Categories of Music Description and Search Terms and Phrases Used by Non-Music Experts

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ABSTRACT

Previous research has demonstrated that people listen to music for various reasons. The purpose of this study was to investigate people's perception of music, and thus their music information needs. These ideas were examined by presenting 22 participants with 7 classical musical pieces, asking one-half of them to write words descriptive of each piece, and the other half words they would use if searching for each piece. All the words used by all subjects in both tasks were classified into 7 categories. The two most frequently appearing categories were emotions and occasions or filmed events regardless of the task type. These subjects, none of whom had formal training in music, almost never used words related to formal features of music, rather using words indicating other features, most of which have not been considered in existing or proposed music IR systems. These results suggest that music IR research should be extended to consider needs other than finding known items, or items identified by formal characteristics, and that understanding music information needs of users should be prioritized to design more sophisticated music IR systems.

1. INTRODUCTION

Music information retrieval has flourished in recent years, and interested researchers from various fields have devoted efforts to designing a range of music IR systems. Most such efforts have been focused on known-item retrieval, best represented as sound-based music IR systems. Such systems are certainly important, since they address a long sought goal of a wide range of users, ranging from music librarians to ordinary music lovers. However, we can also think about other musical information needs of those who cannot, or do not wish to represent their music information needs in musical terms. More specifically, there may be other information needs for searching music than just by known items or the formally specified features such as title, composer, genre, or performer. As music IR systems have progressed in satisfying one type of music information need, it may be a good time to speculate and question if other types of music information needs have been unidentified.

Previous research has demonstrated that people listen to music for various reasons, and that they may be involved in many mental activities when listening to a piece of music. From the point of view of music IR, these complicated mental activities are one of the central barriers in designing user-oriented music IR systems, since there is no explicit way to explain these cognitive structures and processes. Further, it is even more intricate to integrate findings about them into design of music IR systems. People can express, convey, and experience relationships to anything definite or indefinite, tangible or conceptual through the medium of music. When it comes to "music as information," we do not have full understanding of how people might want such perceptions of music to be understood and responded to by music IR systems.

It is not the purpose of the present study to explore the "nature" of human cognitive structure and processes, rather, the purpose of this study is to find out if there are some other needs in music information without too much speculation about these mental activities, and to make future suggestions about what we can do with these unidentified needs. We thus go somewhat further than the few earlier exploratory studies in this area (e.g. [7]).

2. RELATED WORK

Wilson [14] states that some of the difficulties with identifying 'information needs' lie with the troublesome concept, information. Therefore, we believe that the concept of music as information should be understood as among the most important of the issues facing music IR. The work of McLane [10] on the concept of "music as information" is an exceptional contribution to the literature of this problem. Among his three views of musical work—subjective, objective, and interpretive views, the interpretive view is the one that we concentrate on here. According to McLane, a significant characteristic of this view is its formal independence from the document it addresses, and this view offers a means to search for noncontiguous relationships. Although the concepts of "subject" and "aboutness" are difficult in text IR, McLane points out that they are even more uncertain in music, and this is certainly one of the problems with music IR as discussed in Byrd & Crawford [3]. McLane (p. 240) concludes that, "[b]oth the choice of view for a representation of music and the degree of completeness of a work's representation depend on the user's information needs," and this convinces us that studying and understanding such needs is of primary importance for music IR.

According to Wilson [14], the central questions of 'information need (preferably 'information-seeking towards the satisfaction of needs' by the author') should be: why does the user decide to seek

information; what purpose does the user believe it will serve; and to what use is it actually put when found. He also notes that the study of information-seeking behavior can stand on its own as an area of applied research where the motive for the investigation is pragmatically related to system design and development. Furthermore, he asserts that the study of information-seeking behavior should be considered as an area of basic research and, although the resulting knowledge may have practical applications, there is no necessity that it should. Three basic 'human needs' adopted by Wilson (p. 7) from psychological research are as follow:

- *Physiological needs*, such as the need for food, water, shelter, etc.;
- *Affective needs* (sometimes called psychological or emotional needs) such as the need for attainment, for domination etc.;
- *Cognitive needs*, such as the need to plan, to learn a skill, etc.

