Proceedings of the 2nd EUROPEAN COMPUTING CONFERENCE (ECC'08)
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NEW ASPECTS ON COMPUTING RESEARCH

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Malta, September 11-13, 2008

Editors:
Prof. Costin Cepisca, University Politehnica of Bucharest, Romania
Prof. Guennadi A. Kouzaev, Norwegian University of Science and Technology, Norway
Prof. Nikos E. Mastorakis, MIUE (ASEI), Hellenic Naval Academy, Greece

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Preface

This book contains the proceedings of the 2nd EUROPEAN COMPUTING CONFERENCE (ECC'08) which was held in Malta, September 11-13, 2008. This conference aims to disseminate the latest research and applications in Artificial Intelligence, Web-based education, Cryptology, Signal Processing, Fuzzy Logic, Algorithms and Complexity 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.

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Keynote Lecture I

Digital Video Image Quality and Perceptual Coding

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Abstract:- Based on a human visual system (HVS) based approach, digital video image quality and perceptual coding (DVIQPC) outlines the principles, metrics an standards associated with perceptual coding as well as the latest techniques and applications. It discusses the latest developments in vision research as they relate to HVS based video and image coding. It discusses subjective and objective assessment methods, quantitative quality metrics including vision model based digital video impairment metrics, test criteria and procedures. It examines post-filtering and reconstruction issues associated with color bleeding, blocking, ringing and temporal fluctuation artifacts in detail along with methods to reduce/eliminate them. It also focuses on picture quality assessment criteria. It poses new challenges to vision research and/or how to transfer vision science to imaging and visual communication systems engineering. It also poses an obvious theoretical and practical challenge regarding the concept of psycho visual redundancy (also how to define this quantitatively) and to establish theoretical bound for perceptually lossless coding.

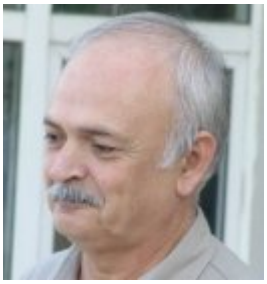
When searching for future generation picture coding framework, the overall codec system design optimization should include pre-filtering/processing post processing and reconstruction techniques in a way similar to transform/predictive coding, loop-filtering, motion compensated prediction, HVS weighting, adaptive intra/inter modes entropy coding in the well established international standards such as the JPEG series (still frame only), MPEG series and H.26x series as part of the equation. When perceptual coding systems are explored, display environment also needs to be considered. Operations such as pre-filtering, post-filtering, color format conversion, spatial/temporal/bit depth resolutions are intentionally outside the domain of these standards with the sole aim to encourage innovation and ingenuity. In selection and design of the next generation picture codec systems, an approach to overall encoding and decoding system optimization needs to be considered on order to achieve improved performance in the rate and perceptual distortion minimization sense.

Although the goal of picture compression is to achieve rate driven minimization or quality driven optimization, most picture coders thus far including those developed by the standards organizations are rate driven and not quality driven if any. While the historical reasons for rate driven coder design are no longer valid such as constant bit-rate transmission, picture quality driven coder design rarely forms the main stream of research and development. For starters, establishing quantitative measures for perceptual picture quality is the first criterion. This can lead to design and optimization of quality driven picture coders. The keynote speech, basically, addresses these challenging issues.

