Interface to the world

On interactive music

MATRIX [New Music Centre]

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Text: Monika Pasiecznik
Revision: Snapdragon Translations
With the support of Cera

MATRIX
CENTRUM VOOR NIEUWE MUZIEK

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Interface to the world

The technological acceleration we are witnessing has led to the coexistence of generations who have grown up in completely different cultural conditions. This situation of overlapping epochs is unprecedented in the history of our culture. How fundamentally different the experiences of successive generations can be is something Marc Prensky discusses in his famous article on digital natives and digital immigrants.[1]

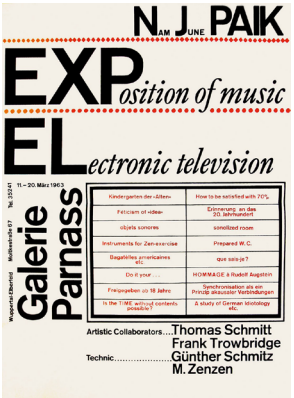
The generation of "digital natives" are people growing up surrounded by new technologies: computers, video games, smartphones and digital music players. For them, the basic space of learning, working and playing is the internet. In contrast, the older "digital immigrants" have had to learn to function in the world of online media, and the virtual space remains strange and external to them. According to Prensky, the differences between the two groups have to do with fundamental issues such as the perception of the world and the understanding of one's own identity.

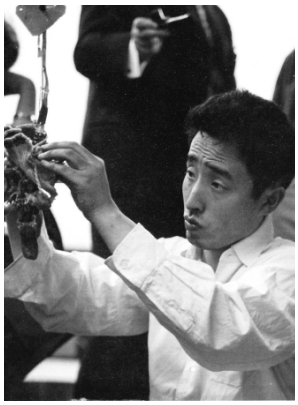
This also affects how they deal with technologies in art and understand the notion of interaction, which seems to be one of the key features of music for "digital natives". It redefines the environment of the composer's work and ways of cooperating with performers as well as the relationship with the audience.

On interactive music

Interactivity in art and music is obviously not a new concept. It has emerged from kinetic art, performance and conceptual art, as well as the open form and all practices of improvisation, or experimental music as it is broadly understood.[2]

The intensification of experiments with interactive sound tools, such as various sensors, came in the 1980s and 1990s, but interactive music had its precursors. Perhaps the most important was **Nam June Paik**, who presented the exhibition ***Exposition of Music – Electronic Television*** .at Galerie Parnass in Wuppertal in 1963. For the first time, he showed his works created with the use of television sets, in an exhibition that is considered the birth of media art.[3]



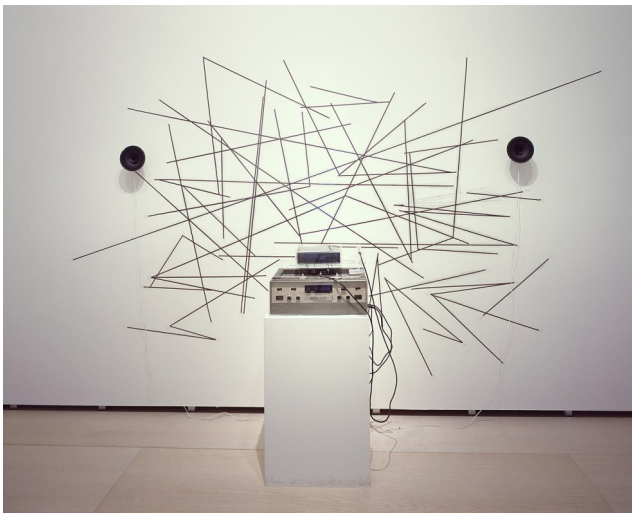


Nam June Paik, Exposition of Music - Electronic Television

It was also an important moment for interactive music. The audience's activities affected the sound and visual shape of several of Paik's installations: in *Participation TV*, the sound spoken into the microphone was transformed into images appearing on the screen; *Kuba TV* relied on the connection of a television set with a tape recorder and the picture changed with the changing signal. In *Random Access* ,fragments of audio tapes hung on the wall, encouraging gallery visitors to create their own music by rubbing them at any rate with a magnetic head connected to a tape recorder.

