental access to music, with the likely effect that the contact with the spatial and temporal schemes that music induces is somehow lost. Indeed, musicologists have often acknowledged that the linguistic approach to music description is in principle not capable of accurately describing or translating musical experience (Bengtsson, 1973; Eggebrecht, 1973). Do we have any alternatives, then?

Moving Sonic Forms

One idea, defended by Hanslick (1891; originally published in 1854), is that music consists of form relationships without defined meanings, just like architecture and dance. A building, for example, does not mean something; it just shows its formal structure. A dance does not mean something either; it just shows its moving forms. In a similar way, says Hanslick, the content of music is “*tönend bewegte Formen*” (moving sonic forms).

Clearly, one can interpret buildings, dances, and music as being the expression of something culturally significant. But that interpretation, according to Hanslick, is a symbolic activity and therefore cannot be anything other than a subjective potentiality. Instead, forms, and in particular moving forms, have a direct impact on human physiology because they evoke corporeal resonances giving rise to signification.

Corporeal Engagement

The notion of moving sonic form, with emphasis on the fact that these sonic forms move and have a physical impact on our bodies, is highly interesting. Moving sonic forms do something with our bodies, and therefore have a signification through body action rather than through thinking. Therefore, this type of signification could be called corporeal signification, in contrast with cerebral signification.

Unfortunately, corporeal signification is difficult to express by using linguistic descriptions. The reason is that motor activities are difficult

to access because our awareness of them is limited. As a result, descriptions of corporeal signification can hardly be based on the hermeneutic method because the latter focuses on interpretation and symbolization of a mental awareness involving music. Therefore, if corporeal signification is indeed a genuine form of direct musical involvement, then alternative methods different from linguistic descriptions should be explored that allow us to fully capture the corporeal aspect as an aspect of meaningful signification.

A motivation for considering forms of music description that differ from linguistic descriptions is that many people do not engage with music in terms of narrative reflections or interpretations of the music's intentions. This is evident in concert halls, where people communicate mainly with their body language. It is also supported by recent research in musical social behavior (North et al., 2004) which shows that there are many different uses of music. Many people will not have the necessary background in music analysis, history, and culture that would allow them to project subjective experience onto a linguistic narrative of cultural meanings. Does this mean, then, that all these people are barred from making sense of music?

Instead, what can be noticed is that people prefer to listen to music for the sake of its direct corporeal value: for relief after a stressful day, for getting in a good mood, or simply for distracting the mind from repetitive working activities. They seek access to music for the sake of its capacity to get into behavioral resonance and for the effects it has on mood. During these activities, most people tend to engage with music in a corporeal way rather than a cerebral way. They move about, they dance, and they actively gain enjoyment from the music. They interact with musical instruments, they play, and they engage in activities that require high-level motor skills. In those situations, signification is not merely a matter of projecting one's own experience onto cultural categories, nor is it the creation of linguistic, symbolic meta-experiences through linguistic narration that counts. Signification, most often, is just a matter of focus and direct involvement, and sometimes even a deliberate avoidance of rational thinking, getting away from awareness and description. The source for these experiences is clearly not the kind of intentionality and signification practice on which subjectivism focuses; rather, it is an embodied intentionality and signification practice that closely attaches to moving sonic forms, as if such forms engage us in behavioral resonances that we cannot resist.

Corporeal engagement with music therefore broadens the perspective of what musical communication is about. It forms a basis of a whole range of interactions with music. Apart from

- Interaction based on linguistic or verbal narrative descriptions and
- Interaction based on symbolic or visual signs with information stored in lists, such as scores and tables containing descriptions of musical properties based on visual icons,

we should also envision

- Interactions based on mimetic skills, or rehearsed action scenarios, such as playing a musical instrument,
- Interactions based on goal-directed gestures that do not require highly developed skills but nevertheless may be highly culture-dependent, such as symbolic gestures, and
- Interactions based on direct episodic action sequences, involving responses based on our emotive, affective,⁶ and expressive capabilities.

In other words, the corporeal basis of musical involvement allows a large variety of interactions with music. The next question to be answered, then, is whether these interactions may form a basis of music description.

Gestures and Description

If moving sonic forms engage subjects in a process of corporeal signification, then it is very likely that body movement provides the key for alternative nonlinguistic descriptions of music. If this can be combined with technology, then it may be possible to develop a proper technology-mediated access to music. Such nonlinguistic descriptions, based on body movement, can range from deliberate actions to spontaneous behavioral resonances.

