Honorary Editors:
Prof. Radu Voinea, President of the Acoustics Commission of the Romanian Academy, ROMANIA
Prof. Tudor Sireteanu, Director of Institute of Solid Mechanics of Romanian Academy, ROMANIA
Prof. Malcolm J. Crocker, Distinguished University Professor, Auburn University, USA

Editors:
Prof. Luige Vladareanu, Senior Scientific Researcher of Romanian Academy, ROMANIA
Prof. Veturia Chiroiu, Head of Department of Deformable MediaRomanian Academy, ROMANIA
Prof. Polidor Bratu, Director of ICECON, ROMANIA
Prof. Ion Magheti, Politehnica University of Bucharest, ROMANIA

ADVANCED TECHNOLOGY FOR ACOUSTICS & MUSIC

9th WSEAS International Conference on ACOUSTICS & MUSIC: THEORY & APPLICATIONS (AMTA '08)

Bucharest, Romania, June 24-26, 2008

Host and Sponsor:
ACADEMIA ROMANA

Scientific Sponsors

National University Research Council

University Politehnica of Bucharest

Technical University of Cluj - Napoca

Executive Agency for Higher Education and Research Funding (UEFISCSU)

ADVANCED TECHNOLOGY for ACOUSTICS & MUSIC

**Proceedings of the 9th WSEAS International Conference on
ACOUSTICS & MUSIC: THEORY & APPLICATIONS (AMTA '08)**

Bucharest, Romania, June 24-26, 2008

Host and Sponsor:

ACADEMIA ROMANA

Scientific Sponsors

National University Research Council

University Politehnica of Bucharest

Technical University of Cluj - Napoca

**Executive Agency for Higher Education
and Research Funding (UEFISCSU)**

ADVANCED TECHNOLOGY for ACOUSTICS & MUSIC

**Proceedings of the 9th WSEAS International Conference on
ACOUSTICS & MUSIC: THEORY & APPLICATIONS (AMTA '08)**

Bucharest, Romania, June 24-26, 2008

WSEAS Mechanical Engineering Series
A Series of Reference Books and Textbooks

Published by WSEAS Press
www.wseas.org

Copyright © 2008, by WSEAS Press

All papers of the present volume were peer reviewed by two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: http://www.worldses.org/review/index.html

World Scientific and Engineering Academy and Society

ADVANCED TECHNOLOGY
for ACOUSTICS & MUSIC

**Proceedings of the 9th WSEAS International Conference on
ACOUSTICS & MUSIC: THEORY & APPLICATIONS (AMTA '08)**

Bucharest, Romania, June 24-26, 2008

Honorary Editors:

Prof. Radu Voinea, President of the Acoustics Commission of the Romanian Academy, ROMANIA
Prof. Tudor Sireteanu, Director of Institute of Solid Mechanics of Romanian Academy, ROMANIA
Prof. Malcolm J. Crocker, Distinguished University Professor, Auburn University, USA

Editors:

Prof. Luige Vladareanu, Senior Scientific Researcher of Romanian Academy, ROMANIA
Prof. Veturia Chiroiu, Head of Department of Deformable MediaRomanian Academy, ROMANIA
Prof. Polidor Bratu, Director of ICECON, ROMANIA
Prof. Ion Magheti, Politehnica University of Bucharest, ROMANIA

International Program Committee Members:

Haiyi Zhang, CANADA
Sen Chi Yu, TAIWAN
Wei Xia, CANADA
Richard Willgoss, AUSTRALIA
Lamberto Tronchin, ITALY
Jorge A. Tejedor, SPAIN
Reza Tavakkoli-Moghaddam, IRAN
Yoshiaki Tadokoro, JAPAN
Chang-kyo Suh, KOREA
Amritasu Sinha, RWANDA
Arkadiusz Salski, GERMANY
Sunint Saini, INDIA
Michael Rosenman, AUSTRALIA
Jong Il Rhee, KOREA
Mohammadreza Rafiei, IRAN
Miroslav Pokorny, CZECH REPUBLIC
Anna Perez, VENEZUELA
Zeljko Panian, CROATIA (HRVATSKA)
Edson Paladini, BRAZIL
Ahmad Moreb, SAUDI ARABIA
Gholam Ali Montazer, IRAN
Azlinah Mohamed, MALAYSIA
Patricia Milligan, UNITED STATES
Jesus Medel, MEXICO
Arie Maharshak, ISRAEL
Edwirde Luiz Silva, SPAIN
James Liu, HONG KONG S.A.R.
Yuan-Horng Lin, TAIWAN
Hankyu Lim, KOREA
Stanislava Labatova, SLOVAKIA
Selva Kumar, INDIA
Walter Kr?mer, GERMANY
Andrei Kolyshkin, LATVIA
Vladimir Kazakov, MEXICO
Elza Jurun, CROATIA (HRVATSKA)
Zhang Jie, CHINA
Girija Jayaraman, INDIA
Shabiul Islam, MALAYSIA
Qiang Hua, CHINA
Chih-hung Hsu, Please, select:
Adolfas Gaigalas, UNITED STATES
Rudolf Freund, AUSTRIA
Kwoting Fang, TAIWAN
Sylvia Encheva, NORWAY
Alexandar Djordjevich, HONG KONG S.A.R.
David Chiu, CANADA
Igor Bernik, SLOVENIA
Mojca Bernik, SLOVENIA
Azam Beg, UNITED ARAB EMIRATES
Noor Habibah Arshad, MALAYSIA
Mohammadreza Anvari, CANADA
Kakuro Amasaka, JAPAN
Rossella Agliardi, ITALY
Elettra Agliardi, ITALY
Shuzlina Abdul Rahman, MALAYSIA