Participation TV

Kuba TV



Random Access

Nam June Paik included active participation by the recipient in his artistic project: his installations invited the public to cooperate with the artist. Participation has become one of the most important and distinguishing features of interactive art – and has expanded for good along with the internet.

Network music, social composing'

The internet started to be used for artistic purposes in about the late 1990s and early 2000s and turned out to be the most natural environment for artists' interaction with the public. It was then that the first network music projects appeared, using an internet connection to perform music at a distance. One such project using global connectivity was ***Lunar Opera: Deep Listening For_tunes*** (2000) by the American composer **Pauline Oliveros.** The six-hour piece of music, which is a fantasy about an alien civilization (on the moon) that combines science fiction with the Old Tibetan tradition, was performed outdoors in

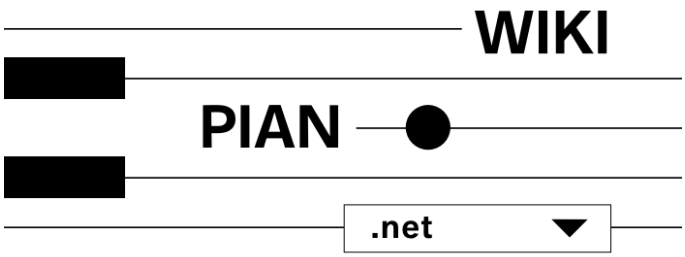
Damrosch Park at the Lincoln Center in New York. In addition to the Deep Listening Band, 250 people from different countries around the world participated in the concert. They took part in a collective improvisation on the internet.

By the end of the 1990s, net art had developed to encompass many artistic projects for which the network was both a sufficient and necessary condition of their existence. The internet has also proved to be an environment that is very conducive to composition, which is now used by the younger generation of creators not only to share their own music but also to create it on the basis of interactive exchange within an internet community.

For his composition ***Oh, Rub the Waxy Buddah*** (2015) for two samplers, piano, percussion and vibrating loudspeakers, the composer **Mikołaj Laskowski** created his own avatar on SoundCloud, which quickly gained followers interested in his recordings to be used in the aforesaid composition. The followers started to remix and process this material as expected by the composer. He used the internet as a social generator of sound material. Instead of classic plunderphonics, we have a looped virtual remix. Besides being "stolen" and processed by someone else, sounds can also be collectively processed and given back to the composer who arranged this interactive composing situation within the internet community.

Oh, Rub the Waxy Buddah,
The Black Page Orchestra
at Unsafe+Sounds Festival 2017,
22.9.2017, Blumenhof Wien.

In his collection entitled ***Community Pieces***, **Alexander Schubert** has launched websites dedicated to particular compositions, on which he placed sounds, films and verbal material, and constructed an interface that would allow any person visiting the site to process this material. Ultimately, these pieces are intended for live performance, but they take a different shape each time. In ***Wiki Piano*** (2018) the pianist always plays the most recent content on the website, even if it changes just before the concert[4] In ***Silent Post*** (2018) the collection of works prepared by the composer serves as a starting point for the creation of new, original versions of these works by performers in various disciplines. In the internet archive, we find dozens of fixed records of such interpretations.[5]

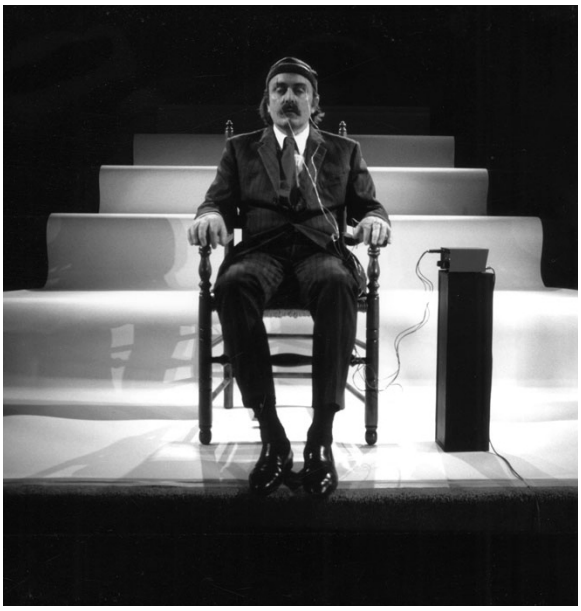


An interesting example of interaction with internet users as well as with the performer is ***Public Privacy #2: Piano Cover*** (2013) by **Brigitta Muntendorf**, intended for keyboard, sampler and video. The work for the soloist includes the preparation of a video that the pianist makes of him or herself playing the keyboard, using a simple computer webcam during Skype sessions with the composer. The recording should be similar to amateur videos by anonymous web users who upload their own music presentations to YouTube. In *Public Privacy*, they become co-creators of the composition somewhat after the fact – by uploading their material to the web, they agree that it may be used and processed by other users of the network, in the same way that the composer does.

