

# Guido d'Arezzo's Musical Notation and Their Significance in the Development of Musical Pedagogy through Interactive Digital Technologies in the Digital Age

H. Hiner and I. B. Gorbunova

**Abstract**—The article examines the foundations of the Guido d'Arezzo system and its significant impact on the development of music pedagogy, especially in the context of modern interactive digital technologies. One of the authors (H. Hiner) is the author of a paradigm in music pedagogy, represented by the concept of "vertical reading" — a method that combines the diatonic scale of the keyboard space with solid and symmetrical lines of the note carrier, offering a direct and intuitive correspondence between musical notation and sound. This innovative approach promotes a holistic understanding of music, combining sound, symbol and duration in a single space-time structure, significantly improving the learning process for people of different ages and abilities.

**Keywords**— Guido d'Arezzo's musical notation, music computer technologies, musical pedagogy

## I. INTRODUCTION

The article explores the historical evolution of musical notation, reveals its internal connection with the teachings that Guido d'Arezzo ingeniously incorporated into his system. This connection not only highlights the spiritual dimension of music, but also highlights the educational potential of incorporating these principles into modern music pedagogy. With the help of music computer technologies (MCT), the authors demonstrate how the triadic nature of musical notes — encompassing sound, symbol, and duration — provides a richer and deeper approach to music education.

In addition, the article critically examines the social consequences of underestimating Guido d'Arezzo's contribution to his musical system. The authors advocate a reassessment of the role of musical notation in education, emphasizing the need to restore its fundamental status in musical literacy and recognize its potential to improve cognitive development, inclusivity and holistic growth of students.

Combining historical views with modern pedagogical

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Irina B. Gorbunova. She is now with the Department of Information Technology and Technological Education of the Herzen State Pedagogical University of Russia and Education and Methods Laboratory *Music Computer Technologies* of the Herzen State Pedagogical University of Russia, St. Petersburg

Hellene Hiner. She is now with the Music Vision International LLC, Director

practice, the authors advocate a scientific approach to music education that uses the possibilities of interactive digital technologies. This approach not only deepens the understanding of the triadic essence of musical notation, but also agrees with the anthropological perspective of combining the physical and spiritual aspects of human experience.

The spontaneous act of flipping the musical text keys upwards, contrary to the knowledge of music theory acquired in music higher education, unexpectedly helped to perceive the integrity and symmetry of the musical system. The ten lines of the musical system were arranged to the right and left of the zero, like the hands of a person with ten fingers. The "index fingers" of both hands in this visual system were identified as the "carriers" of the Treble and Bass clefs.

From this discovery, the idea emerged to create a new direction in musical pedagogy, which specialists have called "vertical reading" [1].

The direct and intuitive correspondence of each line and space of the integral and symmetrical music staff with the diatonic scale of the keyboard space contributed to the crystallization of a new formation in musicology and musical pedagogy — note-sound. This, in turn, illuminated new parameters of the concept of the zone in musicology, as a segment between two boundaries [2]. Thus, the "tertian" arrangement of the lines, implying a unique pitch on the line and a unique pitch in the space between the lines — a simple and, one might say, revolutionary achievement of Guido's, which we continue to use to this day... [3] constitutes a statement of the binarity of the integral note-keyboard space. Diatonic vibrations, physically expressed through the white keys, in conjunction with the note "segments," form an integral construction of the musical system, in which the third link, made accessible through MCT today, is the development of the abstract and concrete into a unit of time.

The integration of a sound, a note, and the duration of both as a single zone of musical time into one indivisible musical whole leads to the representation of new forms of transmitting information about the note and the peculiarities of interaction with it by beginners of various ages and levels of preparation. This opens up new practical knowledge and information in exact figures about how exactly a person interacts with the world of musical sounds and the extent to which this world is transdisciplinary.

The development of various formats of musical text,

followed by the creation of the interactive 'Soft Way to Mozart' technology, enabled us to map out a progression from the vertical, alphabetical notation system to the traditional one. For the first time in music history, music computer technologies (MCT) have facilitated interactive communication with a note-key ('note-sound') throughout its emergence, development, and completion of its duration. Additionally, it became possible to precisely measure the Eye-Hand Span in beginners and to understand the evolution of the skill of sight-reading, memorizing musical text, and identifying the internal supports a person relies on in this process.

## II. MUSIC COMPUTER TECHNOLOGIES AS A UNIQUE HIGH-TECH CREATIVE INFORMATIONAL EDUCATIONAL ENVIRONMENT

And today, in our era, as MCT develop, alongside the formation of a high-tech creative informational educational environment and the advancement of interactive network teaching technologies for musical disciplines, we come to realize that the era of understanding musical-computer technologies in music education has not only arrived but has also been imbued with new meanings. The discovery of knowledge about humans and their development through musical art has gained significance through precise data. Importantly, musical pedagogy has finally been recognized as a truly scientific discipline, in line with Dmitry Ivanovich Mendeleev's assertion that exact science is inconceivable without measurements.