These three categories of basic human needs and Wilson's approach are certainly of interest for the purpose of music IR. Wilson continues that most of the practical approaches taken by information scientists are more or less concerned with only a single facet of human needs, that is, cognitive needs. For example, he cites Belkin (1978) and Wersig (1971). The former notes that "[the] concept of an information recipient's 'anomalous state of knowledge' leads to 'an explicitly cognitive view of the situation with which information science is concerned' (p. 80)". The latter's (1971, cited by Belkin) view of information can be summarized as reduction in the uncertainty involved in problematic situations, which similarly connotes cognitive changes in the recipient of a communication. However, as Wilson notes, "because the situations in which information is sought and used are social situations, however, purely cognitive conceptions of information need are probably adequate for some research purposes in information science, but not for all. Information may also satisfy affective needs... (p. 9)." Even though Wilson further provides some examples of how far affective needs "may" be applied to some extent in information science in principle, the present study needs to further examine how these two different concepts of human needs—cognitive needs and affective needs—may be applied for the purpose of music IR. This issue will be explored in further detail in the next section.

It has been argued by many researchers that music in an aesthetic or philosophical sense, as well as other forms of arts such as literature, visual and plastic arts, can have "meaning." That music can be regarded as an effective means of communication—delivering "meaning"—from composers to performers or listeners, or from performers to listeners, has certainly been a critical issue. However, whether music can have "meanings" as an effective communication means is not, and cannot be a primary concern of music IR research. In other words, it is not such a critical issue if the original purpose of a composer—for example, sadness—can be delivered to listeners as originally intended by the composer. The primary concern of this study is: do people really consider music as having an affective meaning from this point of view? But we do not mean to suggest that this is the only kind of meaning that music can have.

Byrd & Crawford [3] recently wrote an extensive review on problems of music information retrieval. In this study, they not only provide a comprehensive literature review on music IR research, but also examine explicit and implicit reasons why music IR research is inherently different and more complex compared to research on text retrieval. One of the most important statements made by Byrd & Crawford (p. 260) for the purpose of the present study is that, "there is simply no predictable association of musical entities with meanings. And even if music has words, in many cases, experts will not agree on where the boundaries are, and a few musical techniques do have conventional associations with emotional states: the use of the minor mode to express "sadness," for example. But, such associations are notoriously unreliable and inconsistent."

In contrast, some researchers assert [4] that music has assertoric meaning in the way that declarative sentences have assertoric meaning; music differs from natural languages only in that its field of reference is restricted to the world of emotions. Another example is found in Osborne [11], who states, "music has always been regarded as the most evocative of the arts, and throughout the world music has been revered for its extraordinary power to move the emotions (p. 15)."

Byrd & Crawford's statement about the subjectivity of music's emotional functions quoted above is certainly reasonable. However, for the purpose of music IR, it may be proper that we raise broader questions: how much we know about users' musical information needs; how far users studies in music IR have been done; and if affective uses of music information have been ignored regardless of users' needs due to their seeming subjectivity.

3. RESEARCH QUESTIONS

The purpose of this study is neither to detect precise similarities between a composer's intention and a listener's interpretation, nor to expect the regularities to occur in different listeners' reactions. The premise of this study is, that despite the seeming subjectivity in relating descriptions of the affect and function of music to specific musical works, it may still be possible to discover and relate categories of such terms of description. However, these terms or descriptions as representation of music should be considered as only "means" for listeners to express their information "needs".

In this study, we set the subjects two tasks: a "description" task and a "searching" task. The purpose of the description task is to learn about how people perceive music—how do they recognize and describe music. The purpose of the searching task is to find out how people might want their perception of music as "information" to be understood by an ideal music IR system. Furthermore, we wish to consider people who are not experts in music, but rather just music listeners. This leads us to the following research questions.

1. How do users who do not have musical backgrounds in effect perceive and describe music that they hear?
2. How do such users think they would go about searching for music that they have heard, and in particular what words or descriptions would they use for such purposes?

3. To what extent can the answers to questions 1 and 2 inform us of people's various music information needs?

4. METHODOLOGY

The methodology used in this study was adopted from Jörgensen's 1998 study [8] of "Attributes of images in describing tasks." In this study, she asked participants to write individual descriptions of six projected color images while viewing them one at a time in a classroom setting. However, unlike the study reported here, she used three groups of people for each task: simple description; search term description; description from memory. For the purpose of this study, the 3rd task, description from memory, was excluded since it was believed that reperception memory for music—especially unfamiliar music—is generally worse than that of images. Furthermore, it was thought that it would be extremely difficult for participants to remember several unfamiliar musical pieces from the same genre over time.