Public Privacy #2: Piano Cover,
performer: Malgorzata Walentynowicz

Biofeedback and sensor-based composition

In the most recent music, interaction may mean active participation by the audience or community, but it can also mean a specific performance situation in which the composer designs interaction between the instrument and the performer.
An example of such interaction is biofeedback composition, which involves the use of bio-currents to control electronic devices.



The flagship work in this trend is **Alvin Lucier's *Music for solo performer*** (1966), in which three electrodes are attached to the performer's head. They are designed to receive the alpha currents sent by the brain. These currents, transmitted to specially constructed apparatus, are repeatedly amplified and used to excite acoustic resonances in various percussion instruments, which thus "play" even though the performer does not touch them at all.

Music for solo performer by Alvin Lucier himself

Today the biofeedback trend is a rapidly developing field that allows the translation of brain waves and also movements of the eyeballs and muscles. It enables the creation of an organic electronic accompaniment for live performances, and has been used by artists such as **Laurie Anderson** and **Pamela Z** .

One of the newer examples is the ***Sensorium*** (2015) by **Rafał Zapała**, an interactive installation created during the composer's residency at the CCRMA Institute at Stanford University in California and the Zamek Cultural Centre in Poznań. Whereas the performer controls music events in Lucier's work, every person visiting Zapała's installation becomes a musician. The user of the installation is equipped with biofeedback sensors – pulse, GSR and EEG meters – with which they can influence the changes in music emitted by several speakers distributed around the space by means of their bodily reactions. At the end of the session, which lasts a quarter of an hour, the user receives a recording of music "produced" by their own body.[6]

Sensorium

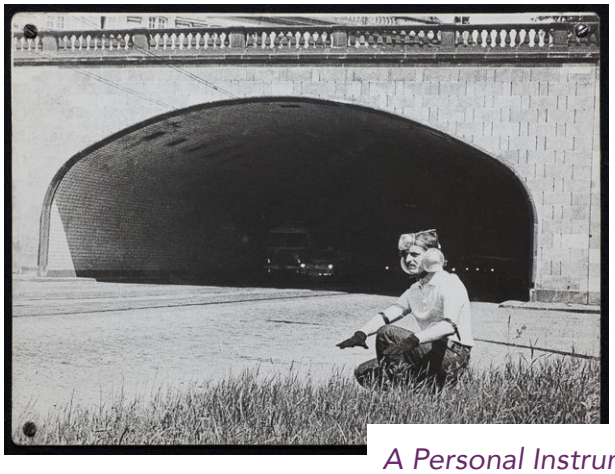
Interactive music also uses all kinds of sensors: movement, light, touch and so on. Such technologies have been developing dynamically since the 1980s, but it is impossible not to mention the theremin in this context – the early invention by the Russian engineer **Léon Theremin** in 1920. The theremin is a contactless instrument in the form of two antennas that convert the movement of the performer's hands into smooth changes in the pitch and volume of a monophonic sinusoidal tone.

For the development of sensor-based interfaces, it was also extremely important that **Max Mathews** and **Laurie Spiegel** created the system called Groove (Generated Real-Time Output Operations on Voltage-Controlled Equipment) in the 1960s: a hybrid analogue-digital system in which a two-dimensional joystick controller modulates electronically generated sound output. It was followed by Radio Baton, a midi controller consisting of two batons, an antenna board and an electronics box, which allowed a performer to conduct/control a musical score stored in the computer in a similar way to how a conductor leads an orchestral performance.[7]

Léon Theremin with the Theremin

Max Mathews with the Radio Baton

Another pioneering artwork based on sensors is ***A Personal Instrument*** (1969) by **Krzysztof Wodiczko**,constructed at the Polish Radio Experimental Studio in Warsaw in cooperation with Polish Optical Industries. It is an interactive set of photocells, headphones and a microphone mounted on the hands and head of the artist, who walks around the city (sound walk). By moving his hands, the artist alters the amount of light falling on photodetectors and thereby regulates the intensity of filtering sounds taken from the environment by a microphone attached to the forehead.[8]



A Personal Instrument

An important centre that has pushed the development of sensor-based interactive music is the STEIM studio in Amsterdam, where a number of interactive devices were produced in the 1980s and 1990s under the direction of Michel Waisvisz.

