18th International Symposium
on Sound Engineering and Tonmeistering

XVIII Międzynarodowe Sympozjum
Inżynierii i Reżyserii Dźwięku

ISSET 2021

Kraków, 27–29 June 2021

Kraków, 27–29 czerwca 2021

Abstract book

Książka streszczeń

Audio
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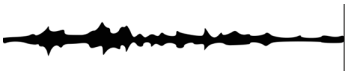

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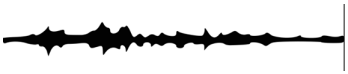

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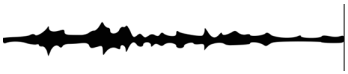

Plenary lectures

Sunday, 27 June 2021
4:30 P.M.
John Krivit
How the audio industry has changed during the COVID-19 crisis

Monday, 28 June 2021
10 A.M.
Roger Roshnik
Challenges on designing professional monitors

Monday, 28 June 2021
3 P.M.
Agnieszka Roginska
Immersive sound expands our reality

Abstracts

Session 1

AI in sound engineering and tonmeistering

Sunday, 27.06.2021
5:30 P.M. – 6:10 P.M.

P. Skrzyński, *AGH University of Science and Technology in Kraków*
J. Kwiecień, *AGH University of Science and Technology in Kraków*
M. Pluta, *AGH University of Science and Technology in Kraków*
A. Dąbrowski, *Independent Digital Sp. z o. o.*
B. Szadkowski, *Independent Digital Sp. z o. o.*

ROBUST, HYBRID ALGORITHMS IN AI-AIDED AUTOMATIC MUSIC PRODUCTION

HYBRYDOWE ALGORYTMY W AUTOMATYCZNEJ PRODUKCJI MUZYKI WSPOMAGANEJ AI

Music market is currently vastly dominated by streaming services. Growing popularity of streamed music consumption enables each music genre to find its niche. Significant position in this respect belongs to so-called relaxation music. This genre, along with several others, are defined well enough in terms of musical form and structure, to carry out an attempt at making the process of their production fully automated. This paper presents selection of algorithms implemented in a system designed to produce relaxation, dance, and electronic music. A hybrid solution combines robustness and controllability of classic approaches with ability to generate and evaluate complex structures inherent for AI-based methods.

M. Kałamoniak, *Poznan University of Technology*
Z. Piniarska, *Poznan University of Technology*
M. Subocz, *Poznan University of Technology*
E. Łukasik, *Poznan University of Technology*

INTERNET SYSTEM FOR SHEET MUSIC RECOGNITION USING DEEP NEURAL NETWORKS

INTERNETOWY SYSTEM ROZPOZNAWANIA ZAPISU NUTOWEGO WYKORZYSTUJĄCY GŁĘBOKIE SIECI NEURONOWE

The paper presents a prototype of the Internet system for reading scanned sheet music documents (Optical Music Recognition). Frontend enables sending an image to the server for analysis and receiving links to download the processed results in MusicXML and MIDI format. The backend is responsible for detecting and classifying musical symbols in the image and mapping their compositions into the machine-readable format using deep neural networks and image processing methods. The experimentally used YOLO V5 network gave auspicious prediction results.

Session 2

Student papers competition – part 1

Monday, 28.06.2021
11:00 A.M. – 12:40 P.M.

T. Ciborowski, *Gdańsk University of Technology*
S. Reginis, *Gdańsk University of Technology*
A. Kurowski, *Gdańsk University of Technology*
D. Weber, *Gdańsk University of Technology, Faculty of ETI, Audio Acoustics Laboratory*
B. Kostek, *Gdańsk University of Technology, Faculty of ETI, Audio Acoustics Laboratory*

CLASSIFYING EMOTIONS IN FILM MUSIC USING SUBJECTIVE TESTS

KLASYFIKACJA EMOCJI W MUZYCE FILMOWEJ Z WYKORZYSTANIEM TESTÓW SUBIEKTYWNYCH

Film music is a part of the artistic message accompanying the image. Its purpose is to enhance or evoke emotions associated with a given scene, but above all, it becomes a distinctive feature of the film or hallmark, often defining its genre. The classification of emotions in film music – in simplified terms – includes issues related to the analysis of music, image color, film narration, and the message of emotions to accompany the film projection. The aim of this paper is to present experiments related to subjective tests determining emotions in film music. First, the assumptions of an online survey were prepared and then used in the study. The survey was constructed using Google forms (monster). The survey can be found at: https://docs.google.com/forms/d/e/1FAIpQLScfGptx49JORnIWdvbShNt6eL5qzt8yk999hOe6PD95TUQM9Q/viewform.

