Studying, Preserving and Transmission Intangible Cultural Heritage and High-Tech Digital Creative Environment

Imina G. Alieva, Irina B. Gorbunova and Svetlana V. Mezentseva

***Abstract*— The preservation of intangible cultural heritage in the context of globalization is one of the most pressing problems of modern music science, which focuses on the research of scientists from different countries and peoples. The article proposes to discuss issues related to the influence of globalization and the modern phonosphere on traditional culture and language, the evolution of traditional culture in the modern world and the interaction of ethnic groups and civilizations, the preservation and study of cultural heritage, the interaction of traditional culture and composition, as well as the impact on this process of new communication strategies of high-tech creative environment, digital musical instruments, as well as the use of modern music computer technologies (MCT).**

***Keywords*— high-tech information educational environment, digital synthesizers, music computer technologies, musical computer, semantics.**

I. Introduction

In the age of information technology (IT) and innovations in the technogenic society, the understanding of the need to humanize all areas of human activity is becoming more and more established. Raising the level of intellectual and spiritual potential of society, priority development of general cultural components, development of creative abilities of students, familiarizing them with world culture – these principles are the basis of the concept of modern education. In accordance with these principles, programs are reviewed, new methods are formed, and research is conducted. A great role in the process of educating a humane person is given to music, which can bring an atmosphere of special spirituality into the technical educational environment, affecting the soul and consciousness of students.

However, the opposite problem requires no less attention, which is the need to introduce mathematical knowledge in the humanities and, in particular, in music [1-7]. Today, the general humanitarian orientation of music education forms the appropriate musical thinking as a synthesis of sensuality and rationality, intuition and knowledge, and knowledge, as a rule, specifically musical – empirical and theoretical.

The development and formation of a high-tech information educational environment, information technologies in music [1-2] allows us to state with certainty that a modern music computer [3-5] has entered the family of musical instruments.

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II. Music, Mathematics, Computer Science: Semantic and Technological Problems of Interaction

The development of IT in music [8] allows us to state with certainty that the contemporary musical computer (MC [9]) has entered the family of musical instruments.

The uniqueness and versatility of a music computer consists, first of all, in the fact that it is not only a tool for performing and listening to music, but also a professionally oriented software and hardware complex for creating musical works and, most importantly, their detailed analysis, an analysis that relies both on familiar, traditional information (musical text, sounding music), and on the information that has become available thanks to new (musical computer, electronic musical instrument – EMI [10-11]) technologies: visual and auditory representation of individual parameters of the entire musical fabric (characteristics of volume, frequency spectrum, panning, etc.) and its individual textural components (voices of the melody, accompaniment, bass line, etc.), possible acoustic effects, etc.

For more than 70 years of application of computer technology in music creativity and music research, it has gone a long way to the origin and subsequent implementation of various ideas. Initially, computers had relatively small resources – small memory, low speed of information processing. Creativity and research at that time went along the path of analysis and creation of new musical notation (music) texts. Researchers studied the "rules" of composition using a computer and based on these rules created new compositions. Such "compositions" did not have (and could not have) high artistic qualities.

In the 50s of the twentieth century, experiments with electronic sound synthesis took place in various countries. The most significant were the results achieved by R.A. Moog, D. Buchla in the United States, the Studio of Electronic Music attached to A.N. Scriabin Apartment Museum (later attached to firm Melodia) in the USSR, IRCAM in France, K. Stockhausen

in Germany.

At the same time, attempts were made to control electronic sounds using a computer, the computer tools themselves were improved, and their capabilities were expanded. Technologies for automatic speech analysis and synthesis, speech control of automation, automation of information services, recognition of the speaker by voice, and devices for people with speech, auditory and visual disorders, and much more were developed; the analysis and synthesis of "live" musical sound was carried out. It is clear that significant results in these areas could be achieved only with the use of mathematical methods of music research, adequate digital methods of sound analysis and synthesis.

At a certain point in the development of technology, we can say that essentially a person has stopped the sound wave and can now modify it, model its architecture, search for the deep laws of its structure – study the architectonics of musical sound. The main advantage of digital systems for the musician-researcher is the ability to reproduce and easily modify "synthesized" (or recorded acoustic) and analyzed "natural" sounds, as well as the ability to create completely new, original sound forms.

New opportunities in three directions at once – in performance, in the process of composition, for the implementation of musical analysis - put forward, respectively, new requirements for the professionalism of a contemporary musician [12]. Perhaps, at the intersection of interdisciplinary approaches, in the development of a new methodology enriched with developments in related disciplines, in the mutual movement and interaction of science and culture, the basis of modern breakthrough scientific ideas and trends related to the development of artificial intelligence systems applicable in various fields of human activities.

