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HISTORY AND CHALLENGES OF DIGITAL MUSICOLOGY IN SLOVENIA

Abstract

The general aim of this article is to sketch the processes of understanding music as a set of phenomena intricately involved with the IT novelties within the Slovenian research community from the three basic perspectives of ethno/musicologist, librarian (essential when approaching music computationally), and IT. It assesses what these perspectives have brought to the understanding of music, but more importantly indicates that the three perspectives are not arbitrary. Together they form digital musicology in Slovenia. First, it lays out the Slovenian contributions to e-music research, and illustrates academic specificities, both Slovenian and global. Lastly, the article offers some thoughts on current academic challenges and reflects on possible solutions.

Key words: digital musicology; ethnomusicology; music analysis; Slovenian music; digital libraries.

1. INTRODUCTION

In the preface to his *The Style of Palestrina and the Dissonance*, first published in the 1920s, Knud Jeppesen noted that the study of the dissonance has not yet been approached *scientifically*. As he explained, dissonance, "though generally acknowledged as being among the most important for musical research, has not yet been taken up in any serious, scientific way" (Jeppesen 1970: [1]). He approached Palestrina's music from a "genetic point of view" in distinction to the majority of the earlier writers whose aims were mainly "of a practical pedagogic nature" (Idem). His final goal was a stylistic analysis of Palestrina's music.

Almost half a century later, in 1959, Alan Lomax introduced his *Cantometrics* project. Its ambitions were high: to analyse the styles and correlate them to the social variables. His analyses, consisting of 37 features, of the songs was not as eagerly adopted by academic music analysts (or so to speak, musicologists) as he thought it

may be. Yet his logic provided fertile ground for *The Music Genome Project*, a part of the Pandora enterprise. With more than 450 features, *The Music Genome Project* claims to be "the most comprehensive analysis of music ever undertaken".[1] While Lomax's approach was rooted in humanities and social studies scholarship, *The Music Genome Project* undertook the challenge of systematizing music information from an IT business perspective of about 450 variables or attributes, similar to the Gracenote Sonic Style's.[2]

The *fields of interest* in music research[3] have seen enormous expansion over the last two decades. Within the academic music-research community, there are at least three complementary communities worth mentioning. The European Music Analysis Congress ("EuroMAC")[4] built their platform mostly on the principles of music theory/analysis societies, while Sound and Music Computing ("SMC")[5] and especially the International Society for Music Information Retrieval ("ISMIR"),[6] gathered a vital community consisting predominantly of IT specialists. Both communities also benefit from the contributions of (computational) ethno/musicologists. The increasing collaboration among the three crucial fields – ethno/musicologists, IT, digital libraries – is especially visible in the communities that belong to a third group of music scholars, gathered for instance around the International Workshop on Folk Music Analysis ("FMA"),[7] Digital Libraries for Musicology ("DLfM"),[8] or Technologies for Music Notation and Representation ("TENOR").[9] The issues addressed in the latter group (but also in the first two) are being explored through both social studies and humanities (the "soft" sciences, closer to the EuroMAC), as well as the more technically oriented ("hard") sciences (see Figure 4). And, although information retrieval from and about music is a common goal for all three indicated groups, the horizon of understanding of music differs among them.

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[1] https://www.pandora.com/about/mgp, accessed: 8 March 2022.

[2] https://www.fastcompany.com/company/nielsen, more on https://www.gracenote.com/, accessed: 8 March 2022.

[3] The terminological quandary regarding the basic concepts of exploring music urged us to address different fields of ethno/musicological interest, such as music analysis, music theory, historical and systematic musicology under the same perspective of digital humanities.

[4] https://euromac.mosconsv.ru/en/home-0, accessed: 8 March 2022.

[5] https://smc22.grame.fr/, accessed: 8 March 2022.

[6] https://www.ismir.net/, accessed: 8 March 2022.

[7] https://www.folkmusicanalysis.org, accessed: 8 March 2022.

[8] https://dlfm.web.ox.ac.uk/9th-international-conference-on-digital-libraries-for-musicology, accessed: 8 March 2022.

[9] https://tenor2022.prism.cnrs.fr/, accessed: 8 March 2022.