Brief Biography of the Speaker:- K. R. Rao received the Ph. D. degree in electrical engineering from The University of New Mexico, Albuquerque in 1966. Since 1966, he has been with the University of Texas at Arlington where he is currently a professor of electrical engineering. He, along with two other researchers, introduced the Discrete Cosine Transform in 1975 which has since become very popular in digital signal processing. He is the co-author of the books "Orthogonal Transforms for Digital Signal Processing" (Springer-Verlag, 1975), Also recorded for the blind in Braille by the Royal National Institute for the blind. "Fast Transforms: Analyses and Applications" (Academic Press, 1982), "Discrete Cosine Transform-Algorithms, Advantages, Applications" (Academic Press, 1990). He has edited a benchmark volume, "Discrete Transforms and Their Applications" (Van Nostrand Reinhold, 1985). He has coedited a benchmark volume, "Teleconferencing" (Van Nostrand Reinhold, 1985). He is co-author of the books, "Techniques and standards for Image/Video/Audio Coding" (Prentice Hall) 1996 "Packet video communications over ATM networks"(Prentice Hall) 2000 and "Multimedia communication systems" (Prentice Hall) 2002. He has coedited a handbook " The transform and data compression handbook," (CRC Press, 2001). Digital video image quality and perceptual coding, (with H.R. Wu),Taylor and Francis (2006). Introduction to multimedia communications: applications, middleware, networking, (with Z.S. Bojkovic and D.A. Milovanovic), Wiley, (2006). He has also published a book, " Discrete cosine and sine transforms", with V. Britanak and P. Yip (Elsevier 2007). Two books 1. FFT with D. Kim (publisher: Springer) expected March 2009. 2. Wireless Multimedia Communications (publisher: Taylor and Francis) Oct. 2008.Some of his books have been translated into Japanese, Chinese, Korean and Russian and also published as Asian (paperback) editions. He has been an external examiner for graduate students from Universities in Australia, Canada, Hong Kong, India, Malaysia, Singapore, Thailand, Taiwan and USA. He was a visiting professor in several Universities -3 weeks to 7 and1/2 months- (Australia, Japan, Korea, Singapore and Thailand). He has conducted workshops/tutorials on video/audio coding/standards worldwide. He has supervised several students at the Masters (64) and Doctoral (30) levels. He has published extensively in refereed journals and has been a consultant to industry, research institutes, law firms and academia. He is a Fellow of the IEEE. He is a member of the Academy of Distinguished Scholars, UTA.

Keynote Lecture II

Who is Afraid of integration: No Fluctuation Approximation for any Arbitrary Precision



Professor Metin Demiralp
Istanbul Technical University, Informatics Institute,
Group for Science and Methods of Computing,
Istanbul, TURKEY

Abstract: This lecture is focused on the no fluctuation approximation for univariate integration. This approximation technique has been developed quite recently by the author's group and its development is continuing towards several directions.

The basic idea behind this novel approach is not to approximate a function but its matrix representation when it is considered as a multiplication operator. As is well-known almost all of the numerical integration methods based on quadratures where the integral is approximated by a linear combination of the integrand function's values at interior points (sometimes end points of the integration interval can be taken into consideration depending on the considered method's nature) with positive combination coefficients.

$$\int_a^b dx W(x) f(x) \approx \sum_{i=1}^{n} w_i f(x_i) \qquad (1)$$

where a < b are real paremeters which can be finite or infinite in magnitude and W(x) stands for a given weight function which is positive everywhere except (in certain cases) some number of interior points of the interval. The right hand side entities, wi and xis are positive coefficients which are called weight factors, and, the interval's interior points (certain cases may involve end points also) which are called nodes respectively. The integrand of the integral is generally approximated by either polynomials, splines, or sometimes orthogonal functions to get (1). Depending on the idea behind the approximations the weight factors and nodes take different set of values and this affects the quality and stability of the approximation.

Although we do not intend to give these topics in all details, we will emphasize on important issues about the approximation quality mostly.

The main emphasis will be given on the no fluctuation approximation which approximates not the function f(x) but an algebraic operator whose action on its operand is just the multiplication by the function f(x) for a specified x independent variable value. This operator is linear and is defined on a Hilbert space of square integrable functions. It can be noticed without any difficulty that the matrix representation of the operator which multiplies its operand by f(x) over an orthonormal of basis set for the Hilbert space under consideration is equal to the image of the matrix representation for the operator whose action on its operand is just to multiply by independent variable x under the function f. This equivalence does not hold for the matrix representations over the subspaces of Hilbert space under consideration. However, as the author of this talk had proven this equivalence does approximately hold and the approximation quality increases as the dimension of the subspace under consideration grows up to infinity.