Our musical educational system is built on the recently uncovered insight that the musical notation system is both integral and symmetrical. This foundation, which involves the interaction with each note-sound using MCT, has significantly expanded research into individuals' musical abilities. This innovative approach to teaching music sight-reading has proven to be remarkably robust, effective, and virtually fail-safe for students of all ages, starting from as young as two years old. It is inclusive, accommodating beginners with various developmental features, including autism, Down syndrome, cerebral palsy, and other diagnoses. In their reports, professionals from different musical specialties (piano, vocal, music therapy, music teachers in general education schools, and kindergartens) from various countries, both near and far abroad, have noted an increase in attention and motivation, as well as the high effectiveness of musical development from scratch for beginners of any age; they also observed faster achievement of tangible results (with a low dropout rate among students: see the materials of the "Soft Mozart" section at the scientific-practical conferences "Contemporary Musical Education – 2014" [4] and "Contemporary Musical Education – 2023: Creative Work, Research, Technology" [5].

After the evident success of the new approach in practice in more than 60 countries worldwide, the question remained: did the integrated and symmetrical system of signs and vibrational interaction, which we now recognize, emerge spontaneously during the historical development of musical notation and keys, or was it originally conceived by the creator of musical notation? At the time of the creation of musical notation in the

1020s and 1030s, the contemporary system of physical Guidonian sequence of keys did not yet exist (Guido worked with the monochord – the precursor of keyboard instruments). A closer acquaintance with the treatises of Guido of Arezzo (such as "Micrologus," "Prologue to the Antiphonary," "Familiar Text on an Unfamiliar Chant") led us to astonishing and quite intriguing conclusions.

During years of researching the history of musical notation and the practical application of Guido of Arezzo's fundamental pedagogical principles emerged as far more grandiose, and his contribution to educational pedagogy proved invaluable. Today, new possibilities are continually unfolding from the seeds of pedagogical thought planted by Guido of Arezzo, combining with the power of MCT.

How did it come to be that over the centuries, while publishing one work after another, musical researchers failed to see the most important aspects in the works of the great Benedictine monk - inclusivity, integrity, symmetry, combined with the integration of the abstract and the concrete?

The answer is surprisingly simple: musical professionals were looking in Guido of Arezzo's treatises for what they understood best themselves due to their specialization - auditory patterns. The idea that the nature of musical notation is fundamentally visual, primarily created for the ease of human visual perception, somehow eluded detailed investigations.

How far are we from understanding the depth and global significance of musical notation in its original sense? Why do we know so little about the role of Christianity in the development of the written musical language? What damage does this cause to generations of people, regardless of their religious preferences, due to their separation from musical notation as the primary carrier of written musical material? This article delves into these questions and more.

As it turned out, with a great interest the immense interest in the lives and works of users of the musical notation system (both composers and performers), we know very little about the system itself, its origins, peculiarities, and its enormous global significance in the history of modern civilization.

In his "Prologue to the Antiphonary," Guido describes the essence of his system, according to which he arranges symbols (notes) on the lines and between them. [5-6]

Let's read:

Dehinc studio crescente inter duas lineas  
Vox interponatur una, nempe quaerit ratio,  
Variis ut sit in rebus varia positio.

Then, as the learning progresses,  
one sound can be placed  
between two lines—after all, common sense requires  
that different things be in different places.

The dichotomous property of notes is still not part of the knowledge about the notation system, which significantly hinders the development of music reading skills in both children and adults.

In the historical context of the development of musical notation, the duration of a note traditionally correlated with the lexical meaning of words and the rhythm of prayer verses. Modern MCT have allowed us to detail and accurately convey this duration, providing a new level of precision in the performance of musical compositions.

### III. INTERACTIVE COMPUTER TECHNOLOGIES AS A NEW MEANS OF REVEALING THE PROCEDURAL NATURE OF MUSICAL LANGUAGE IN THE DYNAMICS OF ITS READING BY BEGINNERS

In our research, we use a method of complex phenomenal analysis and a methodology of indirectly presented conclusions about how MCT helped us develop an effective learning system using new hardware and software systems, through which learners of all ages (starting from two years old) actively study the three most important components of musical literacy: keyboard and notation space within one unit of musical time. The choice of this method was determined by the multidisciplinary nature of the phenomenon of MCT, covering many areas of research, such as art, computer science, pedagogy, and psychology, and the format of the article.