Understanding music here refers only to the epistemological issue of the range within which different music scholars approach music. Our aim is to sketch the processes of understanding music as a set of phenomena intricately involved with the IT novelties within the Slovenian research community. The contribution sketches digital musicology in Slovenia from three basic perspectives: the musicological one, the perspective of librarians and archivists, and the IT perspective. The main question remains, what have these perspectives brought to the task of understanding music better? We must understand that the three perspectives are not arbitrary. Together they form what we understand to be digital musicology in Slovenia. We shall sketch the scope of the Slovenian digital musicology throughout its history. The contribution will also sum up the achievements and prospects with an awareness of the weaknesses and faults that are involved in a definition of an omnipresent yet to a certain extent also an imaginary phenomenon, such as digital science with many emergent forms.

2. BACKGROUND

Nico Schüler thoroughly explored the history of computer-assisted music analysis. One of his claims is rather telling:

> "Even at the beginning of the 'computer age' of music analysis, communication between scholars was very slow. […] it seems that not much has changed since the 'beginning': scholars know little about the history of their area, previous successes and failures are hardly known. Thus, mistakes are duplicated, and prejudices flo[u]rish" (Schüler 2005: 38-39).

Nicholas Cook, in his ISMIR 2005 talk, spoke about the *opportunities* for musicologists to be involved with IT and reflected about "some of the factors inhibiting musicologists' engagement with information science" (Cook 2005). Cook started wittily, "with something that happily *isn't* the problem: hostility to technology on the part of musicologists" and proceeded with "two points that have to do with data poverty" (Idem: 2): 1. "musicologists are used to working with highly reduced data" (Idem: 3) and 2. "musicologists are used to working with small data sets". Both points are almost tautological: "I think the conclusion is again clear: working with larger data sets will open up new areas of musicology" (Idem: 5). Although something new does not always mean something better, the issue, we hope, thematizes the topic of *theory transfer*.

The *hostility to technology* demonstrated by musicologists is hardly a debatable issue today: it is more a pragmatic challenge, a false quandary, a *technicality*. For

instance, some time ago, if a professor wanted to play a musical example, they played it from a recording; if, however, their professors wanted to use audio examples, they would have to play it themselves on a piano (often somewhat poorly tuned).[10] The *hostility to technology* in the era of YouTube is but a remnant from old times. The range of using new tools for music research and education, to the contrary, is still an important issue. Technically speaking, the difference between playing a recording (vinyl, tape, CD, MP3, etc.) or playing a (reduced) score on a piano is, basically, a "mere" technical question of taste. Pursuing a pragmatic solution makes the difference between playing a recording instead of illustrating a piece of music by performing it on a musical instrument primarily an issue of μέθοδος (method) following certain τέχνη (techne). Yet the consequences are a long-term shift from developing active handcraft capacities of playing musical instruments toward a passive use of music within the confines of whatever the music industry offers at a certain point in time and space. In other words, it seems that there is really "a basic confusion between technology and epistemology here" (Cook 2005: 5). Clearing it would mean to bring about the necessary "conceptual changes" in music research (Idem: 6). Yet, has computer-assisted music scholarship brought about some conceptual changes in existing music research?

The question can be misleading. From the beginning, Guido Adler proclaimed musicology as an interdisciplinary field. Musicology is, like most disciplines, developing ever since Adler's time into a ramified net of differentiated music-related studies. Practically (we do not have any statistics, yet our scholarly intuition allows us to assume this), each of the music research branches claims interdisciplinarity for itself while, at the same time, remaining rather poorly informed about the theoretical concepts and practical achievements of the other fields. Even though interdisciplinarity remains an appreciated concept within the research community, different music-related research branches have very few visions about the mutual transfer of theories and concepts. The use of computer-assisted music research in academia is almost entirely limited to postgraduate level and, mainly, limited to metadata analysis and confined formal analysis of the musical text/performance to several musical parameters. However, the complexities between the social and the "purely musical" factors remain rather scattered throughout almost 2000 entries in RILM consisting of the concept of *transfer* in their title (in October 2020): the music-transfer theory is entirely pragmatic, case sensitive, contextual, monitor-conditioned. If François-Joseph Fétis condemned "tonal miscegenation" (Christensen 2020), post/modernity enthroned the "musical miscegenation": heterogeneous and heteronomous *fusions*.

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[10] It should be noted that in Eastern Europe, the gramophone and vinyl recordings were rare technological extras in music education.