If we consider the basis functions which are in fact natural number powers of the independent variable, that is, 1, x, x2, ..., then we can construct a polynomial basis function set by orthonormalizing this set in the order of ascending natural number powers. If this orthonormal polynomials are denoted by ui(x), i = 1, 2, ... where i − 1 is the degree of the polynomial, and, we denote the matrix representation of f(x) by M (f') where f' stands for the operator whose action on its operand is the multiplication by f(x) then we can write

$$\mathbf{M}_{ij}\left(\widehat{f}\right) \equiv \int_a^b dx W(x) u_i(x) f(x) u_j(x), \qquad i,j = 1,2,... \tag{2}$$

If W(x) is normalized to make its integral equal to 1 then u1(x) becomes 1 everywhere in the interval of the integration. This enables us to write

$$\int_a^b dx W(x) f(x) = \mathbf{e}_1^T \mathbf{M}\left(\widehat{f}\right) \mathbf{e}_1 \tag{3}$$

where e1 stands for the first standard unit vector whose all elements except the first one which is 1 vanish in infinite dimensional cartesian space. If the infinite matrixM (f')is replaced by its left uppermost n×n block where n is a positive integer then we obtain the n–th order no fluctuation approximation. The quality discussions on this focus will also be comprehensively included in the lecture.

Brief Biography of the speaker: Metin Demiralp was born in Turkey on 4 May 1948. His education from elementary school to university was all in Turkey. He got his BS, MS, and PhD from the same institution, Istanbul Technical University. He was originally chemical engineer, however, through theoretical chemistry, applied mathematics, and computational science years he is working on methodology for computational sciences. He has a group (Group for Science and Methods of Computing) in Informatics Institute of Istanbul Technical University (he is the founder of this institute).

He collaborated with the Prof. H. A. Rabitz's group at Princeton University (NJ, USA) at summer and winter semester breaks during the period 1985--2003 after his 14 months long postdoctoral visit to same group in 1979--1980.

Metin Demiralp has roughly 70 papers in well known scientific journals and is the full member of Turkish Academy of Sciences ince 1994. He is also a member of European Mathematical Society and the chief--editor of WSEAS Transactions on Mathematics currently. He has also two important awards of Turkish scientific establishments.

Plenary Lecture I

Digital Measurements of Non-Sinusoidal Electrical Quantities and Metrological Performance

Professor Costin Cepisca
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Measurement Department
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ROMANIA

Abstract: This talk will review a recent development in the field of digital measurements. Accurate measurement of ac quantities is important at all levels of the electrical power system. The presence of harmonics in the power system put higher demands on both power system components and on the measurement equipment. In power system measurements the problems caused by harmonics have been incorporated in increased uncertainty figures.

The subject is classical, but the theoretical and experimental treatment of several of its topics is new and includes:

- Analysis of a new generation of instruments for measuring distorted signals, voltages and currents. These instruments can calculate and display the amplitude and phase angle of each harmonic, by the use of sampling techniques and "FFT analysis", and the active, reactive and apparent power and energy;
- Experimental results based of the use of power and energy calibrator;
- The development of methods for uncertainty determination in the field of metrological performances.

Brief Biography of the Speaker: ostin Cepisca was born in Bucharest, Romania, on May 21, 1949. He received the degree in electrical engineering (1972) and the Ph.D. (Dr.ing.) from Bucharest Polytechnic Institute in 1983.

He is currently Professor of measurement systems at the POLITEHNICA University of Bucharest, Head of Research Centre for Metrology and Measurement Systems and Vice-Dean of Faculty of Electrical Engineering. His present research interest includes the sensor interface systems, analogue circuit design, signal processing, measurement theory and low-frequency measurements. He has published more 300 technical papers and 60 books and has been involved in numerous government and industrial projects in area of measurements and instrumentation.

Plenary Lecture II

Topological Theory of Electromagnetic Boundary Problems

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Abstract: Spatio-temporal shapes of the electromagnetic field are defined by the boundary and initial conditions, and the most of them are derived by numerical methods due to the complexity of the solutions. In this lecture, the treatment of the boundary problems of the electromagnetism by topological methods is considered. The field is described by topological schemes. They are composed of the equilibrium points and separatrices of the field-force lines and derived qualitatively on the given boundary conditions using semi-analytical techniques. The developed approach is fast and for effective initial solutions of boundary electromagnetic problems. Additionally, the developed approach has been applied for the electromagnetic signal area. The digital information is carried by topologically different schemes of space-time field impulses composed of 3-D vector manifolds, and the signals have increased noise immunity. The prospective digital circuitry distinguishes the topologically modulated 4-D field shapes and compares them according to the Boolean and predicate logic. The developed approach is for advanced signaling and computing.