One of the first motion sensor systems was **The Hands** (1984) – an experimental interface using sensor data processed in MIDI. Two wooden frames attached to the hands allowed the user to play music by making hand and arm movements, bending gestures and moving the fingers. The Hands was used, for example, by **Edwin van der Heide**, who co-founded the Sensorband trio with **Zbigniew Karkowski** and **Atau Tanaka** in 1993. Their flagship project was a gigantic interactive network that converted physical movement into sound. The infrared sensors placed on it reacted to the movements of artists equipped with infrared beams who were moving in the space of the network. Sensorband performed until 2003 and was one of the first interactive music groups.[9]

In 1994 Laetitia Sonami developed an interactive hand device called Lady's Glove at STEIM, which has been used by artists including **Franziska Bauman**, a Swiss singer and performer famous from her interactive vocal performances.

Initially, sensor systems were expensive and inaccessible. If they wanted to use this kind of technology, artists were forced to stay for long periods at professional electroacoustic music studios and needed the help of engineers to develop proper interfaces. This applied to both composers and performers who had built their musical style on the use of sophisticated, exclusive and highly personalized devices, among them **Frances-Mari Uitti**, who used to play a cello fitted with sensors (which she called a "hypercello") or **Sarah Nicolls**, a pianist who commissioned a series of pieces for her extended piano.

Nowadays sensor-based systems have become popular and accessible, expanding their circle of users. The way of using these devices in music has also changed. The prevalence of such devices in artists' practices has caused the demystification their technical values and disappearance of their aura. Initially used either for the technical extension of traditional instruments and the demonstration of new virtuoso possibilities or as a generator of immersive experiences in organic space, interactive sensors had to be redefined. The composers of the "digital native" generation understand what interactive devices are very well. Many of them focus on interactive interfaces as a starting point for building complex relations within the work and for developing an evocative concept or links to the non-musical world.

Good examples of such strategies include works by Alexander Schubert, mentioned above, who uses sensors extensively in his compositions. In ***Your Fox's A Dirty Gold*** (2011)), the singer is equipped with motion sensors and electric guitar and sings a pastiche of a rock song, controlling electronically distorted sounds with body movements on stage. In ***Laplace Tiger*** (2009) for drum kit, arm sensors, live electronics and live video, the performer controls sounds with body movements but also co-creates the video, which gives them a stronger stage presence by amplifying their gestures.
Schubert benefits from and builds on STEIM's achievements. He uses interactive interfaces to extend the performer's ability to control music and facilitate certain executive processes. But he also strengthens the musician's stage presence. Motion sensors allow him to combine sounds with expressive gestures and build spectacular performances, or to combine live music with live video, thus adding non-musical narratives to the piece.

Point Ones, Nadar Ensemble
at the Darmstädter Ferienkurse, 2012

Laplace Tiger
performer: Jonathan Shapiro

Your Fox's A Dirty Gold
performer: Frauke Aulbert

Unlike the generation of pioneers who focused on technology and its new musical possibilities, Schubert is more interested in the sensor as an interface between sound and the world. We encounter the same strategy in the creative output of the German composer **Johannes Kreidler**, who based his ***Kinekt Studies*** (2011/13) on Microsoft Kinect 3D Sensors system. Some might doubt that this piece is interactive, as it makes use of fixed video pieces. In fact, however, Kreidler misuses the tool, emphasising the expression of particular concepts.

Kinekt Studies

Computer games

Joysticks and computer game controllers have become part of music for good and are used today by artists such as the composer-performer **Julia Mihaly**, who creates heterogeneous, interactive, multimedia stage performances, or **Simon Steen-Andersen** , who composes on the edge of sound, performance and video (including works ***Run Time Error*** (2009)).

