PAN ARCHIVES OF ACOUSTICS
Vol. 41, No. 2, pp. 355–373 (2016)

DOI: 10.1515/aoa-2016-0038

The 10th EAA International Symposium on Hydroacoustics Jastrzębia Góra, Poland, May 17 – 20, 2016

The 10th EAA International Symposium on Hydroacoustics, which is also the 33rd Symposium on Hydroacoustics in memory of Prof. Leif Børnø organized in Poland, will take place from May 17 to 20, 2016, in Jastrzębia Góra. It will be a forum for researchers, who are developing hydroacoustics and related issues. The Symposium is organized by the Gdańsk University of Technology and the Polish Naval Academy.

The Scientific Committee comprises of the world – class experts in this field, coming from, among others, Germany, UK, USA, Taiwan, Norway, Greece, Russia, Turkey and Poland. The chairman of Scientific Committee is Prof. Eugeniusz Kozaczka, who is the President of Committee on Acoustics Polish Academy of Sciences and Chairman of Technical Committee Hydroacoustics of European Acoustics Association.

The Symposium will include invited lectures, structured sessions and contributed papers covering almost all major topics of hydroacoustics. Structured session will be devoted to:

- underwater acoustics in security systems,
- seafloor scattering,
- satellite methods in marine ecosystem research,
- underwater communication in confined and shallow waters,
- noise monitoring in European marine waters,
- ultrasonic applications,
- sound propagation in the sea and modelling,
- sonar signal processing,
- sound propagation in the sea and modelling.

More than 90 scientists have already registered to the Symposium representing research centers mainly from Poland but also from other countries including Israel, Canada, USA, with 5 invited papers:

- Prof. Chi Fang Chen: *Review on the Development of Underwater Acoustic Propagation Models*;
- Dr. Ing. Tanja Grießmann *et al.*: *Application of Bubble Curtains to Mitigate Hydro Sound Levels at Offshore Construction Sites*;
- Dr. Christopher Jenkins: *Backscatter from Intensely Biological Seabeds – Benthos Simulation Approaches*;
- Prof. Eugeniusz Kozaczka: *Technical Support for National Border Protection on Vistula Lagoon and Vistula Spit*;
- Prof. Andrzej Nowicki *et al.*: *Estimation of Radial Artery Reactive Response using 20 MHz Ultrasound*;
- Prof. Jerzy Wiciak: *Advances in Structural Noise Reduction in Fluid*.

All accepted papers will be published in the periodical "Hydroacoustics".

Abstracts

Review on the Development of Underwater Acoustic Propagation Models

Chen Chi-Fang, chifang@ntu.edu.tw

National Taiwan University

Underwater acoustic propagation modeling began with two-dimensional (2D) approach by treating the ocean as range-dependent medium and neglecting the azimuthal variation. Later the azimuthal variation is taken into account by Nx2D approach, i.e. dissect the space into azimuthal sectors and treat each sector with 2D approach. However the ocean is 3-dimensional; we cannot neglect the true ocean physics. This motivated model developers to develop model(s) to treat the 3D ocean physics realistically. This was how the FOR3D (which stands for Finite difference solutions for an Ordinary differential equation using the Rational function approximations for 3Dimensional wave propagations problems) was developed. In 1990s, FOR3D was first introduced to the underwater acoustics community to treat ocean as a three-dimensional medium with variations in range, depth and azimuth. This was the pioneer work in three-dimensional underwater acoustic propagation.

In the last decade, the three-dimensional research attracted more interest as the computational power and speed were greatly improved and advanced. In this paper,

Detection of Variations in Random Characteristics of Scattering Medium by the Wavelet Analysis

Doubrovina Olga, Gambin Barbara, bgambin@ippt.pan.pl
Wójcik Janusz

Institute of Fundamental Technological Research
Polish Academy of Sciences

The main idea of this research is to show the capacity of the wavelet analysis to the differentiation of randomness of backscattering structures. Simulated ultrasound backscattered signals are obtained under real conditions imposed on the incident field generation and properties of the actual ultrasound transducers. It is assumed that the scattering volume, i.e. region of interest, is composed from a sum of two random media occupying the neighboring locations. The considered media are equal in size but they consist of backscattered with different random distributions or different physical properties. As an example, particular structure of the complex random scattering volume is considered. It consists of the ensemble of spheres randomly shifted from the center of cubic cells with the shift distributed uniformly and normally with different characteristics for each of two sets. It will be seen in what a way the two randomness impact on the features of the wavelet spectrogram of RF signals in which not only the variations in randomness but also the location of the border between two random parts is noticeable.