Preface

This book contains the proceedings of the 9th WSEAS International Conference on ACOUSTICS & MUSIC: THEORY & APPLICATIONS (AMTA '08) which was held in Romania, June 24-26, 2008. This conference aims to disseminate the latest research and applications in Mathematical Models in Acoustics, Computational Acoustics, Sound Insulation, Noise Control Engineering, Medical Diagnostics, Non-destructive Inspection, Biological Effects of Sound, Psychoacoustics and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in   **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

Table of Contents

Plenary Lecture I

A Lifetime Dedicated To Acoustics

Professor Radu P. Voinea
Member of Romanian Academy,
President of the Acoustics Commission of the Romanian Academy,ROMANIA

Web site: http://www.acad.ro/academia2002/acadrom/pag_ist.htm

Abstract: I want to do a special mention related to the activity of professor Aurelian Stan in the field of acoustics, particularly about the activity as scientific secretary, vice-president and president of the Commission of Acoustics of the Romanian Academy. The activity of scientific research of professor Aurelian Stan consists of over 200 books, studies, papers, communications, yielding original contributions in the domain of acoustics: noise control and vibrations at ships, elevators and in the textile industry; acoustics treatment of the industrial places; using the noise absorbing ceilings; acoustics of the performance halls, particularly, acoustics of the National Theatre Hall; study of the noise produced by town traffic, particularly in Bucharest; papers useful in military area, in the domain of infrasound, vibrations of the pipes of anti-aircraft guns, acoustics of underwater for the detection of the submarines, etc. I have always been impressed by the care of professor Aurelian Stan concerning the elaboration of the 30 volumes of scientific communications made at the annual sessions of this commission, from 1972 until 2002, so modestly named "Note-Books of acoustics". I admired him examining very carefully every communication separately, the way he talked to the author, often a young and less experienced person in the technique of elaboration and he used to give useful advice to this youth. I know he would not have accepted any communication if it had not met the exigencies of a publication of the Romanian Academy. For special scientific results, in 1943, the professor Aurelian Stan was elected corresponding member of the Romanian Academy of Science, an academy founded in the '30 and functioned parallel to the Romanian Academy. In 1993, on 23rd of March, he was elected member of honour of the Romanian Academy. In 1995, professor Aurelian Stan founded The Romanian Acoustical Society, he being among the founding members. In 1997, he became founding member of the Academy of Technical Sciences in Romania (ASTR). His activity was appreciated especially by some prestigious scientific societies from abroad. Thus, in 1974 he was elected member of the Group of Acousticians speaking French Language (GALF). In 1976, he became member of the European Acoustics Society (FASE), being elected vice-president of this prestigious society in 1982. Let's add to all these the fact that in 1979 he was awarded the silver medal of the French Acoustics Society and in 1980, this society conferred him the title of member of honor.