To the researchers' knowledge, there have been no studies conducted using this methodology in music IR. However, as mentioned above, the purpose of the study reported here is certainly different from that of Jörgensen's—while this study investigates music information needs as expressed in "texts as a means," her study is rather an attempt to relate texts with images.

The data analyzed in this study came from volunteer participants at Rutgers University in spring 2002: nine masters students in Library & Information Science; fourteen Ph.D. students in LIS and Communication; two faculty; and one undergraduate student participated. Four of the participants were excluded from analysis on the grounds that they were music "experts". Participants were randomly assigned to one of two groups: those performing the description task, and those performing the searching task. Both groups of participants were asked to listen to the same seven musical pieces. The description group was asked to write three or more words which they believed described the musical piece, and the searching group was asked to write down words that they would use when searching for the musical piece using their "ideal" music IR system. The first task was designed to elicit unconstrained descriptions of music while the second task was designed more specifically to investigate what categories of words users would relate with the chosen music in searching. Participants were asked to imagine that their words would, in effect, express their "music information needs" to represent that specific musical piece within any music information retrieval system. The two questions used for each task are as following:

- Please write down **three** or more words which you believe **describe** this musical piece. They could be verbs, adjectives, nouns, or even sentences—any form of word is perfectly acceptable.

- How would you want to find this musical piece? Suppose that you're using your "**IDEAL**" music information retrieval system—which means that your words do not necessarily need to be confined within some of existing music IR system. Please list **3 or more** words. For example, what words would you use in following question?

"Find me a music on, about, from, or for ……"

Each musical piece was played for approximately three minutes from the beginning, and if the piece exceeded three minutes, it was stopped in the middle of playing. There was a pause between each piece so that the participants would have enough time to do the tasks. Before and after the experiment, participants were asked to indicate: minimum demographic information such as gender, academic background; their ability and degree of playing any musical instruments; their experiences in searching for music information; their overall familiarity with the musical pieces; and the title or composer of any recognizable piece. All the measurement questions used a 5-point Likert scale (1=not at all, 5=extremely).

The musical pieces that were used in this experiment are:

1. Handel, *Arrival of the queen Sheba*
2. Debussy, *Claire de lune*
3. Rimsky-Korsakov, *Flight of bumblebee*
4. Mussorgsky, *The great gate of Kiev* from *Pictures at an Exhibition*
5. Mozart, *Concerto No. 1 for flute & orchestra, K. 313, 3rd mov.*
6. Saint-Saens, *Le Carnaval des animaux, No 8. Aquarium*
7. Addinsell, *Warsaw concerto*

5. DATA ANALYSIS

This study attempted to identify categories into which the words, terms and phrases that were used by the subjects in both tasks could be placed. This was done by grouping the terms into classes initially by the first author of this study, then checked by the second author, and then regrouped, in an iterative cycle. First, words from the description task for each musical piece were analyzed separately across the participants in order to characterize the statements generated by participants. This analysis produced a range of words (n=3 terms per question; 11 non-music expert participants; 7 musical pieces which resulted in [3 x 11 x 7] = 231), which were grouped conceptually into seven classes or categories. These categories are as follows: emotions; musical features; movements; occasions or filmed events; objects; nature; and concepts. Second, the words gathered from the searching task from each question for each musical piece were analyzed using the same method. Although analyzed separately, they also grouped into the same seven categories. Third, basic descriptive statistical analyses were performed to estimate the proportion of each category appearing in both descriptive words and searching words. This analysis produced the frequency of each category observed across all the musical pieces; and the category's frequency difference between descriptive words and searching words.

The conceptualization into seven categories was done on the basis of the literature both in music perception and psychology. Specifically, the category, emotions, was applied only when the words explicitly fall into the emotion categories defined by Shaver et al. [12]. The category, occasions or filmed events was derived from research in music perception in which congruence between music and visual images, such as film and videos has long been identified [1] [2]. Also, the category, movements, is based on the finding that music can be congruent with such body movements as dance [9]. However, it should be clarified that the category,

movements here adopts broader criteria as it also includes words explicitly describing any movements or activities. The category, musical features, includes all words indicating any of seven musical facets defined by Downie [5]. The other three categories—nature, objects, and concepts—are preliminary ones, and more detailed explanations and definitions are provided in the following section.