Mass production – and thus the widespread availability of various interactive tools such as computer game consoles, controllers and motion sensors and dance mats – offers composers more possibilities to use them in a very experimental way. All these devices have become musical instruments, but they saturate music with their particular non-musical content as well. The virtual interaction offered by such devices also redefines the traditional role of the performer.

What this saturation means can be seen in the work of the Belgian composer **Stefan Prins** who explores the subject of phantoms, virtual reality, digital prostheses and hyperbodies with the help of technology. He uses new media to arrange artistic situations in which the boundaries between the real and virtual world are blurred.

Many years ago, the pioneer of media research Marshall McLuhan noted that media create a kind of prosthesis of our senses. There are many examples of "media prostheses", such as telephones, televisions or cars. Nowadays, the process of extending our corporeality has entered the virtual era, a phenomenon that is being intensively exploited by the creators of computer games, among others.

Stefan Prins took the computer game as the basis for his composition ***Generation Kill*** (2012) for four instrumentalists and four people operating game controllers, as well as video projection. In front of the performers equipped with Play Station 3 consoles, there are four transparent screens. Four instrumentalists are sitting on the other side of the screens. By pressing buttons and moving their hands, the musicians equipped with consoles control many musical parameters, which are translated into images. While playing, the real performers engage in visual and sound interactions with their virtual avatars.

Generation Kill, Nadar Ensemble at Gaudeamus, 2015

The composition *Generation Kill* shows the world experienced by the digital generation. We observe the phenomenon of the material duplication of the performer's body in the intangible space of a computer game. The performer's body enters a fictitious world that he or she can interact with directly and which interactivity makes more real. Just as a player using a console identifies with the world of the game, musicians also gain new virtual identities and start existing in this artificial space in a new way. A duplicate and exceeded body is created: a "hyperbody" that acts simultaneously in two places at the same time.

The issue of the performer's "hyperbody" appears also in Prins' series ***Flesh + Prosthesis #0-2*** (2013-2014).

The composer has equipped the musicians with a "digital prosthesis". Using a computer program running on the laptop connected to the instrument, the performer can process recorded sound, for example, with a pedal system: reversing it over time, filtering it, freezing it or changing its natural resonance.

Flesh + Prosthesis #0-2, Nikel Ensemble at the Darmstädter Ferienkurse, 2014

There is also another level of meaning in Stefan Prins' music, also related to computer games. The title *Generation Kill* refers to the book written by Evan Wright, a reporter who accompanied soldiers during the Second Iraq War. The soldiers who fought in that war were the first generation of soldiers brought up on computer games and the internet. Wright pointed out that the experience of virtuality distorted their view of the war. Killing the enemy came easily, as if it were a computer game. By reconstructing this seemingly innocent game situation, Stefan Prins criticizes the media and its impact on consciousness.

GPS art & audio walks

Another branch of interactive sound art has developed outside the walls of concert halls and galleries, in urban spaces. Connected with physical movement in an open area of the city, it uses various navigation tools and handheld instruments, such as cell phones or GPS, for example, making them interfaces of interaction between people and a given space.

Electrical Walks

Christina Kubisch is known today for her ***Electrical Walks***, during which participants equipped with headphones and electromagnetic receivers wander around the city along a route determined by coded sound sources. The first *electric walk* took place in Cologne in 2004.

The concept of audio walks was invented by Canadian **Janet Cardiff**, who has created numerous interactive pieces called ***Walks***. The format is similar to that of an audio guide. The participant is given a CD player or iPod with headphones and directed by the artist's voice to turn right, sit down or act in any given way in the urban space. The pre-recorded sound of footsteps, traffic, birds, and miscellaneous sound effects overlap and extend the soundscape of the reality. All the sound effects are recorded in binaural audio, which makes the experience hyperreal.

Since the beginning of this century, GPS (the global positioning system) has also been used in art. One of the artists using its abilities creatively is **Marek Chołoniewski**, a composer from Krakow who specialises in interactive music. Previously, he experimented with light sensors in ***WYSYG – What You See You Get*** (1989) for light and computer (1989), as well as with network music in ***Globalmix*** (1998), an online collective composition. Since 2000, he has been carrying out the project ***GPS-Art Trans 1-15*** (2000-2016),), a series of interactive compositions based on the strategy of mapping urban space and controlling sound recordings and the image of city streets using a car equipped with an interactive GPS system. The effects of this mapping were made available in the form of internet transmission and in the gallery space. In GPS-Trans 4 (2003) the sound was extended to include video images, and the audience was included in the process of its live transformation.