Different processes of transferring ideas, things, and people from one context into another is a ubiquitous and quotidian phenomenon, crucial for understanding our "postmodern modernity" (Welsch 2008) and its "transversal reason" (Welsch 1996) that manages to understand almost all phenomena through a premise consisting of an "aesthetic" and "anaesthetic" ("Anästhetik") that "problematizes the elementary layer of the aesthetical, its confine and limit" (Welsch 2017: 13).[11]

If the *transfers* between the two levels conjure up a vast array of different, as it were, interlocutors, the historical sketch below confines itself only to the "previous successes and failures" of digital musicology in Slovenia. At the end, some suggestions for further development of the field of digital musicology in Slovenia are indicated.

3. PREDECESSORS OF SLOVENIAN DIGITAL MUSICOLOGY: FOLK-MUSIC ANALYSIS CONCEPTS AND DIGITAL COLLECTIONS

3.1. *Folk-music analysis concepts*

The concept of *music collections*, although it has existed for centuries in the geographical area of Slovenia, gained more and more attention with Glasbena matica (1872). Then, the most important and active Slovenian music institution considered itself responsible for collecting and preserving national musical heritage as well was responsible for music score publishing, music education and, of course, performances. Glasbena matica initiated the establishment of the Institute of Ethnomusicology (GNI) in 1934 – the oldest institute of the Scientific Research Centre (ZRC) of the Slovenian Academy of Sciences and Arts (SAZU). In 1956, GNI under the supervision of Valens Vodušek (1912–1989), prepared a plan for the classification of folk songs in six catalogues and later, in 1962, also a form for text cataloguing and classification. Vodušek's immense work triggered a wide regional recognition of the GNI. Vodušek's scheme (see Figure 1) is the first systematic analytical concept for analysis of the aspects of musical structure – a kind of pre-computer-assisted analytical concept for music information retrieval.

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[11] "Das ist nicht erst in der Philosophie, sondern schon in der Medizin so: durch Anästhesie schaltet man die Empfindungsfähigkeit aus – und der Wegfall des höheren, des erkenntnishaften Wahrnehmens erweist sich als bloße Folge davon. Anästhetik problematisiert also die Elementarschicht des Ästhetischen, seine Bedingung und Grenze" (Welsch 2017: 13).

Figure 1: Every field recording was processed according to the form above. The music was analysed following the given variables introduced by Valens Vodušek at the Institute of Ethnomusicology in Ljubljana in the 1950s. Published with permission of GNI.

The analytical part consists of three musical levels or "tupes": M = melody; Rt = rhythm; and H = harmony. The "structure" of a piece was addressed through the following variables: Met = metrics; Verz = verse; Rim = rhyme; Obl = form; Tdim = *; Harm = harmony; Kad = cadences; Grup = groups; Takd = bars; Lin = *; Ton = initial tone; Amb = ambitus; MM = tempo (Mälzel's metronome). The approach may be seen as a predecessor of the music information retrieval systematisation so specific for the computer-assisted analytical approaches. The form was archived together with the transcription and the recording of each piece only until the 1980s, when computers were entering into the horizon of the humanities. Later, transcriptions were gradually left out of the systematically programmed regular activities of the Institute. The transcriptions are ever since provided through individual research and publishing projects. * We were unable to explain these variables.

The Institute of Ethnomusicology was the leading institution in cataloguing music in Slovenia. Their leaflet catalogue ("listkovni katalog") consists of 6 identical leaflets distributed through 6 categories: 1. title; 2. catalogue number; 3. melodic structure; 4. rhythmic and metric structure; 5. genre; and 6. province of the piece's provenience (see Figure 2):

Figure 2: A leaflet from the catalogue of the Institute of Ethnomusicology. A photo courtesy of Dr Urša Šivic. Published with permission.

At the Institute of Ethnomusicology digitalisation began in 1992. The cited analytical forms were part of the systematic music research that may be considered a predecessor of today's practices of digitalising music. The forms of analysing audio recordings – a speciality of the Institute's scholar Drago Kunej (cf. Kunej 1999; 2000; 2001; 2004; 2005; 2009; 2014; 2017; 2020) – were elaborated for archiving by Kunej in the early 1990s. Although the analytical form includes a transcription, systematic transcribing and systematic analytic work on the Slovenian folklore corpora has taken slower pace since the 1990s.