6. RESULTS AND DISCUSSION

The responses from the pre-questionnaire and post-questionnaire are analyzed to indicate participants' background information including their previous music knowledge. As shown in Table 1, most participants came from the Library and Information Science major. More than 50% of the participants had experience in searching for any kind of music information. However, only 31% of the participants defined themselves as frequent searchers of music information in the Internet. The mean for the familiarity with the musical pieces is 2.1, which is low, as expected. Even though these non-music experts indicated that some of the music was familiar, only one participant out of 22 provided one correct answer for the question asking the composer or the title.

Table 1. Participant Information

Question	Responses
Major	Communication: 5 Library & Info.: 16 Other: 1
Gender	M: 9/ F: 13
Have you ever sought out music information?	Yes: 15/ No: 7
Are you a frequent searcher of music info from the Internet?	Yes: 7 /No: 15
Can you play any musical instrument? (1=beginner, 5=expert)	Yes: 9 /No: 13 (Mean=2.4)
Familiarity with the musical pieces chosen for this study (1=not at all familiar, 5=extremely familiar)	Mean=2.1
Number of correct answers for composers or titles of musical pieces chosen for this study	1 (n=208)

Table 2. Definition and frequency of categories, with example terms and phrases

Categories	Explanation	Frequency (n=231 for each task)		Examples
		Description task	Searching task	
Movements	Words related to specific movements	9 (4%)	8 (3%)	Running away; Flying; Sprint
Neutral concepts	Words that are evaluatively ambiguous or neutral	38 (16%)	45 (19%)	Ambivalence; Transformation; Simplicity; Realization
Emotions	Words explicitly indicating emotional status	**70** (31%)	55 (24%)	Happy; Joyful; Sad; Threat; Cheerful
Nature	Words indicating nature-related phenomena	39 (17%)	22 (10%)	Nature; Trees; Flowers blooming; Bees; Butterflies
Objects	Words indicating concrete materials other than nature	12 (5%)	4 (2%)	Spy; Europe; Wizard; Queen Elizabeth
Occasions or filmed events	Words describing specific occasions or events—also referring to filmed events	54 (23%)	**67** (29%)	For celebration; For Baroque party; Grand arrival or entry; Song for exploring forest; Saturday at the Art gallery
Musical features	Words indicating musical features	9 (4%)	30 (13%)	Violin; Slow-tempo; Orchestra; Rondo; Strings; Symphony

The results with respect to the nature of the terms and phrases used by the subjects were far more disperse across the musical pieces than expected. For example, while some of the participants wrote brief descriptions (e.g. happy), some wrote more detailed descriptions in a sentence or even a story (e.g. Children running and playing happily in the field), and this was more frequently found in the description task. As mentioned above, the data were grouped into seven higher-level categories using content analysis. The examples and definitions of each category are shown in Table 2. There, the other categories than those based on the literature are clearly defined. Many participants frequently related music with some objects including nature-related phenomena, and

metaphors. Since it was unclear and impossible to identify what they wanted to express through those words, certain categories such as nature, neutral concepts, and objects were applied rigorously for those words. The symbolic or metaphorical categories in concrete forms such as nature, and objects were found more in the description task. The proportions of category movements in each task were respectively similar. The differences of the proportions of each category appearing in the two tasks are more clearly depicted in Figure 1.