J. Skorupa, *Poznań Supercomputing and Networking Center*
M. Głowiak, *Poznań Supercomputing and Networking Center*
R. Zapała, *Ignacy Jan Paderewski Academy of Music in Poznań*

THE MASZYNA KONCERTOWA IN INTERACTIVE BROADCASTS OF MUSICAL EVENTS.

„MASZYNA KONCERTOWA" W INTERAKTYWNYCH TRANSMISJACH WYDARZEŃ MUZYCZNYCH

The "Maszyna Koncertowa" project is an open platform for creating original, telematic music events via the web. This tool allows for including in the classic form of audio-video transmission, an active interaction between the recipient of the event and its creator. This is done by providing a universal, individually created interface similar in its form to a simple network MIDI controller. As part of the article, the creators will discuss the principles of the portal, ways to communicate with external software, details of interaction and practical methods of using the "Maszyna Koncertowa" on the example of the inaugural concert.

E. Sieradzka, *Wrocław University of Science and Technology*
B. Kruk, *Wrocław University of Science and Technology*

COMPARISON OF MEASUREMENT ACCURACY BY SMARTPHONE APPLICATION WITH A 1 CLASS SOUND LEVEL METER

PORÓWNANIE DOKŁADNOŚCI POMIARÓW WYKONYWANYCHPRZEZ APLIKACJE NA SMARTFONY Z MIERNIKIEM POZIOMUDŹWIĘKU KLASY 1

Noise is a serious threat that we are exposed on every day. According to WHO (World Health Organization), approximately 466 million people are affected by hearing loss and this number could double in the next 30 years. Is it possible to prevent it in a very simple way, thanks to the one thing that most of us have in our pockets? Mobile applications measure the volume level using a built-in microphones from the device. The aim of the work is to compare measurements received from free smartphone applications with measurements made by class 1 sound level meter. Thanks to that we are able to obtain whether the available mobile applications are reliable and can replace professional equipment.

M. Markowski, *Jagiellonian University*
U. Kaleta, *Jagiellonian University*
J. Jasiński, *AGH University of Science and Technology in Kraków*
B. Głowacki, *AGH University of Science and Technology in Kraków*

TALKING ABOUT SOUND – A STUDY LINKING POLISH TIMBRE SEMANTICS WITH PARAMETRIC SIGNAL ANALYSIS

ROZMAWIAJĄC O DŹWIĘKU – BADANIE ŁĄCZĄCE OPISY BARWY DŹWIĘKU W JĘZYKU POLSKIM Z PARAMETRYCZNĄ ANALIZĄ SYGNAŁU.

This study investigates the link between the acoustic parameters of a sound's timbre and the semantic terms used to describe it by Polish native speakers. Two experiments were conducted. In the first, listeners were asked to describe sounds with as many adjectives as came to mind. Based on results a set of polish semantic timbre descriptors was created. The second experiment presented listeners with sounds and they were asked to place them on scales between semantic antonyms. The results were compared to acoustic parameters extracted from the sounds and correlations between these values were found. The result of the study creates links that allow us to more consciously translate changes in acoustic timbre parameters into Polish natural language.

J. Zajączkowski, *Fryderyk Chopin University of Music*

BETTER

Student Competition – submission in category recording.

Session 2

Student papers competition – part 2

Monday, 28.06.2021
1:20 P.M. – 2:40 P.M.

B. Czubak, *AGH University of Science and Technology in Kraków*

ODWZOROWANIE BRZMIENIA UTWORU MUZYCZNEGO WYKONANEGO ZA POMOCĄ APARATURY ANALOGOWEJ, PRZY UŻYCIU CYFROWYCH NARZĘDZI DŹWIĘKOWYCH

Student Competition – submission in category recording.

A. Konieczna, *AGH University of Science and Technology in Kraków*

PROBLEMS OF THE VOCAL VOICE IN THE TRANSCRIPTION

PROBLEMY GŁOSU WOKALNEGO W PROCESIE TRANSKRYPCJI

The aim of the transcription of vocal voice is to extract information about the duration of sounds and their fundamental frequency from the signal. Then, the information is converted into musical pitch and rhythmic value. The problems of the vocal voice in transcription can be divided into those related to the time domain (problems with onset and duration of the sound, fluctuations in the tempo of the melody) and the pitch domain (F0 detection, pitch maintenance, octave errors, intonation problems). On the other hand, certain types of articulations or song lyrics may create difficulties. This paper focuses on the representation and principles of the problems, which lead to improvement of signal analysis methods and transcription results.