Brief Biography of the Speaker: Graduated in the year 1946 the Polytechnical Institute of Bucharest, where he distinguished himself as an eminent scholar in theoretical mechanics, resistance of materials, dynamics and construction stability. His scientific research includes approach to problems of theoretical mechanics, mechanism theory, elastic and dynamic stability, but also contributions, as a national first and with notable results on an international level, to fields such as chaos theory, fractal problems, dynamic systems' theory, etc. From his original contributions of widespread acknowledgement there are noted: „The Sufficiency of the Virtual Mechanical Work Principle", introducing the concept of „Critical System" along „Olonome and Unolonome Systems", „Distribution of Acceleration in the Relative Movement of the Rigid", „The Method of Independent Cycles", „Positional Analysis of Mechanisms", „Cinematic Couples Synthesis", „The Effects of Coupling very different Rigid Structures", „The Dynamic of Vehicle Suspension", „The Vibration of Rotors in non-inertial Systems", etc. In 1963 he was elected correspondent member and in 1974 title member of the Romanian Academy. In 1972 he obtained the title of Professor Emeritus and in 1974 that of Scientist Emeritus. Since 1997 is a founding member and President of the Romanian Academy for Technical Sciences. Starting in 1992, has taken on the role of General Director of the Romanian Space Society. He is the President of the Acoustics Commission of the Romanian Academy.

Plenary Lecture II
Sound Quality

Professor Malcolm J. Crocker
Distinguished University Professor,
Director, Sound & Vibration Research Laboratories
Mechanical Engineering Department
270 Ross Hall
Auburn University
Auburn, AL 36849, USA

E-mail: mcrocker@eng.auburn.edu

Abstract: Throughout the twentieth century, engineers have used increasingly sophisticated experimental and theoretical approaches to reduce the noise of machines, vehicles, aircraft, etc. Since the mid-1980s it has become apparent to manufacturers that it is insufficient simply to reduce overall noise levels. In most cases the noise of vehicles, appliances, etc, has been sufficiently suppressed that it no longer poses a hearing loss hazard after extended exposure, or interferes with speech, sleep and other activities of occupants. Other properties of the noise, in addition to its overall sound pressure level, such as loudness, frequency content, tonal components, impulsiveness, and level fluctuations may determine whether the quality of the noise is acceptable or not in particular circumstances. Product sound quality studies have been made on household appliances, air-conditioning systems, high speed trains, etc., although most attention has been paid to interior vehicle noise. This paper reviews the main properties of sound that are important in sound quality determination and includes some of the author's own experimental evaluations of the sound quality of four automobiles.

Brief Biography of the Speaker: Dr. Crocker has 45 years' research experience in the areas of experimental and theoretical acoustics, vibration and noise control. He was named Assistant Director/Acoustics of Purdue's Ray W. Herrick Laboratories in 1977, where he also conducted research on vehicle and machinery noise from 1969 to 1983. He has published over 350 technical articles and books in acoustics and vibration and noise control. He was a founding director of INCE/USA in 1971 and of International/INCE in 1974. Dr. Crocker was general chair of Internoise 1972 and the 1981 President of INCE/USA. From 1973 to 1994 he served as Editor-in-Chief of the international refereed publication: Noise Control Engineering Journal. He has also served as Editor-in-Chief of the four volume 2000 page Encyclopedia of Acoustics published by John Wiley and Sons in 1997 and the single volume Handbook of Acoustics in 1998. The Encyclopedia won the 1997 award of the American Association of Publishers for excellence in professional and scholarly publishing. He has served as Executive Director of IIAV since 1995 and Editor-in-chief of the International Journal of Acoustics and Vibration since 1996. His Handbook of Noise and Vibration Control was published by John Wiley and Sons in 2007. In the last 38 years Dr. Crocker has been principal investigator on over 70 research contracts for industry and government and has supervised over 50 graduate students. He currently has two three-year NASA contracts to study and predict spacecraft rocket exhaust noise at launch and the turbulent boundary layer and separated flow noise and oscillating shock pressure fluctuations on the NASA Orion/Ares space vehicle, which will replace the Shuttle Orbiter. Dr Crocker has three honorary doctorates from Bucharest and Craiova, Romania and St. Petersburg, Russia.

Plenary Lecture III
The Effect of Structural Degradation on the Dynamic Behaviour of Buildings

Professor Tudor Sireteanu
Institute of Solid Mechanics,
15 Constantin Mille Street, Bucharest,
ROMANIA