The history and practice of video analysis in Slovenia is still rather stagnant (in technical science and humanities research), both methodologically and practically. Naško Križnar, the only Slovenian systematic scholar in visual anthropology, has a rather limited interest in music (cf. Križnar 1991; 1994; 2001a; 2001b; 2002; 2006; 2009; 2012; 2015).

Of course, the methods and practices related to music research have been drastically changed by IT experts. However, before we turn to their contribution, we should address another crucial field comprising, in a way, the prerequisite contributors when discussing digital musicology scholarship – libraries and archival digital collections.

3.2. *Digital collections*

Both research of digital musicology and MIR (Music Information Retrieval) is fuelled by well-prepared digital music collections of different contents, formats, quality, and quantity. The handling of the growing music materials is today scattered among different "stakeholders" of the Slovenian musical world. Besides the strongest music re-/production institution in Slovenia, the national broadcasting agency RTV Slovenija, with its nominally public archives that are unfortunately difficult to access by the public, the librarians and archivists emerged as the most productive scholars in the field of digital musicology.

The Slovenian version of what is today known as Europeana[12] was introduced by the National and University Library in Ljubljana in November 2005 with The Digital Library of Slovenia (dLib).[13] Although their primary aim was to digitize the physical materials, one of the most important motivators of the project, Zoran Krstulović,[14] emphasized two general benefits in this process: the "new possibilities for searching" that enables content to be more "widely available" as well as the wider archival goal that aims "to preserve books for future generations […] making them accessible in one place" (Tomažič 2010).

Although these processes of database building may seem somehow far from the *proper* digital musicology, it is important to know that it is impossible to carry out research without ensuring the digitisation step first. As Kranenburg et al. point out, "(ethno)musicological archives contain the musical 'memory' of the world" (Kranenburg, Grabers & Volk 2010: 2). As a lot of this "memory" remains inaccessible today, digital scholars are usually "tempted" or "forced" to use or even keep on returning to the same available song collections instead of exploring the not-yet explored (Idem).

It is rarely unwillingness that prevents the creation of collections of digital material. Among many obstacles, the most unbridgeable issues relate to staff and/or financial shortages and/or legal regulations of various areas of social life. The possibilities for creating digital collections are increasingly influenced by legislation

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[12]   https://www.europeana.eu/, accessed: 1 July 2022.

[13]   The dLib was created at the end of 2005 following the emergence new possibilities offered by the new web technologies of that time. Digital platforms ensured better accessibility to the Slovenian classics and more vulnerable library materials; thus, it established a digital library portal with an accessible digital repository. The materials were collected within the national library, but also from various partners (libraries, archives, scientific and other institutions). More on: https://www.dlib.si/, accessed: 1 July 2022.

[14]   He was granted a librarian *Kalanova nagrada* award in 2011 together with Karmen Štular Sotošek on "theory and practice in digitalisation of the library materials" (http://www.old.zbds-zveza.si/kalan2011_krstulovic-stular.asp), accessed: 8 March 2022.

in the field of copyright, privacy protection, personal data protection, etc. Related obstacles rarely disappear, even when the collection is already established, thus not only the innovation but also the sustainability of such projects must be ensured.

If we now return to the case of Slovenian dLib, a variety of materials in the field of music was successfully made public. From resources for studying the musical past, printed music, and manuscripts of the 19th and the first half of the 20th centuries, to music newspapers and magazines and sound recordings. Today, a little more than eight thousand units of music manuscripts, printed music and recordings are available through their platform. The oldest materials are graduals, antiphonaries, and psalteries from the 16th century, Hren Choir books from the 17th century and Himni ad Laudes by Jacopo Tomadini from the 18th century. Slovenian music of the first half of the 19th century is presented in the form of printed music and music manuscripts. Apart from that, it offers an interesting insight into the nature of creativity for piano in the Slovenian territory in the 19th and the early 20th centuries. Project dLib also provides access to all Slovenian music magazines that were published until 1945, and to most of those published after the Second World War, programme notes from more than 1600 concerts, textbooks for singing and various instruments, and so on. The audio collection has been increasing as well, with about 2000 digitised audio cassettes released between 1970 and 2000. The project is fairly new (as many of them globally also tend to be), thus the direct "computational processability" of data remains restricted. Nonetheless, it nowadays represents the largest digitised treasury of Slovenian music-related documents and thus a good starting point for many musicological and MIR research.