A. Korytowski

OBJECTIVE ASSESSMENT OF QUALITY AND SPATIALITY OF ARTIFICIAL REVERBERATION

OBIEKTYWNA OCENA JAKOŚCI ORAZ PRZESTRZENNOŚCI SZTUCZNEGO POGŁOSU

The purpose of the work was to create objective parameters to assessment of artificial reverberation. Parameters were defined based on literature describing signal features having influence on quality and spatiality of a signal. They are based on common statistical parameters applied to spectral and time analysis, as well as to evaluate similarity of signals. Numerical values of the parameters can be used to assess different versions of a reverberation in order to choose the best in terms of quality and spatiality. Creation of the parameters one should treat as an attempt for finding a way to a state where numerical values of the parameters are congruent with subjective listeners indications.

K. Zimny, *AGH University of Science and Technology in Kraków*

SOFTWARE EMULATION OF MIDI ARRANGERS

MIDI arrangers are the type of keyboard instruments, used for song arrangement and playing live. It's done by using the so-called automatic accompaniment, controlled by the user in real time. With auto-accompaniment play mode, some song-creation operations are moved to the MIDI arrangers' algorithms. Therefore the user can focus on manually played part, while not giving up the following of other instruments.So far, the idea of MIDI arrangers has been used only for hardware devices and its software emulation. Therefore, the use of MIDI arranger features in any MIDI-device systems became the subject of this paper. For this purpose, an application which emulates the operation of MIDI arranger's algorithms has been designed.

Session 3

Psychoacoustics

Tuesday, 29.06.2021
10:30 A.M. – 12:10 P.M.

P. Falkowski-Gilski, *Gdańsk University of Technology*
S. Brachmański, *Wrocław University of Science and Technology*
A. Dobrucki, *Wrocław University of Science and Technology*
M. Kin, *Wrocław University of Science and Technology*

PERCEPTION AND QUALITY ASSESSMENT OF SPEECH SAMPLES AMONG TEENAGERS AND YOUNG ADULTS

RÓŻNICA W SUBIEKTYWNEJ OCENIE JAKOŚCI MOWY POMIĘDZY NASTOLATKAMI A MŁODYMI DOROSŁYMI

The subjective assessment of users is a complex process, taking into account previous experiences and habits of individuals. In this work, we assessed the stability of speech signals assessment between high school students and university students. The study involved 60 participants, with 30 people in both the adolescents group aged 16-18 years, as well as the young adults aged 20-25 years, without any hearing disorders. The speech samples included 3 sets: American English, British English, and Polish. Results of research indicated that evaluation of young adults is characterized by the higher notes and lower variations of obtained results what may provide valuable guidance for both researchers and teachers in primary, secondary and higher education, as well as engineers designing services and distributing content.

M. Kin, *Wrocław University of Science and Technology*
A. Dobrucki, *Wrocław University of Science and Technology*

RESEARCH ON THE PERCEPTION OF SOUND COLOR BY PEOPLE WITH PRESBYACUSIS

BADANIE PERCEPCJI BARWY DŹWIĘKU PRZEZ OSOBY Z NIEDOSŁUCHEM STARCZYM

The aim of the work was to study the perception of changing the sound color for people with hearing loss. In addition to discrimination abilities to change the spectra of speech and musical signals, the impression of sharpness and brightness of sounds encountered on a daily basis, such as the sound of a horn or the sound of a bell has been examined. The study involved 10 people in each group: 6 women and 4 men. The obtained results from both groups were compared and described the relationship in the responses for different signals. In the case of brightness of the tone for the everyday sounds, people with presbyacusis rated them as darker in comparison to the assessment of the control group. The assessments of sound color sharpness and ability to recognize changes in sound spectra also differ from those of the control group: people with presbyacusis have evaluated these signals as less sharp and the changes in spectra in the mid- and high frequency ranges are less noticeable.

P. Rogowski, *Fryderyk Chopin University of Music*
A. Miśkiewicz, *Fryderyk Chopin University of Music*

PITCH DISCRIMINATION OF LOW-FREQUENCY PURE TONES

PROGI DYSKRYMINACJI WYSOKOŚCI TONÓW NISKOCZĘSTOTLIWOŚCIOWYCH

Pure-tone pitch discrimination thresholds were measured at six frequencies, within a 20–100 Hz range, and at two higher frequencies of 250 and 1000 Hz. The tones were presented binaurally, through headphones, at a loudness level of 40-phons in a 31.5–1000 Hz range and at a slightly reduced level at lower frequencies. The experiment was conducted on six music students, with a constant stimuli method and with an up-down, adaptive method. The results indicate that the group pitch discrimination threshold, expressed as a pitch interval in cents, markedly increases with decreasing tone frequency and exceeds a semitone below 31.5 Hz. The data show large across-subject variability. For some subjects the threshold exceeded 400 cents at a 20-Hz tone frequency.