A simple example of a deliberate action that could be considered as a description of music is hand movement. Hand movements were used by the ancient Egyptians to indicate melodic movement (Gerson-Kiwi, 1995).⁷ They have an appeal to forms of conducting or to forms of description that allow the expression of moving sonic forms. A simple form of movement is tapping along with a finger, but most people are capable of making more elegant hand movements when listening to music.

In many cases, body movements may express structural properties of music, such as pitch going up or going down. But other properties, such as objects coming closer or moving away, or sensitive properties of objects, such as the feeling of roughness or volume, can also be expressed using body movement. Obviously, these body movements can have different degrees of sophistication. They can be spontaneous as well as planned or arranged; they can be natural as well as conventional. The latter implies imitation learning, and perhaps intensive rehearsal, in order to acquire the necessary skills. Playing a musical instrument is a typical example of a very sophisticated motor skill, and the movements of playing the instrument are likely to tell us something about the signification process of the player.

In that sense, dealing with sonic moving forms in terms of body movement provides descriptions that are based on perceptual and sensorimotor mechanisms. These descriptions can be communicated and understood by other people. They may imply cultural background as well. By means of gestures, musicians tend to put cultural knowledge in their playing. Part of this cultural knowledge is likely to be nonlinguistic, such as the knowledge of stylistic gestures (that is, sequences of elementary musical movements which are relevant for a particular style at a particular place in a particular period of time). Grace notes in the execution of musical phrases of baroque music provide a good example of this. In short, there is indeed a basis for the ideas that (a) certain aspects of music can be communicated without linguistic descriptions, using body movements as description format, and (b) that linguistic descriptions can be based on these body movements.

Social Basis and Flexibility

It may furthermore be assumed that gestural utterances, like linguistic utterances, rely on an intersubjective basis of shared understanding. Because of that social basis, gestures may become signs that act in ways similar to linguistic symbols—sign language, for example.

Yet in comparing gestures to linguistic symbols, it is evident that gestures are more restricted in their possibilities to express different meanings. The limited referential flexibility of gestures, and the fact that they are less precise in embodying the viewpoint of an interpretation, are due to the fact that the representational format draws on corporeal realizations and their perception as spatiotemporal images rather than propositions. Gestures, unlike linguistic utterances, are not detached from

their sensorimotor basis, and therefore their accuracy for describing interpretive nuances is much more limited. This connection between form and content can be seen as a limitation, but it is at the same time one of the most powerful properties of gestures.

The sensorimotor basis of gestural communication may account for the fact that music from a largely unknown culture in Africa, for example, can have a meaning for Western listeners. This meaning then draws upon gestural forms of communication which can be picked up because the physical constraints of human bodies are universal. Even if the cultural meanings of the gestures are unknown, it is still possible to experience and feel the corporeal meaning because the music has its foundation in a physical constitution that all humans share. It is not the connection with cultural context that matters at this level of musical understanding, but the fact that the physical energies of the music correspond with a physical disposition caused by being human. In addition, gestures form the basis of mutual adaptive behavioral resonances that create shared attention and are responsible for the feeling of being unified with other people. In that sense, one could say that the gestural language of music is universal, because its moving sonic forms share human corporeality.

Multimodality of Expression

Another important characteristic of nonlinguistic communication is the fact that forms or patterns expressed in one modality can be rather easily translated into another modality. In particular, this seems to be true for moving forms which have an expressive character (Lipps, 1903). The expressive nature of sadness, for example, can be communicated through different sensorimotor modalities, such as the movements of the human body, the color palette in a painting, or sonic forms such as slow tempo and legato in music. Given the multimodal basis of expressive communication, it is therefore of interest to study possible transfers from one modality to another.

Nonlinguistic descriptions, such as body movements in response to music, rely on the transfer of sonic moving forms to motor moving forms. The motor modality is then the expression of the original auditory experience and, as such, it can be considered a description of the original music with the body. But it also may give rise to new experiences, such as the visual or tactile perception of a moving body. In that sense, nonlinguistic descriptions blur the traditional distinction between experience and description because the description of a moving form in one

modality may become the source of a new experience of a moving form in another modality. It is exactly this dual capacity of sensorimotor behavior, based on the unity of form and meaning, that can be exploited in combination with technologies that allow the registration of the physical energies (light, sound, pressure, etc.) that go along with moving forms.