4. MUSIC-RELATED IT RESEARCH (MIR)

From the previous section, it seems that the first wave of digitalisation (and consequently, the entrance of digital ethno/musicology) rested on two premises. One – *preservation* – is anchored in one of the most notorious anthropological perspectives of the late 18th century: the enlightenment ideal of universal knowledge. Its encyclopaedic goal was to gather all "futures past" – that may substantially differ from any individual "past futures" – as Reinhart Koselleck formulated the relations between understanding our past, contemporaneity and the projections of a future (cf. Koselleck 2004). In this respect, digitalisation has enabled music to gain incredible omnipresence.

While music is preserved in many forms, music's general *accessibility* has typical *postmodern* capacities of permutation, fragmentation, and branching out. At present, there seems to be little information on *access* to individual components of the

communication chain. Within the IT community, for instance, Orio wrote about "accessing, filtering, classification, and retrieval" (Orio 2006: 1), and Schedl, Gómez, and Urbano about addressing "music content", "music context", "user context" and "user properties" as interrelated areas, with "music perception" being the common issue of MIR (cf. Schedl, Gómez & Urbano 2014), Müller wrote about "music representations and the Fourier transform" as the two topoi that make his excellent survey of the field "self-contained to a great extent" (cf. Müller 2015). Jannach, Weihs and others concentrated their contributions on "music analysis processes" which, after the subchapter *Music Data: Beyond the Signal Level*, include various areas of mathematics as well as musicking, such as "emotions", "organization of music collections and database", "music recommendation", even "automatic composition" (cf. Weihs et al. 2016). In short, which information is accessed depends broadly on the researcher's epistemological focus. Moreover, it may be hasty yet in the current stage of music research hardly exaggerated to claim that a common concern of the researchers is anchored on the premise of information retrieval *from* and *about* music. It seems that exactly the distinction of elaborating data *from* music on the one hand, and *about* music on the other, defines the two interrelated sets of issues regarding MIR today. In this respect, the Figure 3 that embeds the plethora of research foci from within the field of music perception constitutes a rather persuasive perspective for the systematization of the entire field of not only computer-assisted music research, but music research as such today.

Figure 3. Source: Schedl, Gómez & Urbano 2014: 131.
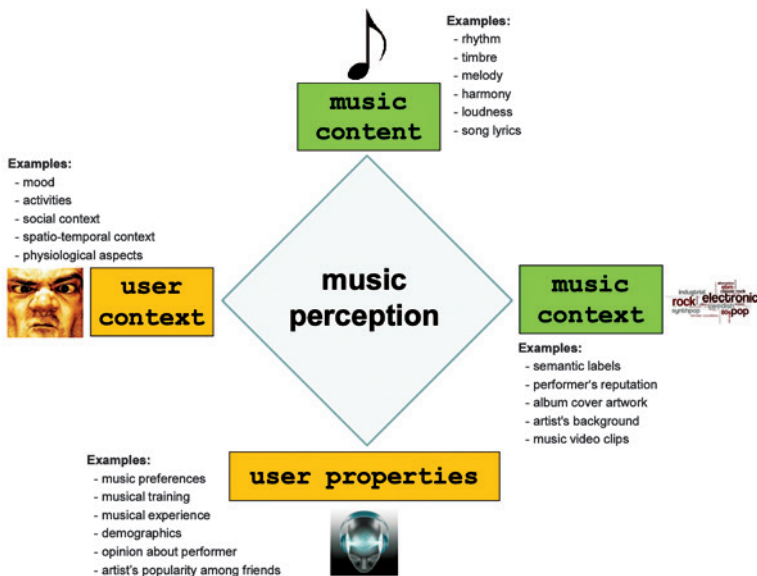
For a more integrative version, we would propose somewhat different emphases, starting from the current institutional formations within the music-research network (see Figure 4).

