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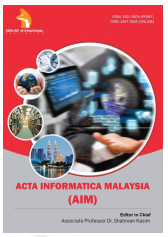

RESEARCH ARTICLE

ELEMENTS OF MUSIC BASED ON ARTIFICIAL INTELLIGENCE

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ABSTRACT

Thus, for the current status of research and practical music audio processing needs, this paper argues, the music element analysis technology is the key to this research field, and on this basis, proposes a new framework music processing - Music calculation system, the core objective is to study intelligently and automatically identifies various elements of music information and analyze the information used in constructing the music content, and intelligent retrieval method translated. To achieve the above core research objectives, the paper advocates will be closely integrated music theory and calculation methods, the promotion of integrated use of music theory, cognitive psychology, music, cognitive science, neuroscience, artificial intelligence, signal processing theory to solve the music signal analysis identify the problem.

KEYWORDS

Music Elements, Music calculation, Music automatically escaped, Debugging Detection, Chord recognition

1. INTRODUCTION

Music is one of the oldest art forms and the most universal appeal, is the human voice through the kind of harmonious and orderly permutations and combinations to express thoughts and feelings, to communicate with each other special language. Music creation, performance, understanding, appreciation, is one of the most basic human mental activity. As the most important carrier of human culture, music has a rich culture and history connotation characteristics, so the heritage of thousands of years, still occupies an essential place in human life. In the new era, its meaning, and the existing forms of communication, along with the rapid development of high-tech, it has been made a new interpretation (Scruton, 1997).

The content-based music information retrieval and calculation is based on the theory of intelligent music technology comparison, we found that, although both the purpose and application of different directions, but in its core research issues and current research bottlenecks encountered but it is the same - how to intelligently analyze and get the music based on the audio content shown by the various elements of music and other useful information. Music elements generally refers to part of the logical structure of the music theory within the framework of the music: if the music analogy is a language system, elements of music is music language "words, words, sentences and chapters.

"Specifically, from the music theory, by definition, elements of music summarizes the various elements of music and music support the interpretation of the various means of expression, which can be divided into two basic elements and form elements level. Mainly refers to constitute the basic elements of music, showing the basic elements of the physical properties of sound: pitch, intensity, duration and timbre of the notes; and music by the above basic elements combined with each other and the role of support to form a musical interpretation, music theory form elements system systematically discussed: melody, harmony, melody and rhythm, speed, strength and so on; and in the broader level, the music basic elements and form elements of the combination can also be defined as style, emotion, structure belt there are cultural and subjective description tag music overall macro-elements (Makhoul et al., 2000).

Specific to real-world applications, effective analysis of the elements of music for music information retrieval and intelligent music teaching and creation of great significance. For music information retrieval, build all kinds of indexing as much as possible from different angles is a key precondition for the effective mass music information retrieval; at the same time, from different angles on music similarity measure is the core issue of sample retrieval .Among them, tuning, style, global music elements can be retrieved according to different user requirements to provide index and enrich the massive database management; global elemental structure, melody and so that you can measure the similarity between the music section is provided on the structural characteristics of music basis, but also provide an important feature for achieving humming.

For music teaching and the creation of the field of intelligence, musical notes, chords, melody and other musical elements of melody recognition is a necessary part of the whole score is automatically translated. The music is automatically translated, music can be directly converted into music characteristics that can be applied to music teaching visual, musical ear training and many other areas, to improve music teaching autonomy, efficiency and intelligence have a huge role in promoting. At the same time, music is a way to improve music rendering efficiency and the level of intelligence important assistive technology, which can greatly simplify the process of music - composers by playing or singing to music and to complete the modification process, change the current side playing side

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edge modified traditional notation creation mode, making the popularity of music possible.

2. MATERIALS AND METHODS

2.1 Music calculate the theoretical basis for system

From a long historical period, the music as one of the main carriers of human culture and the spread of emotional interaction, carrying a very rich connotations. These connotations from the perspective of human music display and processing mechanisms to understand, can be broadly divided into two categories, namely physical and psychological connotation. And according to these two types of music connotation decomposition, we can be decomposed into music sound component attributes and mental attributes component level two connotations.

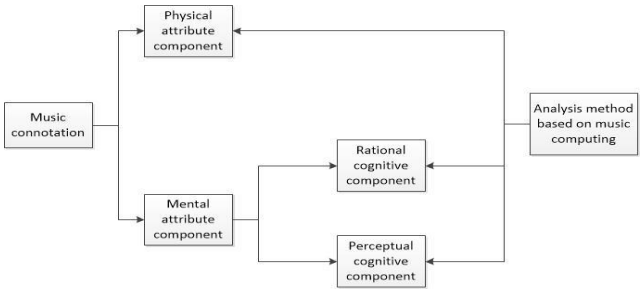

Figure 1: The theoretical basis of Music Computing

2.2 Music method of computing technology

Study the music is calculated and the music audio content contained in the various elements of music. From the perspective of content analysis point of view, every kind of music has elements of the above-mentioned three-level attributes. From the position for the characteristics of the music content and the use of these features in music theory system point of view, but also the characteristics of these elements into three categories: low-level features, intermediate, advanced features, and characteristics. Low-level feature itself is not music elements, it is the use of statistical pattern recognition methods extracted from the music audio statistical features, such as MFCC, spectral flow, etc., this feature in the traditional speech / audio processing method in wide range of applications. Intermediate features music belongs to the basic elements and form elements, such as scales, chords, rhythm, with its music analysis method is the basic method of music theory model.