To sum up, moving sonic forms may be captured by corporeal articulations (gestures). This may form the basis of a kind of music description that is of interest to music mediation technology. The fact that sensorimotor-based descriptions have both form and meaning contained in a single representation is both a weakness and a strength when compared with linguistic descriptions. It is a weakness because gestures offer less referential flexibility and are vague. At the same time it is a strength because gestures in one modality can be captured and translated onto another modality. Moreover, they provide a basis for mutual adaptive behavioral resonances, which is the basis of direct social involvement with music.

1.4.3 Technology-Mediated Access

Finally, consider the role of technology-mediated access to music. The main argument why corporeal-based involvement with music should be studied further, in addition to linguistic descriptions, has much to do with the unique role of technology with respect to music: that access to music nowadays proceeds via digital technology. This is the case in music production, music description, and music consumption.

Media technology, the infrastructure for sound production, sound distribution, and sound consumption, has had a very profound impact on musical culture and the associated signification practices. In the course of the twentieth century, music culture became almost completely dependent on highly technical infrastructures. Every small group playing popular music nowadays has electronic music instruments and personal or portable amplifiers. Composers use computers for composition and store their scores in electronic format. Concert halls use amplifiers to improve the acoustics. Music is recorded with advanced electronic equipment and recorded sounds, and once it is captured, is burned on CDs with laser technology, or is put on large mass-storage devices from which backups are taken on magnetic tapes. Music files are put on the Internet in compact MP3 format and distributed over cables, or wirelessly, to small devices that people can carry in the palms of their hands or hang around their necks. Thus, involvement with music depends largely on

technology. This situation creates dependencies as well as opportunities for musical involvement.

Dependencies

Dependencies occur when technology becomes a necessary instrument for human action. A concrete example is Napster. At the time of its introduction in 1999, Napster was considered a revolutionary technology for music distribution because it allowed millions of users to directly share their hard disks and exchange music files over a distributed network topology. Equally revolutionary was the clear effect of this file-sharing on user behavior. Communicating music, from that moment on, became a matter of sharing files.⁸ The ease and speed of the technology was the real reason for the breakthrough of file-sharing systems, with a clear effect on how people behave with music (Kusek and Leonhard, 2005). More than ever, a piece of music has become a commodity which is rapidly consumed and thrown away in order to make a place for the next consumable. Browsers have become necessary to access information on the Internet and users have become dependent on them.

Opportunities

However, this technology has also created new opportunities. The most important, perhaps, is that a larger number of users have unlimited access to music. They can learn about music and experience a broader range of music. After all, sharing files is nonrivalrous activity. The original owner retains a copy of a downloaded file and does not affect ownership of that file by sending copies to others. Users can browse the files of other users and discuss the music in the chat rooms of online communities. The Internet thus offers a new context for the verbal description of music, and it is available at almost no cost. It allows users to read phrases about music, to learn to describe music, and thus to have direct content-based access to music. In that sense, the Internet offers a new platform for learning more about music (audio files), charts (song rankings), discussion forums, and artist biographies and information (Salavuo, 2006). This learning is based on cognitive diversity and distributed expertise. Finally, sharing files contributes to new sampling practices, such as audio mosaicing (Lindsay, 2006), and reinforces the culture of music remixes and free distribution of original sounds and musical excerpts. In short, media technology has provided a number of new opportunities for music description and for having physical access to music.⁹

Content-Based and Experience-Based Technologies

While the Napster experiment and related experiments with recent peer-to-peer technologies indicate that user behavior is changing due to the introduction of new music distribution technology, this change in user behavior in turn has had an effect on the development of media technology. Users started to use this technology as a recommendation engine, and they may be interested in using more advanced tools in order to further facilitate access to, selection of, and retrieval of music (Lesaffre, 2005). Also, in music performance, advances in technology have gradually been extended in the direction of active resources for expressive enhancement. Examples are installations which interact with humans in an artistic/expressive way (Camurri et al., 2005).

In that sense, modern electronic infrastructures have created a new demand for a content-based and experience-based access to music, which implies a broadening of the current focus on encoding and transmission of the physical signals to content-based processing, data-mining, and interactive engagement with sophisticated systems for music generation and audio control.