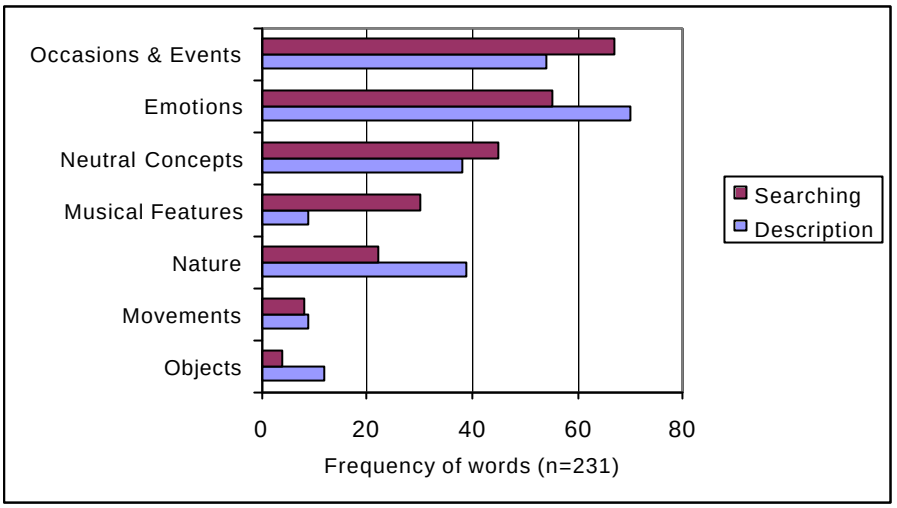

Figure 1. Comparison between terms appeared in Searching task & Description task

There are several points that need to be further discussed. First, although individual participants used different language to express their interpretation or perception of a given piece, a relatively small set of themes consistently emerged. The seven categories identified in the present study may not be exclusive or exhaustive; rather inclusive and preliminary in a rigorous sense. There is no doubt that some aspects of these categories have been studied and identified in other related fields as well. The description task firmly supports the previous findings from these fields in that music in effect is perceived as in an affective relationship to anything perceptible in association with, but at the same time in some way structurally distinguishable from, the strictly 'musical' structures [13]. Participants recurrently seemed to find affective relationships with the music, and further created implications for past or future events in that such categories as emotions and occasions or filmed events ranked high in the description task. The frequency of other categories as nature, objects, and neutral concepts indicates that music has connotative functions as well. These different categories of words also seemed to be occurring consistently in the searching task.

The analysis of the searching task confirms that people want to find music information for, about, or on certain occasions, events, or specific activities as much as, or even more than they expect to find the information in accordance with certain emotions. More specifically, we may infer from these results that their musical information needs are often related with certain uses of music such as for a party, relaxation at day's end, ceremonies, and dancing. These functional needs seemed to extend to help them remember some scene-specific events, and even create a "story." For example, words like "for chasing scene/ background music when Tom chases Jerry in Tom & Jerry cartoon" for musical piece 3, and "for children's movie/ background music for fairytale story" for piece number 7 appeared. However, the relatively high ranking of a category such as neutral concepts in the searching task reinforces how complicated it is to understand people's needs in the music IR task. For instance, words like "acceptance, creation, or continuation" are evaluatively ambiguous. It may be possible that the subjects have expressed their emotions, or even some past occasions by these ambiguous or neutral words which are identifiable and sensible only for themselves. This may also indicate the limitations of this study, and suggest the need for more rigorous methodology in future studies.

7. CONCLUSIONS

The aim of the present study was to investigate how people—particularly non-music experts—perceive music, and if their perception and interpretation of the music is also observable and can be classifiable in music IR tasks. These ideas were examined by presenting 22 participants with 7 classical musical pieces, and asking them to write description words or searching words for a given piece. The analyses for the description task and searching task have focused on identifying primarily non-music experts' information needs. These analyses generated 7 categories: movements; neutral concepts; emotions; nature; objects; occasions or filmed events; and musical features. Even though these categories are preliminary, they are certainly valuable to understand music information needs of those who cannot, or do not wish to express their needs in musical terms. In fact, a very small portion of the participants used words indicating the formal features of music information; further, none of them wanted to find the music by specific tunes even though a lot of them said that they had heard several of the pieces before. One possible interpretation is that there might have been some biases due to the example given with the searching task question.

Certainly, there are limitations in generalizing the findings from this study. First, the musical pieces chosen for this study are

very limited. Most of them are somehow "descriptive," and all the musical pieces are classical. Second, studying a mere 22 non-music experts and their responses to 7 chosen musical pieces, does not allow drawing any kind of statistically reliable conclusions. However, this study contributes in two ways. First, to the researchers' knowledge, it is the first study in the music information needs of non-music experts, at least from the point of view of music IR. Also, this study attempts to identify frequently appearing categories of music information needs of non-music experts. As existing or proposed sound-based music IR systems whereby music can be represented as musical terms cannot fulfill the whole variety of music information needs, neither does this study. It may be more appropriate to say that this study serves as a "complementary" groundwork for any music IR systems designed to do more than known item searching or searching on formal characteristics. If music IR is to embrace issues in developing more multi-purpose systems which can appeal to more users by reflecting their perceptual, and other needs as well as the current research agenda, and if those systems are something that enable users to access via any access points, research in this direction should be continued and extended. Future studies may need to employ more rigorous methodology to identify and categorize music information needs; and to further address more tangible suggestions for their practical application.

8. ACKNOWLEDGMENTS

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