A. Kosiek, *AGH University of Science and Technology in Kraków*

HOW CAN ACOUSTIC STIMULI INFLUENCE DEVELOPMENT AND BEHAVIOUR OF CHILDREN?

W JAKI SPOSÓB BODŹCE AKUSTYCZNE MOGĄ WPŁYWAĆ NA ROZWÓJ I ZACHOWANIE DZIECI?

The research consisted in studying the relationship between sound stimuli and their influence on development and behaviour of children. The research shows that the most distracting stimuli for children are those they especially like. Additionally, if for children any music or noise is neither really interesting nor unpleasant they have smaller impact on the correctness and speed of giving answers than sounds/noises from other children. Another observation is that children hardly pay attention to road or house noise while performing the task. A general conclusion can be drawn that in kindergartens, where children behave more calmly and play without making unnecessary noise, the results are better, children answer questions faster and are able to focus on tasks for much longer.

T. Makuch, *AGH University of Science and Technology in Kraków*
P. Kleczkowski, *AGH University of Science and Technology in Kraków*

THE EFFECT OF PHASE MODIFICATION ON THE PERCEPTION OF REVERBERANCE IN AUDIO RECORDINGS

WPŁYW MODYFIKACJI FAZY SYGNAŁU NA PERCEPCJĘ POGŁOSOWOŚCI W NAGRANIACH AUDIO

In terms of sound perception, phase dependencies between the frequency components are usually associated with timbre and source localization in low frequency bands. However, some studies suggest that phase changes in time can influence perception of reverberation. This paper presents preliminary studies on creating an impression of reverberance by changes in phase of signal components. Phase in anechoic recordings was modified within assumed boundaries; then, informal and formal listening test were performed. Several aspects of modification, such as bandwidth, the range of phase change and the rate of changes were considered; some of them have significant impact on reverberance.

Session 4

Spatial sound

Tuesday, 29.06.2021
1:40 P.M. – 2:20 P.M.

K. Sochaczewska, *AGH University of Science and Technology in Kraków*
M. Piotrowska, *Krzystof Penderecki Music Academy in Kraków*
S. Piotrowski, *Learn How To Sound*
P. Małecki, *AGH University of Science and Technology in Kraków*

SPATIAL AUDIO IN MUSIC PRODUCTION: TOOLS, METHODOLOGY AND PERCEPTION

Spatial audio systems along with the available tools create a superior environment for creative musical production. Rapid expansion of immersive audio technology opened the new ways of expression, especially regarding localisation, perception of distance and movement of the sound sources. Paper includes the outline of selected spatial formats and tools. Practical implementation can be basis for the research on human auditory perception within multichannel and binaural systems. Remarks on the case study production process in ambisonic system including technical aspects, the creative factor and aesthetics are followed by listening tests. Outcomes and discussion are aimed for future development of the workflow in music production in 3D audio systems.

P. Małecki, *AGH University of Science and Technology in Kraków*

SETTINGS OF REVERB PROCESSORS FROM THE PERSPECTIVE OF ROOM ACOUSTICS

PARAMETRY PROCESORÓW POGŁOSOWYCH W UJĘCIU AKUSTYKI ARCHITEKTONICZNEJ

Pogłos stanowi immamentną cechę dźwięku w produkcjach muzycznych, ale przede wszystkim w akustyce pomieszczeń, gdzie w sposób oczywisty znajduje się jego geneza. W akustyce architektonicznej istnieje wiele ustandaryzowanych metod pomiaru i opisu pogłosu, szczegółowo zdefiniowanych m. in. w dokumencie ISO 3382. W produkcji muzycznej, urządzenia i algorytmy do produkcji pogłosu wyposażone są w szereg ustawień i parametrów, ale ustawienia te bardzo różnią się w zależności od rodzaju narzędzia, a ich głównym zadaniem jest kreacja pożądanego brzmienia. Celem niniejszej pracy jest próba oceny, na ile te dwie płaszczyzny przenikają się i są ze sobą skorelowane. Aby to osiągnąć przeanalizowano zmienność wybranych parametrów pogłosowych (RT, C50, C80, BR, ER, CT) pod wpływem regulacji typowych ustawień 5 wybranych procesorów pogłosowych. Przeanalizowano 5 typowych ustawień wtyczek VST, a wyniki poddano szczegółowej analizie porównawczej oraz wyznaczono relację obserwowanych zmian do progów JND.