Acknowledgments: This work was partially supported by the National Science Centre (grant no. 2011/03/B/ST7/03347).

⋆ ⋆ ⋆

Spatiotemporal, Multidimensional GIS for Pelagic Fish Biomass Estimation

Drypczewski Krzysztof, kszyk@eti.pg.gda.pl
Stepnowski Andrzej

Gdańsk University of Technology

Various methods of pelagic fish biomass estimation provide information about quantity of fish in a specific geographical location. Analysis of the consequent measurements for the same area over extended period of time can help in explaining the changes occurring in the environment (migration etc.). Moreover, pelagic fish biomass estimation compared with fishing data can help in effective fishery planning. Modern Geographical Information System (GIS) technology can provide easy to use, near real-time solution to aforementioned problem. Multidimensional GIS systems are especially designed to acquire, distribute, analyze and visualize complicated temporal data.

In the article, authors present an idea for multidimensional GIS for pelagic fish estimation analysis and discuss possible benefits, architecture and applications.

⋆ ⋆ ⋆

A Novel Algorithm of Spectral Analysis for Passive Sonars

Dyka Andrzej, adyka@eti.pg.gda.pl

Gdańsk University of Technology

A problem of significant importance in various areas of science and technology is an effective detection of a short duration harmonic signal embedded in noise and in the presence of slowly varying disturbance.

Short duration is understood here as time instant from a to several (less than 100) of periods of the harmonic signal sought.

This is, among other the scenario in passive underwater location, where the goal is to detect the periodic signal of the submarine propeller.

The main idea of the algorithm consists in chopping the analyzed signal into a number of adjacent subintervals of the duration equal to the assumed period of the signal to be detected. This, thru averaging, enables an improvement of signal-to-noise ratio and provides some flexibility in choosing metric for most robust determination of the number frequency of the harmonic signal to be identified.

The goal of this paper is to discuss the available metrics and their performance in identifying the harmonic signal vs the performance of standard Fourier analysis.

⋆ ⋆ ⋆

Effect of Water on Acoustic Properties of Ionic Liquids

Dzida Marzena, mhd@ich.us.edu.pl
Skowronek Justyna

University of Silesia

Ionic liquids are considered to be a novel and attractive huge class of chemical compounds with unique properties such as negligible vapour pressure, a broad liquid temperature range, a high chemical and thermal stability. Thus they are becoming a new green solvents.

The measurements of speed of sound in ionic liquids have been undertaken, either to study the nature of molecular interactions, structure and packing effects or to obtain thermodynamic quantities for applications in chemical and industrial process. The presence even a small amount of water in ionic liquids may affect many of their properties. Therefore speed of sound, density, acoustic impedance, isentropic compressibility, and isobaric thermal expansion were determined for solutions of water in 1-ethyl-3-methylimidazolium ethyl sulfate and 1-octyl-3-methylimidazolium chloride within the temperature range from 278 K to 343 K.

⋆ ⋆ ⋆

Development of a High-Resolution Real-Time Capable 3D Sonar Camera for Deep Sea Operation

Ehrhardt Michael, michael.ehrhardt@ibmt.fraunhofer.de
Becker Franz Josef, Speicher Daniel, Degel Christian

Fraunhofer Institute for Biomedical Engineering (IBMT)

The deep sea and especially the seafloor constitute an increasingly attractive field for different scientific and economic interests. In order to accomplish a comprehensive exploration as well as an efficient economic utilization of the deep sea, visualization tools which provide images of reasonable quality within an acceptable period of time are required. Since the commonly used optical imaging systems are restricted in the seafloor area, a high-resolution real-time capable sonar-system is required to ensure an adequate visualization for exploration and process monitoring