Similar interactive tracks using GPS and mobile phones have also been created by Atau Tanaka, Yolande Harris and Art Clay. Greg Schiemer and Ge Wang have experimented with cell phone orchestras.

***

This is merely a brief overview of interactive music, its history and present. The selection of examples is as subjective as it is incomplete, and excludes many important works. Conversely, interactive music itself is very broad if not infinite, and is still developing with new devices and interfaces. Interactivity is a vast notion embracing many practices at the intersection of new technologies, different genres of art, performances, working concepts and industry. Net art, sound toys, computer games, sound design and musical apps are examples of genres based on interaction that could not be discussed within the scope of this article . Hopefully, however, this brief discussion will spark readers' interest in this field and encourage them to explore it on their own.

Monika Pasiecznik

Notes

1 Marc Prensky, Digital Natives, Digital Immigrants, https://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf (7.03.2019)

2 Ryszard W. Kluszczyński, Sztuka interaktywna. Od dzieła-instrumentu do interaktywnego spektaklu, Wydawnictwa Akademickie i Profesjonalne, Warszawa 2010.

3 Kluszczyński, idem

4 http://wiki-piano.net/ (7.03.2019)

5 http://wiki-piano.net/ (7.03.2019)

6 http://www.sensorium.poznan.pl/ (7.03.2019)

7 Atau Tanaka, Sensor-based musical instruments and interactive music, in: The Oxford Handbook of Computer Music, red. Roger T. Dean, Oxford University Press, New York 2009.

8 David Crowley, Spatial Music: Design and the Polish Radio Experimental Studio, https://post.at.moma.org/content_items/335-spatial-music-design-and-the-polish-radio-experimental-studio (7.03.2019)

9 Gevolgd door de Duitse groep Tryonis en door Metraform uit Australië.

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The Oxford Handbook of Interactive Audio, edited by Karen Collins, Bill Kapralos, Holly Tessler, Oxford University Press, New York 2014.

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COLOFON

The publication *Interface to the world* has been created in the context of the project *3 x nieuw*.

3 x nieuw stands for new music from the twenty-first century, new media and new audiences. The art music from the still young twenty-first century is often designed by a multidisciplinar character: stage direction, light design and scenography conquer the traditional stage and the understanding of the concept 'music theatre' gets a much wider definition than the classical opera. Technology is everywhere: computer programs, video and even social media are part of the artistic resources of composers.

In this hyperdiverse field MATRIX searches for starting points to get a larger audience acquainted with the music that is been written today. We selected four subjects, on which we focus on one by one for two years: new music and video, new music and interactivity, new music and theatre and the virtual concert hall. With customized guest readings and workshops in classrooms and the publication of additional and accessible background information, MATRIX wants to encourage young people and adults to get over their cold feet and wants to open ears and mind to the music of this century.

3 x nieuw is supported by Cera.
With about 400.000 associates Cera is the largest coöperation of Belgium. Cera brings together people, resources and organisations, joins forces, takes initiatives and realises valuable projects with a clear purpose: all together investing in welfare en well-being.

Text
Monika Pasiecznik, commissioned by MATRIX [New Music Centre].
Revision
Snapdragon Translations

Minderbroedersstraat 48
B-3000 Leuven
+32 (0) 16 37 41 62
info@matrix-new-music.be
www.matrix-new-music.be

MATRIX [New Music Centre] specializes in art music from after 1950. Being passionate collectors and researchers, we map out existing tendencies and reflect on the meaning of music as a contemporary form of art. Our library and documentation manages a large collaction of scores, audio recordings and literature of and about new music. Being explorers and inventors, we are constantly scouting the great potential that contemporary music has to offer for music education. Music teachers, schools, musicians, concert and festial organizations and the public an rely on MATRIX in the quest for information and educational guidance. MATRIX wants to contribute to a cultural awareness that helps to overcome prejudices against the 'other' and reticence about the unknown.

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