Email: siret@imsar.bu.edu.ro

Abstract: The paper is an analysis of buildings behavior during strong earthquakes, considering the modifications of the structural dynamic characteristics due to strong earthquake - generated damages. The acceptance of plastic hinges occurrence in a building according to the seismic design standards [1-3] leads to a degradation of the structural restoring force and to an increase of the structural damping. The first effect could be beneficial if the natural vibration periods of the building are longer than those of the main spectral components of the ground motion ("fast earthquakes"). In this case, by structural stiffness degradation the building is "pulled" from the resonance regime resulting in a reduction of seismic response. On the other hand, if the main spectral components of the seismic ground motion are longer than the building natural periods ("slow earthquakes"), then the structure could be "dragged" to resonance with a significant increase of the seismic response, which can result in important building damages or even in collapse. The increase of the building structural damping capacity due to the occurrence of plastic hinges is beneficial in both cases as more of the kinetic energy injected to the building by the seismic action is consumed as the structure experiences repeated stress reversals. However, this increase of structural damping is not so important such as to dramatically reduce the vibration amplification within the resonance range. The dynamic behavior of buildings during an earthquake must be analyzed for both undamaged and damaged conditions of the building. Figs. 1a,b illustrate the effect of damages produced by slow and fast earthquakes on the building dynamic behaviour, highlighting the increase or decrease of the structural seismic response, as function of the mode the initial value of the building vibration period is situated relative to the pre-amplification, resonance or attenuation frequency range of the normalized ground response spectra (curve). As one can see, for "slow earthquakes", such as Vrancea intermediate earthquakes or the earthquakes on soft soil sites, the controlled damage of buildings could result in most cases to an important increase of the seismic energy transfer from the foundation ground to the building. Therefore, the acceptance of plastic hinges occurrence, as specified by EUROCODE 8 and P100/22004, is not a solution to be adopted in all cases for earthquake protection of buildings. The study is focused on the difference in a building behavior, function of the mode the structure is situated relative to the seismic ground motion from the spectral point of view: above resonance or below resonance. Experimental and simulation results are presented for simplified mechanical models of building structures with stiffness degradation. As a convenient measure of the effect of duration and severity of the building seismic loads, the total energy dissipated through hysteresis is considered.

Brief Biography of the Speaker: Dr.Tudor Sireteanu is the director of the Institute of Solid Mechanics of the Romanian Academy since 1990. He was born in 1943 in Bucharest. He is a graduate of the University of Bucharest, Faculty of Mathematics and Mechanics and has been with the Institute of Solid Mechanics since graduation, working in the field of vibration control. In 1971 he received a Fulbright Grant for a research stage at California Institute of Technology, Department of Engineering. In 1982, he received his PhD degree in applied mathematics from the University of Bucharest, Faculty of Mathematics and Mechanics with a thesis on nonlinear random vibrations. Since 1992 he is PhD advisor in the field of applied mathematics and associated professor with the University Politechnica Bucharest since 1997.

His scientific work is focused on applied vibration theory, experimental methods and signal processing, the application of novel techniques such as semi-active control strategies assisted by computational intelligence methods(genetic algorithms, fuzzy logic and neural networks). Dr.Tudor Sireteanu was awarded the Romanian Academy Prize "Traian Vuia" (1998) for a series of papers published in the field of dynamic system control. In 2004 dr. Tudor Sireteanu received the title of Honorific Member of the Academy of Technical Sciences from Romania in recognition of his major contribution to the development of vibration control applied to automotive suspensions, machinery vibration isolation and building seismic protection. He has published more than 100 scientific papers in scientific journals and international conference proceedings and three books on automobile suspensions, magneto-rheological dampers and semi-active control. Dr.Tudor Sireteanu is the editor scientific secretary of the "Revue Romaine de Mécanique Appliquée", published by the Printing House of the Romanian Academy.

Plenary Lecture IV
On the Sound Propagation in the Open Air

Professor Veturia Chiroiu
Member of the Technical Sciences Academy from Romania (ASTR),
Head of Department of Deformable Media,
Romanian Academy,
Institute of Solid Mechanics,
ROMANIA

Email: veturiachiroiu@yahoo.com

Abstract: This contribution is planned to provide the application of the soliton theory to understand the sound propagation in the open air. The sound propagation in the atmosphere is more complicated than the theory of geometrical spreading above a flat hard ground. When sound propagates, it is attenuated with increasing distance between source and receiver, and the sound characteristics depend on time and the distance from the source. Grounds may not be flat and also acoustically soft, the wind and temperature refract sound either upwards or downwards at the ground, leading to complex reflection coefficients and the multiple reflections at the ground. Atmospheric turbulence causes fluctuations and scatters sound into acoustical shadow zones. The methodology to study the sound evolution equation is the soliton theory. The sound is regarded as an entity, a quasi-particle, characterized by a proper propagation mechanism which conserves its character and interacts with the ground properties and micrometeorological factors. The sound propagation theory is faced with the unexpected appearance of chaos or order. Within this framework the soliton plays the role of order. The results obtained in the linear theory of sound motion, by ignoring the nonlinear parts, are most frequently too far from reality to be useful. The linearization misses an important phenomenon, solitons, which are waves, which maintain their identity indefinitely just when we most expect that dispersion effects will lead to their disappearance. The solutions regarding the attenuation due to atmospheric absorption, the decrease in sound pressure level with different factors, are represented by the revolution ruled Tzitzeica surfaces. The capability of the Bäcklund transformation to provide an integrable discretization of the characteristic equations associated to the sound propagation, are considered for modeling the sound rays during downwind and upwind propagation.

