The Integrative Model for the Semantic Space of Music and Music Computer Technologies

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Abstract: *The advent of computer technology has led to the creation and development of new forms of teaching musical art. The emergence of music computer technologies (MCT) was the basis for creating both new forms in the educational process and new subjects, the appearance of new disciplines and new educational trends in the system of a contemporary musical education. These new subjects, such as Musical Informatics, Computer Music Creative Work, Computer Arrangement and Composition, Sound and Timbre Programming, Electronic Musical Instruments and many others, fully reflect the essence of the changes that have occurred in approaches to the study of music art. This article analyzes the possibility of including an integrative model for the semantic space of music, developed with the participation of the prominent cybernetist, scientist Mikhail Borisovich Ignatyev, in a contemporary musical educational process. It shows the role of the Education and Methods Laboratory Music Computer Technologies of the Herzen State Pedagogical University of Russia as an educational structure, within the framework of which primary provisions of the model under consideration are implemented at various levels of teaching musical art*

Keywords: *integrative model for the semantic space of music, Mikhail Borisovich Ignatyev, linguo-combinatorial modeling, musical education, music computer technologies*

1. Introduction

We should note main trends of using an integrative model of a semantic space of music in education.

- In the book "Symmetry" [12], intended for a wide range of readers - teac hers and students, mathematicians and non-mathematicians, for people interested in natural sciences, and people interested in human sciences, Hermann Weyl (1885–1955), one of leading mathematicians of the 21th century, a deep and versatile scientist who made a great contribution to "pure" mathematics and to the field of its applications, in particular, in recognizing the importance of a mathematical idea of symmetry for both mathematics and art studies, states the content of generally accessible lectures read by him in 1951 in Princeton (USA). Philosophical and methodological orientations of the thinker and teacher are formulated

- Music computer science (musical informatics) as a separate field of knowledge was formed in the 70s of the 20th century; it is also a kind of a precursor of an integrative model of a semantic space of music, one of its essential components. Teaching the discipline "Musical Informatics" in Russia began to be gradually introduced into the educational process at the end of the 20th century. So, by the mid-1990s music computer science was taught in a number of musical educational institutions of the country, including the Moscow State Conservatory named after P.I. Tchaikovsky (the musicologist Yu.N. Rags, the mathematician and programmer A.V. Kharuto), the Novosibirsk State Conservatory named after M.I. Glinka (A.P. Mentyukov, G.V. Mikhailenko), the St. Petersburg State Conservatory named after A.N. Rimsky-Korsakov (the musicologist M.S. Zalivadny, the mathematician and programmer I.V. Petryayevsky), the Gnesins Russian Academy of Music (the mathematician and programmer, musicologist V.S. Ulyanich).

The course "Musical Informatics" as an educational discipline is studied by students at universities in many countries of the world. However, in Russia there is still no regulated system of teaching it – a detailed analysis of the situation is given in a number of our works (see, for example, [5-9]).

A significant contribution to understanding foundations of a comprehensive model of a semantic space of music in a contemporary musical educational process was made by the Doctor in Art History, Yu. N. Rags (see [11]).

M.B. Ignatyev writes in the article "Linguo-Combinatorial Modeling," "In the 90s, a joint computer laboratory was successfully operated in the St. Petersburg State University of Aerospace Instrumentation and the St. Petersburg State Conservatory named after A.N. Rimsky-Korsakov." As a result, in the nineties, the specialization "Computer technologies in art and mass media," was developed within the specialty [22.01]: – "Computing machinery, complexes, systems and networks", the educational process was established, and our students began to successfully participate in art exhibitions and contests to actively develop the world's cyberspace and distribute achievements of Russian culture around the world" [10, p. 135]. Elements of using a comprehensive model of a semantic space of music in a contemporary musical educational process are considered in works [1-4].