Brief Biography of the Speaker: The speaker is a Professor at the Norwegian University of Science and Technology- NTNU, Trondheim, Norway. He received the Dr. Sciences (Habil.) degree from the Moscow State Institute of Electronics and Mathematics (Techn. University) in computer engineering and microwave techniques, in 1998. He was with the Russia Research Institute of Space Instrument Design, Moscow State Institute of Electronics and Mathematics, Gennum Corp. and McMaster University (Canada).

He has published more than 100 publications and 14 inventions in electromagnetism, three-dimensional microwave and high-speed integrated circuits, topological electromagnetics and signals, mm-wave biomonitoring, and physics of cold matter. Dr. G.A. Kouzaev was awarded with the Russian Government Prize (1997) and Soviet Union Prize for Young Scientists (1990) for his achievements in the 3D integration and space-time signal processing. He is a member of the IEEE, WSEAS, IMAPS and Trans Black Sea Region Science Union of Applied Electromagnetism (Greece). Dr. G.A. Kouzaev is a chair of the WSEAS'08 conferences in Trondheim. He serves on the Editorial Board of the Journal of Wave Physics and Radio Engineering Systems. He was a Program Committee member of several WSEAS conferences, the international conferences on the Applied Wave Physics and a Co-Chair of a SPIE Symposium.

Plenary Lecture III

Branching Processes and the Problem of Admixture of Neanderthal Mitochondrial DNA to Archaic H. Sapiens

Professor Krzysztof A. Cyran
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Silesian University of Technology
Gliwice, Poland
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Abstract: A lot of relevant discoveries have been recently made in the area of origin of modern humans. The first goal of the lecture is to review some known facts about the relationship between populations of H. neanderthalensis and Upper Paleolithic H. sapiens. The second goal is to infer the upper limit of hypothetical Neanderthal mitochondrial DNA (mtDNA) admixture, consistent with the testimony of sequences genotyped from contemporary modern humans and fossils of Neanderthals and archaic H. sapiens living at the same time in Europe. Because the PCR amplification of mtDNA present in one cell in multiple copies is relatively easy, the mtDNA-based inferences have became an important source of knowledge about origin of H. sapiens. Therefore, successful sequencing of the mtDNA from Neanderthal fossils can be considered as the milestone in revealing our evolutionary paths. For example, until recently, the estimation of the mtDNA mutation rate could rely only on human-chimpanzee divergence data. However, due to relatively long time to this divergence, all estimates of this time were very inaccurate ranging from 4 to 9 million years. Consequently, estimated mutation rate could not be accurate and it is also true for mitochondrial Eve dating.

Situation changed after 1997, when for the first time the mtDNA from H. neanderthalensis dated to be alive about 40,000 years ago was sequenced. However, only fewer than 400 base pairs were sequenced, hence any estimates based on this data were not very reliable. The next successful sequencings of Neanderthal mtDNA in 1999 and 2000 confirmed the accuracy of the first experiment. In 2004 the four additional Neanderthal fossils yielded mtDNA sequences together with five early modern humans fossils and the results were corroborating with previous sequencing efforts.

What is also important, some fossils sequenced by Serre et al. in 2004, contained examples named Vandija 77, Vandija 80, Mladec 25c and Mladec 2, considered by multiregionalists as "transitional" forms between Neanderthals and archaic modern humans. Yet the mtDNA proved to be of Neanderthal type for Vandija fossils considered as Neanderthals, and of modern human type for Mladec fossils, considered as modern humans. This is exactly what is expected by recent out-of-Africa model of modern human evolution. Serre and his colleagues, apart from reporting these results, tried to estimate the upper limit of possible Neanderthal admixture to Upper Paleolithic H. sapiens, consistent with mtDNA record. The numerical value of the estimate equal to 25 percent is given only for the simplest case of population with constant size, known, however, to be unrealistic.

In the lecture it will be shown how to estimate similar limit using branching processes and computer simulations methodology. Obtained results further reduce the maximum hypothetical Neanderthal mtDNA admixture to early modern humans gene pool to about 15 percent. Remarkably, branching processes have been recently used also for inferring the age of the primate last common ancestor, basing on archeological stratification and the number of species known to be alive in a given period. Finally, the consequences of the maximum admixture of 15% for two competing theories of modern human origin will be discussed.