Brief Biography of the Speaker: Veturia Chiroiu (born in 1942) received the PhD degree in Mathematics from University of Bucharest in 1981. Since 1966 she is a senior scientific researcher at the Institute of Solid Mechanics of the Romanian Academy, head of Department of Deformable Media (www.imsar.ro). She received a Fulbright Fellowship to work at the Princeton University, Dept. of Aerospace and Mechanical Science (1972–1973), and has led various research projects (Copernicus, NATO) and lectured in foreign institutes and universities. She is author of numerous research articles in referee journals and international conferences, covering dynamics of deformable media, acoustics, intelligent structures and materials, and inverse problems. She is the winner of the prize Aurel Vlaicu of the Romanian Academy in 1997. Since 2000 she is a PhD advisor in the field of mechanical engineering at the Romanian Academy. Since 2004 she is an Honorific Member of the Technical Sciences Academy of Romania (ASTR).

Plenary Lecture V
Measurement and reproduction of spatialization in room acoustics

Professor Lamberto Tronchin
Chair of the Musical Acoustics Group of
the Italian Association of Acoustics
DIENCA - CIARM,
University of Bologna,
ITALY
E-mail: tronchin@ciarm.ing.unibo.it
Web site: www.ciarm.ing.unibo.it

Abstract: The definition and measurement of sound spatialisation have been strongly enhanced in last years, as nowadays spatialisation is considered quite important during design of auditoria and virtual audio reproduction of sound quality in dedicated listening rooms for 3D reproduction purposes. Even though international standards like ISO 3382 require measuring some spatial parameters (i.e. LE, LF, IACC) , usually only binaural measurements are performed, by means of a dummy head, and rarely 3D impulse responses are measured and utilised for sound reproduction.

In this paper, after an overview on the most common techniques utilised for 3D auralization, an innovative procedure of measuring and reproducing spatial sound characteristics is presented. The application of this new technique in virtual 3D sound reconstruction is presented. Furthermore, the methodology is compared with other techniques of 3D sound reproduction. Moreover, the results of a wide campaign of measurements of spatial parameters among different auditoria all over the world, ranging from Italy to Japan and Australia, and conducted with the novel methodology, are compared with the results of standard binaural and 3D measurements. The possibility to enhance the spatial reproduction of sound quality in real spaces and the comprehensibility of spatial parameters is finally considered and presented in different cases.

Tutorial I
Sound to image visualizations and image to sound transforms

Doctor Dionysios Politis
Multimedia Lab,
Department of Informatics,
Aristotle University of Thessaloniki,
Thessaloniki, GR-541 26
Greece
E-mail: dpolitis@csd.auth.gr
website: www.csd.auth.gr/~dpolitis

Abstract: Numerous algorithms have been proposed for image to sound and sound to image transforms. Based on heuristic assignments of sound frequencies to RGB values, they perform effective mappings between musical entities (notes) and values for optical wavelengths. The new element that has been recently exploited is the chromaticism of the sound domain. When taken into account, a colouring of the performed music may take place. On the other hand, segments that have acoustic polymorphism can be assigned to colours and archetypal image to sound transforms may take place. In both approaches, the visualization of music is exhibited according to the melodic structure and not only according to the temporal characteristics (i.e. rhythm).

Brief Biography of the speaker: Dr. Dionysios Politis earned his Ph.D in Computer Science, MSc in Radio Engineering and Telecommunications, and B.Sc. in Physics from the Aristotle University of Thessaloniki. He is also a holder of a Graduate Diploma in Computing Studies from RMIT as a scholar of the Australian Government. Apart from his academic career in the Department of Informatics of the Aristotle University of Thessaloniki, he had been a scientific collaborator of the Centre of International and European Economic Law in Thessaloniki and participated as EU expert in Computer Law in various projects aiming to enhance the pre-accession route of Bulgaria, FYROM, Romania and Cyprus. His research focuses on Multimedia Applications, Computer Music and e-Learning, with more than 50 publications in these areas. He has authored, edited and co-edited six books.

Author Index