Figure 4: Interests in music analysis today derived from juxtaposing some of the most notable academic associations. The indicated epistemological premises shared among all sciences are, we believe, probably the most discussed tectonic issues in music research today.
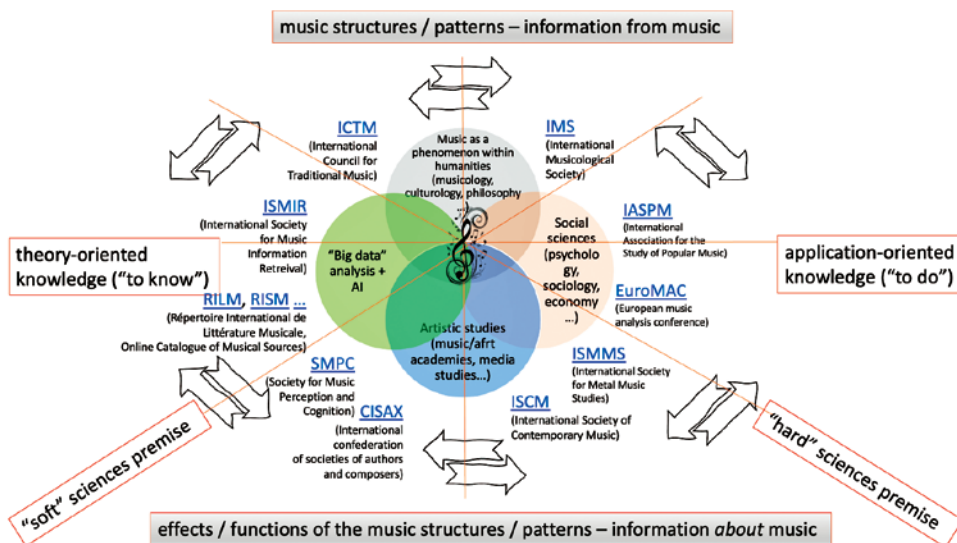
Within this division, there have been several projects accomplished in Slovenia, mainly related to the Laboratory for Computer Graphic and Multimedia at the Faculty of Computer and Information Science at the University of Ljubljana. Activities of the Laboratory are mostly focused on the computational aspects of music information retrieval and understanding. In the last twenty years, their researches have covered a large variety of topics, from multi-pitch transcriptions of piano music (cf. Marolt 2004) and bell playing (cf. Lefeber et al. 2011), melody extraction (cf. Marolt 2005) and intermediate representations for cover song detection (cf. Marolt 2008) to the exploration of relations between mood and colour perception in music (cf. Pesek, Strle et al. 2017), and deep compositional modelling of harmony, melody and rhythm (cf. Pesek, Leonardis et al. 2017; 2019).

Their cooperation with GNI started in 2006 and resulted in several successful projects and applications, starting with the establishment of the *EthnoMuse* archive as a digital embodiment of the institute's collections (Strle and Marolt 2012). Parts of

the *EthnoMuse* were also presented through the projects *Click to Homeland* (ARRS project, 2010-2012), which provided a web-based multimedia presentation of Slovenian emigrants' cultural heritage, and *EtnoFletno* (structural funds project, 2014-2015), which provided a new streaming-service-like approach (e.g., Spotify) to experiencing folk music heritage on the web and mobile devices.

Through the projects *EtnoKatalog* (ARRS project, 2008-2011) and *Thinking Folklore* (ARRS project, 2018-2021), they focus on music information retrieval approaches designed specifically for folk music archives. Namely, the computational approaches, which are typically used for information retrieval in popular or art music, are only seldom useful for folk archives due to their specific content (e.g., field recordings, made in non-ideal conditions, with amateur performers vs. studio recordings with professionals). The work resulted in systems for the segmentation of field recordings (Marolt 2009; Pesek et al. 2019), segmentation and transcription of singing (Bohak and Marolt 2016), and transcription of bell chiming recordings (Marolt 2012).

Recently, they have also started to relate their music research to music education by developing the *Troubadour* platform (Pesek et al. 2020) in cooperation with the Conservatory for Music and Ballet Ljubljana. The platform is a dedicated ear training tool for new generations of students which grew up with mobile devices. It is focused on practicing melodic, rhythmic, and harmonic exercises. New tools are still being developed, while the platform is already successfully integrated into their syllabus at the Conservatory (Pesek et al. 2020).

5. EDUCATIONAL APPLICATIONS

Besides the research-oriented achievements, some educational applications should also be mentioned. Since the first systematic attempt to sketch the field of computer-assisted music education in Slovenia was pursued a relatively long time ago (cf. Stefanija 2006), it seems appropriate to sketch the Slovenian music e-learning environment.