The article uses the following materials for analysis:

- Statistics of the market of users of products included in the category of MCT (for example, [7-8] and other materials from IT industry websites).
- General and specific features of specific versions of software and hardware systems that allow students to interact with the educational environment with maximum efficiency (for example, [9]).
- Results of previous research described in scientific articles from the Scopus, Web of Science databases, and Russian scientific journals with relevant expertise, included in the list of the Higher Attestation Commission of the Russian Federation (for example, [10-11], and so on).
- Results of pedagogical observations, including observations conducted during the development and implementation of methods for mastering MCT tools, presented at international scientific-practical conferences such as 'Modern Music Education,' organized and conducted by Herzen State Pedagogical University and the Rimsky-Korsakov St. Petersburg State Conservatory and others.

Results: Long-term observations and statistics show the following:

- The IT industry is one of the leading sectors of the modern economy, despite the fact that the assessment of its achievements contains extreme poles, from hopes for positive changes to apocalyptic forecasts.
- Mobile communication means and equipment, including smartphones and various sound devices, are becoming cheaper every day, and their functionality and other characteristics are constantly developing and improving [12].
- The user IT market, including MCT, is subject to constant turnover. Various models and versions of software and hardware are constantly replacing old versions; some software and hardware companies remain viable for a long time, while

others disappear.

### IV. CONCLUSION

A conclusion section is usually required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. In the considered field, important and promising developments in MCT are those that use the achievements and advantages of these technologies to allow beginners to interact with three spatial-temporal elements of music simultaneously:

- a) musical notation, which can be transferred from paper to the screen;
- b) the keyboard of a musical instrument;
- c) sound, which reflects auditory representations of artistic imagery (including that which is contained in musical notation) and the result of accumulated experience in using the technical means of a specific musical instrument.

The written form of the musical language emerged about a thousand years ago, and its significant development took place in Russia, where classical music education traditions have been evolving for many centuries. The beginning of these traditions can be traced back to home music education and the theatrical work of the nobility. Later, it transformed into a system that starts with children's music schools, which are transforming today into a state network of additional education for children.

The 'Soft Way to Mozart' system is an example of such a technology that expands upon the methodological principles of Guido of Arezzo, while also providing students with a deeper understanding of the triadic essence of a musical note: its sound, visual representation, and temporal duration.

Such an approach, based on the integration of these elements, reflects not only the musical but also the cultural and historical significance of notation, emphasizing its role in education and the perception of music as a temporal art.

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**Irina B. Gorbunova** was born in Saint Petersburg (Leningrad), Russia. 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 Pedagogical Sciences, the Herzen State Pedagogical University of Russia, St.

Petersburg, 1989; Doctor degree: Doctor of Pedagogical Sciences and Information Technology, the Herzen State Pedagogical University of Russia, St. Petersburg, 1999. Dr., Full Professor, Chief Researcher of the Education and Methods Laboratory *Music Computer Technologies* at the Herzen State Pedagogical University of Russia, St. Petersburg; hold the degree of Honorary Worker of Higher Professional Education of the Russian Federation.

#### Work experience:

1990 – 2010 - Associate Prof., Professor of the Department of Information Technology of the Herzen State Pedagogical University of Russia, St. Petersburg;

2010 - present - Full University Professor, Department of Information Technology, Institute of Computer Science and Technological Education at the Herzen State Pedagogical University of Russia, St. Petersburg;

2002 – present - Head and Chief Researcher of the Education and Methods Laboratory *Music Computer Technologies* of the Herzen State Pedagogical University of Russia, St. Petersburg.

She has more than 500 scientific publications, among them are monographs *Music Computer Technologies: Historical-Theoretical and Practical Aspects*, St. Petersburg: Publ. House "SMIO Press" (2007.) and *Music Computer Technologies: The Problem of Modeling the Process of Musical Creativity*, compiled with participation of S. V. Chibirev, St. Petersburg: Publ. House of the Herzen State Pedagogical University of Russia (2012); textbook *Information Technology in Music*, vol. 1 – 4: vol. 1, *Architectonics of Musical Sound* (2009), vol. 2, *Musical Synthesizers*, 2010; vol. 3, *Musical Computer*, 2011; *Music, Mathematics and Computer Science*, vol. 4, 2013, St. Petersburg: Publ. House of the Herzen State

Pedagogical University of Russia; Bazhukova E., Gorbunova I., Zalivadny M.S., Chibirev S. *Musical Informatics*: textbook. St. Petersburg: Publ. House Lan; Planet of Music, 2023; I. B. Gorbunova "Information Technologies in Music. Book 1: Architectonics of Musical Sound" Moscow: Publ. House URSS, Lenand (2023); I. B. Gorbunova "Information Technologies in Music. Book 2: Musical Synthesizers". Moscow: Publ. House URSS, Lenand (2023).

Prof. Dr. Gorbunova is a Chairperson of the annual International Research and Practical Conference *Contemporary Musical Education* held since 2002; Chairperson of the annual International Research and Practical Conference *Music Computer Technologies in the System of Contemporary Education* held since 2007.