Brief Biography of the Speaker: Krzysztof Cyran was born in 1968, in Cracow, Poland. He received MSc degree in computer science (1992) and PhD degree (with honours) in technical sciences with specialty in computer science (2000) from the Silesian University of Technology SUT, Gliwice, Poland. His PhD dissertation addresses the problem of image recognition with the use of computer generated holograms applied as ring-wedge detectors. In 2003-2004 he was a Visiting Scholar in Department of Statistics at Rice University in Houston, US. He is currently the Assistant Professor and the Vice-Head of the Institute of Informatics at SUT.

Dr Cyran has received several awards of the Rector of the SUT for his scientific achievements. In 2004-2005 he was a member of International Society for Computational Biology. He is a member of the Editorial Board of Journal of Biological Systems and a reviewer for Optoelectronic Review, Mathematical Biosciences and Engineering, and Studia Informatica.

He has been an author and co-author of more than 60 technical papers in journals (several of them indexed by Thomson Scientific) and conference proceedings, and has been involved in numerous statutory projects led at the Institute and some scientific grants awarded by the State Committee for Scientific Research. His current research interests are in image recognition and processing, artificial intelligence, digital circuits, decision support systems, rough sets, computational population genetics and bioinformatics.

Plenary Lecture IV

Use of Artificial Intelligent Techniques to Fault Diagnosis in Analog Systems

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Institute of Electronics,
Faculty of Automatic Control, Electronics & Computer Science,
Silesian University of Technology,
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Abstract: Basic concepts of fault diagnosis in analog circuits and devices by means of the simulation-before-test approach, the so called dictionary approach, have been presented. Special attention has been paid to application of artificial intelligence tools, such as: artificial neural networks, fuzzy sets and evolutionary computing.

Brief Biography of the Speaker: Damian E. Grzechca received M.Sc., and Ph.D. degrees, all from the Silesian Technical University - Poland, in 1998, and 2003, respectively. His teaching and research interests are in the analog and digital signal processing and application of artificial intelligence methods like the fuzzy set theory, neural networks, genetic algorithms to electronic system diagnosis and design.

Plenary Lecture V

Why are Wordnets Important?

Professor Janos Csirik
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Abstract: Wordnets are lexical databases in which words are organized into clusters based on their meanings, and they are linked to each other through different semantic and lexical relations. The first wordnet called Princeton WordNet has been created for English, which has been followed by various wordnets born within the framework of EuroNet and BalkaNet projects. We focuses on the development of the Wordnets and of the Hungarian WordNet (HuWN). The process of constructing HuWn is illustrated with examples, some language-specific and language-independent problems encountered during the building process are discussed, and basic statistical data on HuWN are presented as well. Finally, two subontologies of HuWN, namely, the financial domain ontology and the legal domain ontology are also presented, with applications.

Brief Biography of the Speaker:

Name: Janos Csirik
Born: April 14, 1946 in Ambrózfalva, Hungary
Family: Married. 2 children
Citizenship: Hungarian

Degrees:
Dr. Rher. Nat., József Attila University, Szeged, Hungary, 1973.
Candidate of Math. Sci., Hungarian Academy of Sciences.
Budapest, Hungary, 1977.
Doctor of Math. Sci., Hungarian Academy of Sciences,
Budapest, Hungary, 1990.

Positions held:
Research worker, József Attila University, Szeged, Hungary, 1969-1977
Senior research worker, József Attila University, Szeged, Hungary, 1978-1990
Professor and Head of Dept. of Applied Computer Science, József Attila University, Szeged, Hungary, 1990-95
Vice-rector of József Attila University, 1991-1992
Rector of József Attila University, 1992-1994
Deputy State Secretary, Ministry of Culture and Education, 1994-95
Head of the Department of Computer Sciences, József Attila University, 1995-
Dean of Faculty of Science and Informatics Graduate Studies, University of Szeged 2005-

Visiting positions:
Vienna, Austria, 1974 (Boltzmann-fellowship), 5 months
Erlangen, West-Germany, 1980-81 (Humboldt-fellowship), 1 year
London, UK, 1981, 1 month