Beside the textbooks and handouts that circulate more and more frequently in e-formats (mainly pdf), some e-classes have also been designed outside of academia. The online courses are designed almost exclusively for music theory classes. The National Educational Institute Slovenia has conceived an ambitious remit of "gathering materials throughout the educational vertical for music education",[15] where

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[15]   https://skupnost.sio.si/course/view.php?id=999#section-1, accessed: 8 March 2022.

eight online classrooms[16] and three e-textbooks[17] may be emphasized. The Academic and Research Network of Slovenia has been offering e-classrooms for teachers since 2018, there are already 206 classrooms for music[18] available primarily for primary schools followed by materials for secondary school and music theory for elementary music schools.

Additionally, several applications have been developed in the last decades. Although teachers on different levels of music education use different internationally known music-related apps, the first integrative set of trainers for music theory within Slovenia was launched online as a freely available tool for music education in 2007 on the site Music Theory Concepts.[19] Apart from the online application *Glasbeni slikovni zapis: Ritem* (*Music image recording: Rhythm* – unavailable since 08/09/2015) (cf. Borota and Brodnik 2007), *MySolfeggio* (2017) (powered by See-Score) in particular should be mentioned[20] as a (freely available) prototype for complementing the textbooks and classrooms, whereas *MaestroAmadeus* (2017) serves as a professional app for organizing and utilizing sheet music.[21] Also, the endeavours of the team at the Faculty of Computer and Information Science should be mentioned. There, Matija Marolt, Matevž Pesek, and Peter Šavli are prime movers of further work within the neglected field of music IT. Their work-in-progress is the application *Trubadur* (cf. Pesek et. al. 2020).[22]

6. OUTSIDE OF EDUCATION AND RESEARCH

Within the more tourist-driven ambitions, *Guide2Music* for exploring Slovenian natural parks, music collections, (music) venues and musicians' places of birth should be mentioned.[23] Similar ambitions have been tackled by the Slovenian Music

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[16] https://skupnost.sio.si/course/search.php?search=glasba, accessed: 8 March 2022.

[17] https://eucbeniki.sio.si/, accessed: 8 March 2022.

[18] https://ucilnice.arnes.si/course/search.php?q=glasba&areaids=core_course-course, accessed: 8 March 2022.

[19] http://muzikologijaff.si/ptg/VadniceTrainers/index.htm, accessed: 8 March 2022. Music Theory Concepts was a part of the project *Computer-Assisted Music Theory Learning*, coordinated by Leon Stefanija and Nico Schüler, within the life-long learning program of the Slovenian Ministry of Education and Sport in cooperation with the European Social Fund in 2006-7.

[20] https://medijske.um.si/mysolfeggio/, accessed: 8 March 2022.

[21] https://www.maestroamadeus.com/, accessed: 8 March 2022.

[22] http://pojmovnik.fri.uni-lj.si/vadnice/, accessed: 8 March 2022.

[23] http://guide2music.si/, accessed: 8 March 2022.

Information Centre.[24] Both projects are self-contained and without aspirations of further development within an otherwise a highly interactionalist environment.

Edo "enables music performers and publishing houses in Slovenia to supervise their copyrights among music users (e. g. in restaurants, snack bars, bars, confectioneries, shops, hairdressers and beauty salons …)",[25] whereas "GEO is a web application designed to monitor the use of music within the group of so-called small users (restaurants, shops, hairdressers …) with the help of an interactive map".[26] Both applications remain limited in their scope of supervision: exact data – say, per piece/number of performances – are not available.

Gathering the information about the methods regarding the acquisition of data and the number and source of reproducing individual musical works or, on the other hand, how often and from which devices an individual piece has been played, as well as other relevant information one may find useful during their research, thus remains vastly difficult.

7. ACADEMIC DYSFUNCTIONALITIES?

Although we could hardly survive without a computer or smart gadgets today, music research seems to be slow in communicating among its different branches. Which "new areas of musicology" have been opened with the possibilities of "working with larger data sets", as Cook (2005: 5) phrased the main premise of digital ethno/musicology?

For the Slovenian circumstances, big data musicology looks like a set of processes that shyly flirt, if at all, with the existent digital approaches already accepted by some other branches in the humanities and social sciences. Three instances that underpin the claim should suffice to illustrate the situation.