Staff members of the Education and Methods Laboratory Music Computer Technologies at the Herzen State Pedagogical University of Russia developed, licensed, and implemented the following programs in the pedagogical process:

= A professional and educational profile for training Bachelors of artistic education "Music Computer Technologies", to which applicants in various regions and various educational institutions of Russia have been admitted since 2004. Programs have been developed and classes are given for students of music faculties in pedagogical higher educational institutions in the following disciplines: "Computer Music," "History of Electronic Music," "Technologies and Teaching Methods (in disciplines of the training profile: Music Computer Technologies)," "Architectonics of Sound," "Fundamentals of Studio Sound Recording," "Information Technology in Music," "Technology of Musical Styles," "Fundamentals of Composition, Knowledge of Instruments and Computer Arrangement," "Traditional and Computer Orchestrating," "Technologies of Studio Sound Recording," "Methods and Practice of Teaching Electronic Composition and Arrangement," "Teaching Methods of Playing the Electronic Musical Instrument," "Standard Software for Professional Activities of a Musician," "Traditional and Electronic Knowledge of Instruments," "Musical Computer," "Basic Electronic Musical Instrument," "Additional Musical Instrument (Electronic)," "Electronic Synthesizer," "Electronic Ensemble," "Music Computer Practicum," etc.

= A Master's program, "Music Computer Technologies in Education", which was developed and implemented in the pedagogical process in 2006.

= Professional retraining programs:

- "Teaching Musical Disciplines Using Music Computer Technologies in Educational Institutions."

- "Teaching Electronic Musical Instruments in Educational Institutions."

- "Information Technology in Music and Music Education."

- "Technologies for Creating and Artistic Processing of Sound Information."

= Professional development programs

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Irina B. Gorbunova was born in St. Petersburg (Leningrad). DipMus, Special Music Higher School of the St. Petersburg State Conservatory named after N.A. Rimsky-Korsakov; BSc in Computer Science: Information Technology, Computer Science and Multimedia, Leningrad State University, Ussurisk State Pedagogical University; MA in Education, the Herzen State Pedagogical University of Russia; PhD in Information Technology and Pedagogic Sciences, the Herzen State Pedagogical University of Russia, St. Petersburg, 1989; Doctor degree: Doctor of Pedagogic Sciences and Information Technology, the Herzen State Pedagogical University of Russia, St. Petersburg, 1999. Dr. Gorbunova, Full Professor, PhD in Sc., Doctor of Pedagogic Sciences, Chief Researcher of the Educational and Methodological Laboratory *Music Computer Technologies* of the Herzen State Pedagogical University of Russia, St. Petersburg.

She was on a number of business trips abroad, among them working trip to the USA (1999); lecturing and giving research and practice seminars in Hungury (2003, 2005, 2017); business trip to the UK (2016, 2019); she was a member of the Jury of national and international competitions of musical creativity, including *Bridge of Friendship* (Dortmund, Germany, 2011), etc. Work experience; 1990 – 2010 - Associate Professor, Professor of the Department of Information Technology of the Herzen State Pedagogical University of