Dr. Gorbunova is a member of the Jury of national and international competitions of musical creative works, including *Electronic Palette* (Saint-Petersburg), *Music and Electronics* (Moscow), *Music of the 21<sup>st</sup> Century* (Moscow / Saint-Petersburg), International Festivals and Competitions *Musical Electronics and Multimedia* (Moscow / Saint-Petersburg), *CLARINE of the 21<sup>st</sup> 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).

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), and she also leads post-graduate course "Music Computer Technologies in Education" available under the MA in Music Education.

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 research 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 500 refereed publications including 49 books and more than 300 papers in various scientific journals.

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



**Hellene Hiner** was born in Leningrad (currently St. Petersburg, Russia). In 1964, Hiner's family moved to Ukraine. With a concentration in piano performance, Hiner graduated from a state music school in Pokrov, Ukraine, in 1976. She continued her piano studies at the university, and in 1980, graduated from Kosenko Music College in Zhitomir, Ukraine, with a Bachelor of piano, music theory and music history. In 1987, she graduated from University of Arts in Kharkiv, Ukraine, with a Master's degree in musicology, music criticism, music history and music theory— all preparing her to become a music educator. Since 1980 her main field of study has been music pedagogy, psychology and education. At Hiner's graduation in 1987, Moscow Conservatory recommended that she publish her thesis "How to Teach Students in Public Schools to Hear and Appreciate Sonatas and Symphonies."

In 1980, she started her career as a piano/theory teacher in a state music school in Pokrov, Ukraine. During 1987-93, after graduation, she was a teacher in Zaporogiyev state music school #2. After immigration to the USA

in 1993, she opened her Music Developmental Program "Little Mozart" in 1995 (Houston, USA). From 1998 to 2001 she worked as a Music Director of Cottage Montessori School system. Her new findings in teaching music and piano were featured on ABC tv. In 15 minutes on a live talk show, she taught a 7-year-old student chosen at random from the audience to play the piano. In 2001 she created the software component to her method and the company name was changed to "Do Re Mi Fa Soft." Using her digital tool, she further developed her system, named "Soft Way to Mozart" or "Soft Mozart." NBC and CBS channels featured her method and the achievements of her students for their outstanding performances. From 2011 to the present, the company has become Music Vision International, LLC. The system has been translated into Russian, Spanish, German, French, Chinese and Japanese. She is the Founder and the Chief Executive Officer of her music business at Houston, 15131 New Hastings (TX) location in USA. Her first publication was made by Moscow Conservatory in the book *How to teach Solfeggio in the XXI century* in 2006 (Publishing house Classics – 21 ISBN: 5-89817-166-5, Russian Federation). Her research on the most effective ways of teaching music literacy has been further developed and described in a series of scientific publications made with the leaders in the field of music technology and pedagogy: Irina Gorbunova from Herzen University, Russia, and Michael Zalivadny from St. Petersburg Conservatory, Russia. Ms. Hiner's articles on piano pedagogy have been published by several Russian universities in compilations, journals, and conference proceedings. Her article "Computer Way to Mozart" appeared in the book *How to Teach Solfeggio in the XXI Century* (Moscow, Russia: Moscow Conservatory Publishing House Classics 21, 2006). Another article focused on an underserved audience for studying piano: "Inclusive Music Education: The Methodical Recommendations of the System 'Soft Way to Mozart' for Children with Special Needs" (St. Petersburg, Russia: Herzen University, 2017). Three of her articles have been part of a series titled *Internet and Digital Space: Post Material Values of Youth, A Child in the Modern World* (St. Petersburg, Russia: Herzen University, 2018). These three writings are entitled "The Main Features of Attention Span and the Most Efficient Ways of its Development in Children ('Soft Way to Mozart' Music Training Method)," "Motivation as an Important Factor of Successful Teaching of Music on the Piano and Music Recitals Online," and "Building Student Self-Respect and 'Soft Training' as the Main Principles of Teaching Music with the 'Soft Mozart' System." She has also collaborated with other authors. With I. Gorbunova, Hiner wrote "Interactive Network Technologies for Training Music in the School of the Digital Century: The Program 'Soft Way to Mozart'" (Orel, Russia: Oryol State University, 2014). The two authors also presented the paper "Music Computer Technologies and Interactive Network Systems of Learning Music" (Oxford, UK: 190th VIIER International Conference on Psychology, Language, and Teaching, 2018). Hiner and Gorbunova have also published with a third author, M. Zalivadny. Their articles include "About the Value of Mathematical Methods in the Study of Music and Professional Training of Musicians" (St. Petersburg, Russia: St. Petersburg University Consortium, 2015) and "Musical-Computer Technologies as an Information-Translation System in the School of the Digital Century" (Orel, Russia: Oryol State University, 2014).