First instance – music anthropology. Music anthropology – in the widest sense of the word, music psychology, sociology, and aesthetics included – may gain interesting insights into music consumption within discrete geographic places with the concepts underlying the above-mentioned *Edo* and *Geo* systems[27] for tracking the reproduction of music – if they would have been expanded also for research purposes. After all, the so-called *cultural turn* in the humanities since the 1970s repeatedly

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[24] https://www.momus.si/, accessed: 8 March 2022.

[25] https://www.ipf.si/ipf-ko/aplikacije, accessed: 8 March 2022.

[26] http://geo.ipf.si/, accessed: 8 March 2022.

[27] https://www.ipf.si/ipf-ko/aplikacije, http://geo.ipf.si/, accessed: 8 March 2022.

addresses one commonality regarding the fragmented world: Alfred Schütz called it the topic of *co-worlds* (cf. Schütz 1972), Max Bense *co-realities* (cf. Bense 1954; 1965), and the IT experts define it as *virtual* and *extended realities*. However, we are not familiar with any scholarly interest in the *realities* that fall within the horizon of music scholars.

Second instance – music historiography. The historiography of music could gain rather substantial sets of data primarily from two sources: analysis of music patterns in the pieces as well as data regarding the reception and circulation of individual music pieces, as well as ideas regarding production, mediation, and consumption. There are practically no corpora available for systematic music analysis, analysis regarding music circulation, or analyses on music reception within (probably not only Slovenian) music historiography. They would, however, certainly be of interest to a wider circle of music-related studies, such as cultural management, economy, or media studies.

Third instance – music theory. The smart music theory trainers are, as a complementary tool, rather popular among students at different levels of music education. Yet, theory in its etymological root includes *inspection* and *reflection* about musical phenomena in a wider sense than practised in today's academia: it ranges from analysis and reproduction of basic musical structures and style analysis to analysis of the terminology of music reception history. On this wider level, music theory has much in common with linguistics, psychology, and media studies, among other disciplines. The Slovenian music theory community is presently in a rather early stage of acquiring basic perspectives of exploiting IT in music research.

8. FACIT

Today's democracy and liberalism in music research competes with the rapidly changing world of IT. However, although computer-assisted music analysis seems almost confusingly reaching, we believe that the goal of any analytical endeavour in music research still addresses only two interrelated sets of questions described neatly by Carl Dahlhaus in 1970. He claimed that each music analysis is: 1. either a presentation, foundation, or critical reflection of a certain theory (about composition, performance, aesthetic, reception etc.) or 2. focused on details regarding one phenomenon or several musical phenomena – a piece of music, opus, genre, style, mode of perception, effect, etc. (cf. Dahlhaus 1970). The correlations between the "big picture" and the "small particle" – between the *theory* (context) and the *phenomenon* ("the thing") – are too broad to be addressed here. In short, in Adorno's almost three-quarters of a century old analytical ideal – to "determine each whole form

from the dynamic interplay of its elements" (Adorno 1991: 109)[28] – seems to still be of central interest to IT music analysis today. The relations between the patterns of a music structure and their "dynamic interaction" with the "whole" are, after all, what lies behind Alan Lomax's *Cantometrics*, Pandora's *The Music Genome Project*, and the Nielsen's *Gracenote Sonic Style* "style profiles". Although the AI procedures underneath these enterprises are nothing new to a classically trained musicologist, the academic curricula need more time to explore the benefits of the new possibilities of analysing music through larger data sets. Of course, it is necessary to define in stricter terms how exactly to interact between the musical structures and "the whole" of their, and our, existence with the help of AI.

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[28] "(…) von jedem Ton, jeder Pause, jedem Motiv, jeder Phrase läßt sich angeben, wozu sie da sind, und umgekehrt jede ganze Form aus dem dynamischen Zusammenspiel ihrer Elemente bestimmen." (Adorno 1991: 109) The issue at stake has a rich context within Adorno's analyses. His analyses of Anton Webern's op. 3 and op. 12 thematizes the relationship between the detail and the theoretical frame nicely. He distinguishes between "compositional analysis" (*Kompositionsanalyse*) and "performance analysis" (*Interpretationsanalyse*) as "not schematically delimited from one another, although in the performance analysis the compositional took precedence throughout" ("nicht schematisch voneinander abgegrenzt, obwohl in den Interpretationsanweisungen der Komposition durchweg der Vorrang zukam") (Adorno 2003: 275).

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