Session 5

Acoustic and electroacoustic solutions

Tuesday, 29.06.2021
2:20 P.M. – 3:40 P.M.

M. Kmiecik, *AGH University of Science and Technology in Kraków*

EXTRACTION OF THE DYNAMIC LOUDSPEAKER STATE PARAMETERS THAT INFLUENCE DISTORTIONS

EKSTRAKCJA PARAMETRÓW STANU GŁOŚNIKA MAGNETOELEKTRYCZNEGO WPŁYWAJĄCYCH NA ZNIEKSZTAŁCENIA

Distortions introduced by loudspeakers have significant impact on the quality of sound. Reduction of distortion is possible by using digital signal processing, but it requires a good numerical model of motion of the membrane that includes nonlinearities. This paper describes main causes of loudspeakers nonlinearity and feasible methods for estimating parameters required to make a sufficient model. The proposal does not use additional sensors like laser displacement sensor or microphone – the suggested source of information is the electromotive force of the voice coil. This solution requires application of an appropriate method of signal analysis and an electric circuit, which provides measurements of impedance. Moreover, the system will work continuously based on audio signal, not test signal like swept sine or MLS.

K. Czesak, *AGH University of Science and Technology in Kraków*
P. Kleczkowski, *AGH University of Science and Technology in Kraków*

A METHOD FOR DETERMINING THE DIRECTIVITY PATTERN OF DISTRIBUTED MODE LOUDSPEAKERS

METODYKA WYZNACZANIA CHARAKTERYSTYK AMPLITUDOWO CZĘSTOTLIWOŚCIOWYCH GŁOŚNIKÓW MODÓW ROZPROSZONYCH W FUNKCJI KIERUNKOWOŚCI

Distributed Mode Loudspeakers are characterized by a much wider angle of radiation than the pistonic transducers. They behave as non-coherent sound sources and produce a more dispersedacoustic field. When such a loudspeaker is placed in a room, this leads to different properties of the sound field than that obtained with conventional transducers.The frequency responses obtained from measurements of Distributed Mode Loudspeakers taken in neighbouringpoints can vary significantly between each other. Furthermore, unlikethe conventional transducers, the Distributed Mode Loudspeakers do not produce the highest levels of sound pressure on axis. The goal of this work was to reveal fine details of the three-dimensional radiation pattern of these speakers.This paper describes planning and preparing of the appropriate procedure for the measurement of spatial radiation of Distributed Mode Loudspeakers and presents problems encountered during the measurements and data analysis.

J. Jasiński, *AGH University of Science and Technology in Kraków*

THE CONNECTION BETWEEN RESONANCE CHAMBER VOLUME AND TIMBRE IN A PLUCKED STRING INSTRUMENT

WPŁYW ZMIANY OBJĘTOŚCI PUDŁA REZONANSOWEGO NA BRZMIENIE CHORDOFONU SZARPANEGO

This study investigates the possibility of modifying the tonal properties of a plucked string instrument through the change of its resonance chamber volume. This is done through designing and building a prototype of such an instrument, based on a classical guitar, the backplate of which can be moved in order to adjust the instruments depth. The objective was to measure whether the possible tonal changes achievable through such a mechanism are significant enough to warrant further development and testing. Recordings of the instruments sound were conducted for different configurations and parametric and spectral analyses have clearly shown that changing the resonance chamber volume through such a system has a perceptible impact on the instrument's timbre.

W. Wronka, *AGH University of Science and Technology in Kraków*

IMPLEMENTATION AND APPLICATIONS OF A TRIAXIAL OSCILLOSCOPE IN SOUND VISUALIZATION

IMPLEMENTACJA I ZASTOSOWANIA TRÓJOSIOWEGO OSCYLOSKOPU W WIZUALIZACJI DŹWIĘKU

This work describes the process of developing real-time sound visualization system, presenting various parameters in both intuitive and useful way, with added benefit of being visually appealing. Initial idea was to extend a traditional oscilloscope display into a third spatial dimension and by that improve time-scale intelligibility or introduce visualization of additional sound parameters, while preserving cohesive and intuitive form of an oscilloscope image. Visualization system has been implemented in graphical programming language Max, particularly video and graphics framework Jitter and OpenGL API. It has been tested in various scenarios, including Lissajous shapes based visualization of triads and three-dimensional goniometer for surround mixing tasks.