$$f(t)=\int_{-\infty}^{+\infty} e^{itx} dF(x), \qquad t \in R \tag{1}$$

$$f(t)=E\left(e^{it\xi}\right). \tag{2}$$

$$f(t)=\sum_{k} e^{itx_k} p_k, \qquad p_k = P\{\xi = x_k\}. \tag{3}$$

The advanced features music is based on the overall structure or global properties, such as the musical structure, style, emotion and other macro-elements, which are the main object of study in cognitive psychology of music. It is worth mentioning that the musical tune style and melody of these two music global properties, according to our classification should belong to the advanced features, but because of its relationship with the music basic elements is extremely close, is the core concept musical tone theory system and the main elements of the form, and is often used in conjunction with some of the basic elements of music, so here it is classified as intermediate feature classes (Subrahmanian, 1998).

2.3 Music computing research tasks

Each proposed theory must be supported by a variety of practical research under its framework may verify their theoretical value. Layer theory and technical level in the previous section of this article has been calculated from the music to the music computing system conducted in-depth exposition, so this section will describe specific research tasks under the framework of music theory constructed in this paper, that is music computing tasks layers. Objects Music Computing research is real world music audio exhibited musical elements, each study task is outside to the inside - the establishment of the sense of hearing music audio characteristics (sound property) intelligence methods to reflect internal principles and laws. Therefore, the study of music computing system task in this paper are elements external sound for music performance. Most of the studies have been presented by the task before the introduction of MRI technique, this paper will reorganize and to describe the connection between the various tasks. As each task is a study for one or a few attributes of music analysis, this section is still in use on the section of the proposed property classification, the different levels of research tasks in accordance with the study of music and their mutual property relations classification.

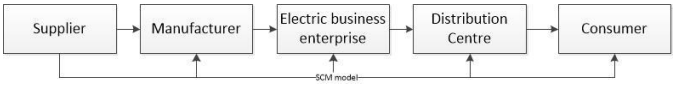

Figure 2: The progress of Computing

3. RESULTS

Music Information Retrieval and music teaching intelligent and creative problem its urgent application requirements and broad market prospects, becoming the music information processing two research focus, but also audio signal processing technology and humanity's oldest carrier in Arts & Culture effective combination of theory and practice. On this research, the music element analysis technology is the music information retrieval and intelligent music teaching and research co-creation of the core issues and research focus. Elements of the core issues for the music of the musical signal processing, the proposed calculation music system.

Traditional music and signal processing technology, here are calculated within the framework of music, from music theory, Guiding cognitive theory, the establishment of new methods of intelligence analysis to identify elements of music. Based music computing system, the paper some music signal processing techniques are studied; and music computing technology system under the guidance for tuning and chord core musical tonality property elements, melody and other musical major evolution in the form of elements and musical structure and other styles Global information elements were studied (Singhal, 2001).

Significance of the study of the music that elements of analysis: the music information retrieval direction, factor analysis can help build category-based search index, based on a sample retrieval and sample similarity measure: tuning, style, global factors may be Music is retrieved according to different user requirements to provide index, rich massive database management; global elemental structure, melody is the main music piece based on the similarity between the metrics on the structural characteristics of the music, and the achievement of an important feature of humming retrieval (Casey et al., 2008). Identification and creation in music teaching intelligent direction, notes, chords, melody and rhythm and other musical elements are a core component of the full score is automatically translated. The music is automatically translated visual music teaching, music teaching autonomy and improve the efficiency of the core practical skills, but also to simplify the process of music creation and improve the efficiency of an important creative assistive technology (IFPI, 2010).

4. CONCLUSION

Music calculation proposed framework, and form a hierarchical theory expounded theoretical basis method needs, as well as applied technology research tasks of this framework. Music Computing Architecture will feature various aspects of information processing in the field of music organized and orderly, and a targeted selection of music as a core element analysis research direction for music information retrieval and intelligent music teaching creative problem solving and provides a theoretical basis , defined the research objectives and the research provides a way of thinking effectively support. According to the sound properties of music

known to psychology and music theory, put forward the assumption that human perception of music type based on selective attention, whereby to obtain calculated acoustic auditory saliency features and applied music melody analysis on the portion. Meanwhile, according to the cultural attributes of music paper classical model of music theory proposed music theory auditory saliency features, and use the full auditory saliency features, combined with technology and music theory rules proposed in this paper, we propose a effective automated music translation methods. Experiments show that the auditory saliency features can be very accurately capture the music in a significant part of music theory rules can also be good for the recognition result "filtering"; and in general, the proposed musical automatic translation technology can achieve industry-leading technology similar performance, and can be subjective sense of hearing people accepted.

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