Unfortunately, linguistic interaction with modern electronic infrastructures is still the dominant form of access to information. Content-based access to images and sounds is currently far underdeveloped, and most modern technology does not allow users to interact with machines in a sophisticated way involving body language. For that reason, technology is often an obstacle because it does not provide an intermediary between the human mental approach to music and the machine encoding of physical energy. What is needed is a technology which no longer is an obstacle between the human subject and the music. The technology should become a tool that enhances subjective access to music.

The call for advanced content-based and experience-based technology characterizes a recent trend in the development of music and the multimedia industry, one that will allow users to engage with virtual agents that provide access to physical information streams (audio, video, etc.), related stories (text-based contextual information, lyrics), visual data-mining tools, and controls based on the recognition of human gestures and the expressiveness of communication. This offers a challenging opportunity for music research.

External Storage Systems

These recent developments in media technology require a reconsideration of Donald's claim (1991, p. 321) that "temporal codes and phonological

codes, the two retrieval workhorses of episodic and oral memory, are largely irrelevant to managing the external storage system.” Donald stressed that formal education was invented mostly to facilitate the use of external symbolic storage systems for cultural products, and that experts in a field are those who have learned to be adept in accessing and using the relevant parts of the storage systems.

However, in view of what has been said above, it is likely that the focus on linguistic and symbolic storage systems should be broadened to include storage systems that have encodings of physical energies. Such storage systems make a difference, compared with pure symbol-based systems, because they allow users to interact on the basis of biomechanical and physical energies rather than on the basis of symbolic descriptions. This interaction brings episodic and oral memory, but also motor activities and other aspects of human communication, such as moods, emotions, and affects, back into the foreground of research.

Networks of storage systems thus become sources of genuine experiences and direct access to music rather than sources of symbolic interaction. Users, for example, could sing part of a melody in order to find similar melodies, or they could describe characteristics of the physical energies of the melody with body movement, or give audio examples and recommend a list of similar melodies. Likewise, interactive music systems can interact with human users in ways that allow a fluent exchange of physical energies from human to machine and vice versa. Modern mobile devices can be extended with all sorts of visual, audio, tactile, haptic, and olfactory sensors. Thus they may provide tangible access to external storage networks and interactive machines.

If technology were able to capture aspects of subjective involvement with music, it might become a genuine device with which it would be possible to interact in ways fully compatible with human communication. From that moment on, access points to multimedia networks would no longer be passive devices based on semantic interpretation of linguistic and visual symbols. Instead, access points would have evolved to such a state that they began to become active extensions of the human mind and body, engaging in different types of intelligent interaction. Such devices would be capable of interpreting the user’s intentionality and connecting it with encoded physical energy. That opens possibilities for fully exploiting different aspects of musical communication.

To sum up, the main argument for exploring corporeal descriptions of music within a framework that unifies mind and matter is that technology has created a new context in which nonverbal forms of

communication can be used to access music in a physical as well as a mental way. This is a very simple argument, but a highly relevant one because it offers many new opportunities for musical mediation.

1.5 Conclusion

Musicology has drawn attention to the fact that direct involvement with music is a highly subjective activity which may form the basis for a speculative pursuit of possible interpretation and meaning formation. The hermeneutic methodology fosters projections of this subjective involvement to the music's assumed intentionality.

A branch of subjectivism stresses the exclusiveness of subjective involvement and interpretation, but advocates a general skepticism regarding the possibility of a technology of music mediation. An alternative position is based on an action-based account of subjective involvement with music. In this approach, direct involvement with music is assumed to be based on physical energies having an impact on the human body and mind. This action-based approach accounts for signification practices based on corporeal articulations (gestures). It further holds the promise of finding a connection with media technologies which offer ways to exchange physical energies with human corporeal articulations.

New media technologies call for a new theory for music research that goes beyond subjectivist dualism and relativism. Such a theory of music must do justice to the physical as well as the mental sources of musical involvement. The suggestion is that an action-oriented approach, based on the notion of corporeality, provides a possible epistemological foundation for bridging the gap between musical mind and matter. Music, indeed, has a large impact on behavior, and action can be seen as the corporeal component that contributes to signification. Speaking about corporeal components, however, involves speaking about physical energies. The study of corporeality requires an understanding of the relationship between mind, body, and matter, using methodologies that draw upon experimentation and computer modeling.

The task of the subsequent chapters is to develop the topics that have been introduced thus far: the relationship between a subject and its musical environment, and a model for corporeality that will allow us to make the connection between subjective apprehension and physical, physiological, and mental involvement with music.