Erlangen, West-Germany, 1983 (Humboldt-fellowship), 5 months
Berne, Switzerland, 1987, 10 months
Rotterdam, The Netherlands, 1989-1990, 10 months
Berne, Switzerland, 1991, 1 month
Berne, Switzerland, 1994,1 month
Munich, Germany, 1996, (Humboldt fellowship), 3 months
T Research Labs, NJ., USA, 1998, (Fulbright-fellowship), 3 months&AT
Graz, Austria, 1999, 1 month
Columbia University, New York, 2000, 1 month
Berne, Switzerland, 2001, 1 month
Berne, Switzerland, 2002. 2 months
Munich, Germany, 2002-2003, 1 year

Awards: Prize of the Hungarian Academy of Sciences, 1981
Kalmár Prize of the Hungarian Computer Society, 1983
Bolyai Farkas Prize, 1999
The Order of the Hungarian Republic, Officer's Cross

Fields of research:
Analysis of algorithms, pattern recognition, medical image processing, natural language processing.

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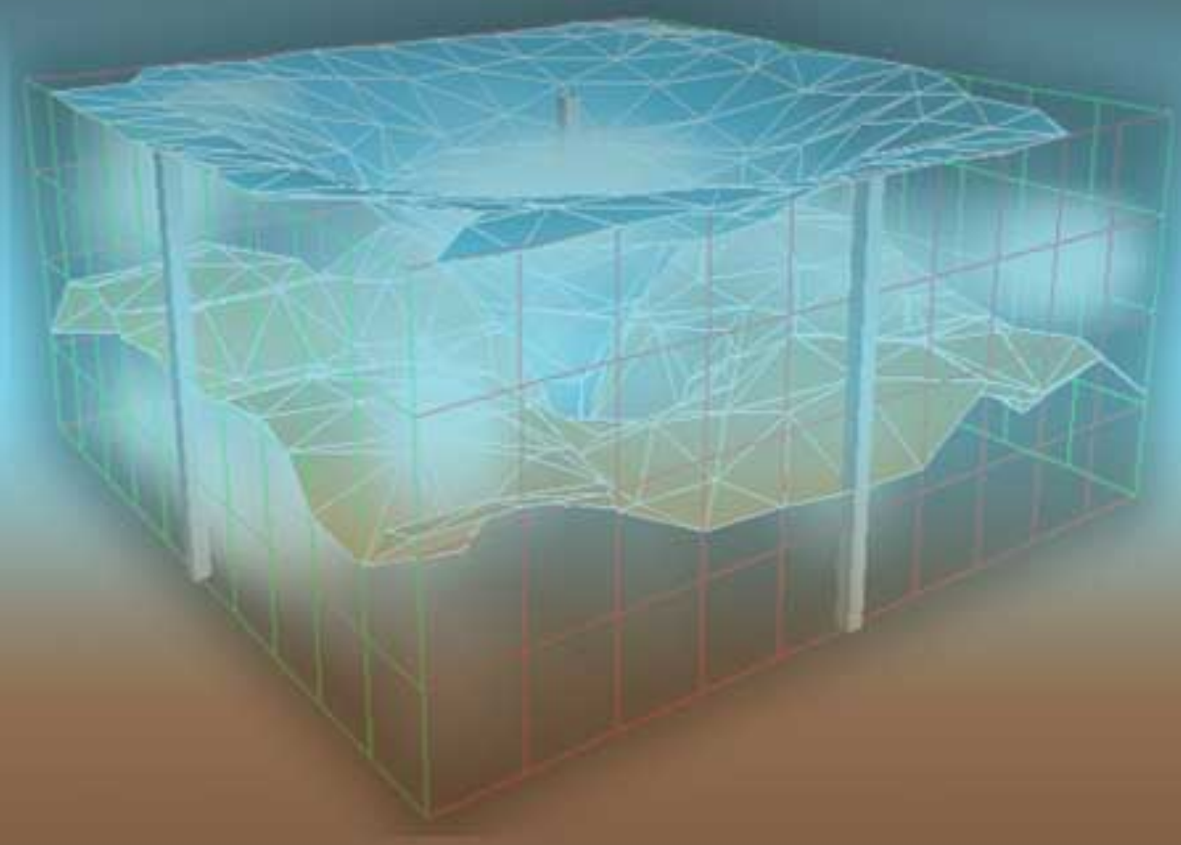

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