All this can not but affect the features of the formation of musical thinking of a scientist, performer, composer, teacher, student of a musical University. But looking at history, we can note that this situation has already been observed in the past. As you know, the basis of the ancient (Greco-Roman) and medieval educational systems (from Libri by Boethius, De nuptiis by Marcian Capella, etc.) were seven arts – a cycle of disciplines that were combined into a Trivium (grammar, dialectics/logic, rhetoric), which represented the lowest level, the "three – way" of knowledge, and the quadrivium - the highest level of knowledge, which included arithmetic, geometry, music/harmony and astronomy/physics. We are particularly interested in the quadrivium - the general name of the system of exact sciences, a course of advanced training in the education system in Byzantium, which was the lot of units. The unifying common for the disciplines included in the quadrivium was arithmetic (considered the basic discipline of geometry, astronomy, and music (which meant the science of harmonics). The development of the quadrivium allowed us to move to the understanding/study of metaphysics in order to study the nature of existence and the knowledge of the highest being, the highest unity, the highest good, and the assimilation of divine Truth.

In our time, the musical computer is becoming a new tool (including performing) of the musician [13]. The famous Petersburg composer Gennady Belov, a student of Dmitry Shostakovich, writes: "For a professional composer, the musical PC is a multi-functional "means of production." If the composer has carefully thought out his composition and fully hears it with his inner ear, then he can do without the piano when working on its sound embodiment (just as P. I. Tchaikovsky and D. D. Shostakovich wrote their scores at the desk). Now the computer allows the author to perform a score recording of the work (in the programs Finale, Sibelius, Score, and others) immediately in the form in which it was previously released by publishers, “reset” it to the printer, print several copies not only in the score form, but also by voice with automatic editing for transposing instruments. <...> Sometimes a genius creation appears as improvisation, like a Miniture Triptych by G. Sviridov. If Sviridov had played his improvisation on a MIDI keyboard, he would have received a ready-made sheet music text at the output without having to decipher a tape recording of a piano performance at the time" [2, p. 139]. Note that EMI is essentially one of the types of representation of a music computer, presented in a convenient form for a stage performer. EMI is a multifunctional instrument that has mega-timbral variety of functions. It should be noted that in traditional musical culture, we are used to understand a musical instrument as a specific physical object, with which you can create (synthesize) musical sounds of a certain (characteristic) timbre. However, in the field of music computer technologies (MCT [14-16]), in computer music creative work, the concept of "instrument" defines a broader category of devices; a "musical instrument" in this case can be an external sound module with a keyboard, for example, from Korg, or a sound module, for example, from Roland, containing hundreds or thousands of "instruments" (sounds "banks" of EMI). In such a "musical instrument", which initially contains tens of thousands of "instruments", you can load them as many as you want and any other (the choice depends only on the repertoire, the subtleties of musical perception of the performer, as well as the composer, teacher, student, sound engineer, etc., their needs and artistic and aesthetic taste). It can also be a module with synthesizer and sampler capabilities. And finally, a modern workstation is essentially a musical computer with a music keyboard, "equipped" with the necessary software and hardware support.

III. Music, Language, And Creativity: Translation Of Cultural Traditions In The Context Of The Development Of A High-Tech Creative Environment

The uniqueness and versatility of a music computer consists, first of all, in the fact that it is not only a tool for performing and listening to music, but also a professionally-oriented software and hardware complex for creating musical works and, most importantly, - their detailed analysis, based both on traditional information (musical text, sounding music, etc.) and on the information that has become available thanks to new (music-computer) technologies: visual and auditory representation of individual parameters of the integral musical

fabric (characteristics of volume, frequency spectrum, panning, etc.) and its individual textured components (melody voices, accompaniment, bass line, etc.), possible acoustic effects, etc.

Within the framework of this study, we are particularly interested in referring to the quadrivium (Lat. quadrivium – "four-way"), an advanced training course in the education system of medieval Europe; the quadrivium included the following disciplines: arithmetic, geometry, astronomy, music (which meant the science of "harmonica").

For more than 90 years of application of computer technology in musical creativity and musical research, it has gone a long way in the development and subsequent implementation of various ideas. Initially, the researchers studied the "rules" of composition using a computer and created new compositions based on these rules. Such "compositions" did not possess (and could not possess) high artistic qualities.

At a certain stage of technology development, we can say that, in essence, a person has stopped the sound wave and can now modify it, model its architecture, search for the deep laws of its structure – study the architectonics of musical sound. The main advantage of digital systems for a musician-researcher is the ability to reproduce and easily modify "synthesized" (or recorded acoustic) and analyzed "natural" sounds, as well as the ability to create completely new, original sound forms [6-7].

New opportunities in three directions at once – in performance, in the process of composition, for the implementation of musical analysis - put forward, respectively, new requirements for the professionalism of a modern musician [8].

IV. Conclusion

IThus, new information technologies in music not only at the level of theory, but also in the practice of artistic creativity and analysis of its results (see, for example, works [17-18]), have again brought mathematics (and computer science) and music closer together even more organically. In this regard, it is worth noting that teaching mathematical sciences contributes to the development of cognitive abilities and logical thinking, forming the contemporary musical thinking of a professional musician, creates prerequisites for the development and formation of new areas of activity for musicians and specialists working with sound, which was previously impossible without the active inclusion of methods of digital sound generation and processing methods (see, for example, works [9-11]).

Perhaps, at the junction of interdisciplinary approaches, in the development of a new methodology enriched with developments in related disciplines, in the mutual movement and interaction of science and culture, the basis of modern breakthrough scientific ideas and directions related to the development of artificial intelligence systems applicable in various fields of human activity.

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