Russia, St. Petersburg; 2010 - present - Full Professor of the Department of Information Technology, Institute of Computer Science and Technological Education of the Herzen State Pedagogical University of Russia, St. Petersburg; 2002 – present - Chief Researcher of the Educational and Methodological Laboratory *Music Computer Technologies* of the Herzen State Pedagogical University of Russia, St. Petersburg. She has more than 300 scientific publications, among them are monographs *Music Computer Technologies: Historical-Theoretical and Practical Aspects* (2007) and *Music Computer Technologies: The Problem of Modeling the Process of Musical Creativity*, compiled with participation of S. V. Chibirev (2012*)*; course book *Information Technology in Music*, vol. 1 – 4: vol. 1, *Architectonics of musical sound* (2009), vol. 2, *Musical Synthesizers* (2010), vol. 3, *Music Computer* (2011), *Music, Mathematics and Computer Science*, vol. 4, compiled with participation of Mikhail S. Zalivadny (2013). Her research activities include such directions as: MCT in professional music education (as a means to expand creative opportunities); MCT in general musical education (as one of the means of education); MCT as a means of rehabilitation of people with disabilities; MCT as the new direction in preparation of specialists of humanitarian and technological profile; MCT in the field of digital arts; MCT in information technology, psychoacoustics and musical acoustics; system of training arrangements and the art of performing skills on electronic musical instruments. Her circle of interests also includes the problems of interrelation of natural and technical sciences and humanities, as well as the possibilities of applying the results of such interrelation for the purposes of music education and upbringing. She also takes part in working out the specialized software for computer music devices and in application of this software in pedagogical processes. Her developments and researches also belong to the field of musical pedagogics and musicology, musical Informatics, computer modeling of processes of musical creativity, timbre programming, art of performing skills and arrangement on electronic musical instruments, creative work in the field of computer music, mathematical methods in musicology.

Prof. Dr. Gorbunova is Chairman of the Organizing Committee of the international research and practice conference Contemporary Music Education, Chairman of the Organizing Committee of the international research and practical conference Music Computer Technologies in the System of Contemporary Education. Dr. Gorbunova is a member of the Jury of national and international competitions of musical creative works, including Electronic Palette (St.Petersburg), Music and Electronics (Moscow), Music of the 21st Century (Moscow / Saint-Petersburg), International Festivals and Competitions Musical Electronics and Multimedia (Moscow / Saint-Petersburg), Clarine of the 21st Century (Saint-Petersburg), The World of Art without Borders (Saint-Petersburg, Russia - Szeged, Hungary), Bridge of Friendship (Dortmund, Germany), All-Russian Competition of Electroacoustic Music DEMO (Saint-Petersburg). She is a member of Editorial Boards of International Journals: Music Scholarship (WoS, Scopus), The World of Science, Culture, Education / Mir Nauki, Kul'tury, Obrazovaniya, Mediamusic. Prof. Dr. Gorbunova has developed first ever course in Music, called Music Computer Technologies, which has been offered under the Bachelors of Arts and Sciences (BASc), , which in 2004 carried out student recruitment in different regions and educational institutions of Russia and she also leads post-graduate courses "Music Computer Technologies in Education" available under the MA in Music Education, since 2006. Prof. Dr. Gorbunova supervises a number of doctoral and post-doctoral students (more than 30) and lectures on Music Computer Technologies and Information Technology in Music. She supervises researches in various directions, among them there are: Theory and history of culture, Music Art, Information system and processes, Theory and methodology of professional education, Mathematical modelling, numerical methods and program systems, Theory and methods of education and upbringing (in Music, Informatics, natural sciences). The research results of Prof. Gorbunova were published in over 300 refereed publications including 48 books and 255 papers in journals and conference proceedings. Awards and honors: 2003 - Gold medal of the all-Russian Exhibition Centre (former VDNKh); 2005 - Silver medal of the all-Russian Exhibition Centre (former VDNKh); 2009 - Gold medal of the all-Russian Exhibition Centre (former VDNKh); 2009 - Diploma of the winner in the nomination «New educational technologies in ICT environment» of the all-Russian creative contest of scientific-technical solutions, educational products and services in the field of Informatization of the innovative-educational complex «Music computer technologies in the system of modern education»; 2010 - Grand Prix of International Congress-exhibition «Global Education - Education Without Borders»; 2010 - Diploma of the 11th all-Russian forum «Educational environment - 2010» for the project «Digital educational resources «Music computer technologies in education» in nomination of «Creative Competition of scientific developments, innovative solutions and programs in the field of higher vocational education» and many others; 2011 - Laureate of the Prize of the Government «For Outstanding Achievements in the Field of Higher and Secondary Professional Education»; 2013 - Honorary Worker of Higher Professional Education of the Russian Federation.