Editors: Vincenzo Niola, Michel Kadoch, Alexander Zemliak

Recent Researches in Communications, Signals and Information Technology

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- Proceedings of the 11th International Conference on Telecommunications and Informatics (TELE-INFO '12)
- Proceedings of the 11th International Conference on Signal Processing (SIP '12)

Saint Malo & Mont Saint-Michel, France, April 2-4, 2012

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Preface

This year the 11th International Conference on Telecommunications and Informatics (TELE-INFO '12) and the 11th International Conference on Signal Processing (SIP '12) were held in Saint Malo & Mont Saint-Michel, France, April 2-4, 2012. The conferences provided a platform to discuss fast algorithms, array signal processing, active noise control, digital transforms, pattern recognition, telecommunications, informatics etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Scattered Data Interpolation in n dimensional Space

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Abstract: Data interpolation is one of the most often task in engineering. Several techniques have been developed for data interpolation, but they expect some kind of data "ordering". In many engineering problems, data are not ordered in any way and they are scattered in n dimensional space in general. Usually scattered data are tessellated using triangulation, tetrahedronization etc. but for n dimensional data interpolation this approach for is quite prohibitive because of the computational cost. An interesting technique is n dimensional data interpolation using Radial Basis Functions (RBF). RBF interpolation is computationally more expensive because interpolated data are not ordered, but offers quite interesting applications with acceptable computational cost, e.g. solution of partial differential equations, image reconstruction, neural networks, fuzzy systems, GIS systems, optics and interferometry etc.
We will introduce RBF theory at the "application level" including some basic principles and computational issues. There are two main groups of interpolating functions: 'global" and "local". Application of "local" functions, called Compactly Supporting Functions-CSFBF, can significantly decrease computational cost as they lead to a system of linear equations with a sparse matrix. The RBF interpolation will be demonstrated on engineering applications and on image reconstruction problem solution. We will show how the image with over 60% of corrupted/missing pixels can be reconstructed.

Brief Biography of the Speaker: Prof. Vaclav Skala is a Full professor of Computer Science at the University of West Bohemia, Plzen and VSB-Technical University Ostrava, Czech Republic. He received his ING.(equivalent of MSc.) degree in 1975 from the Institute of Technology in Plzen and CSc. (equivalent of Ph.D.) degree from the Czech Technical University in Prague in 1981. In 1996 he became a full professor in Computer Science. In 1997 the Center of Computer Graphics and Visualization (CCGV) was formally established and since then he is the Head of the CCGV in Plzen (http://Graphics.zcu.cz).
Prof.Vaclav Skala is an associate editor of The Visual Computer (Springer), Computers and Graphics (Elsevier), member of the Editorial Board fo Machine Graphics and Vision (Polish Academy of Sciences) and the Editor in Chief of the Journal of WSCG. He is a member of international program committees of prestigious conferences and workshops. He is a member of ACM SIGGRAPH, IEEE and Eurographics Association.
Prof.Vaclav Skala has published over 200 research papers at conferences and research journals. His current research interests are computer graphics and visualization, mathematics, especially geometrical algebra, algorithms and data structures.
Details can be found at http://www.VaclavSkala.eu.

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Plenary Lecture 2

The noise analysis in gear whine

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Abstract: The constant increase of quality standards for motor vehicles, due to the development of advanced technologies as well as process, design, production, and often imposed by specific rules, brings the car manufacturers to compete mainly on the quality level of vehicles.
Some studies converge on the thesis that the customer considers to be of “good quality” car which has a low level of noise inside the vehicle during the running. This led designers to consider closely the development of products oriented to the global reduction of noise. Major attention has been devoted primarily to the reduction of the noise of the engine, once considered as the main and sometimes only source of considerable noise. Reduced the contribution of the engine, became predominant the noise from transmission and especially from gear-box.
Therefore, the reduction of noise of motor vehicles currently has much importance. In particular, major attention is given to the part of the phenomenon produced by the gears. In a vehicle this noise can mainly be referred to the mechanical transmission, to the transfer of torque or is produced by the differential gear.
The geared noise occupies an important role of topic growing interest in the automotive field, until now considered to be one of the major design factors. Designers often try to reduce noise transmission paths by modifying the external structure of the gearbox and the inside soundproofing, although the optimal solution is to reduce, or even eliminate the sources of noise. In order to design less noisy units it is, therefore, necessary to know the origins and characteristics of noise starting from the gear-box.
The main function of the gear is to transmit power between a pair of wheels meshing as uniform and regular as possible. These conditions can be satisfied by a good configuration of the gearbox, a perfect tooth geometry, an infinite stiffness and softness of meshing. In practice there are many factors which can cause deviations from the ideal situation: the shape of the tooth as accurately realized, may not be ideal from a micro-geometrical point of view.
Besides, due to the hardness of the material, we can not think that the tooth and all transmission gears involved in the transport of torque are free of elastic tension, and therefore from deformation.
A gear-box generates a sound composed of discrete frequency tones of meshing gear, due to the number of teeth involved per revolution (order of meshing), and its harmonics. These frequency components, affecting the wheels, because the load is transmitted from a pair of teeth to another one, generate a noise known as Gear Whine. It manifests as a "whistle" or a "siren" and its influence on the overall vehicle noise is significant and must be strictly limited.
The parameters that mainly influence this phenomenon are: the transmission error, the friction forces and the peak to peak transmission error.

Brief Biography of the Speaker: Vincenzo NIOLA is professor of Applied Mechanics at Naples University Federico II since 31 march 1987. After he got an Univerisity Degree in Mechanical Engineering, he started in january 1978 didactics activity as helper at course of Applied Mechanics and Machines et as member of their committee of examination. Since september 1979 he carried on that collaboration as owner of a scholarship from C.N.R. (National Research Council). Since december 1981 to march 1987 he was a researcher carrying on the practice course for Applied Mechanics, taking a part at examination meeting and working as proposer in many degree thesis. Since 1981 to 1984 he carried on his didactics activity as university teacher for Bioengineering course of locomotive apparatus at Orthopaedy and Traumathology specialization school of 2th Department of Medicine and Surgery of Naples University. Since 31 march 1987 is professor of Applied Mechanics at Naples University Federico II, and since A.A. 86/87 to A.A. 92/93 he carried on the Applied Mechanics and Machines course for electronic engineers, and since A.A. 93/94 to today carry on the Applied Mechanics course for computer science engineers. Since A.A. 88/89 to 89/90 he carried on as supply teacher the Applied Mechanics course for building engineers at Salerno Engineering

University. By A.A. 94/95 to A.A. 97/98 he carried on as supply professor Tribology course at Naples University Federico II. By A.A. 2001/2002 he holds the chair of Applied Mechanics for University Degree of “Orthopaedic Technician” at 2th Department of Medicine and Surgery of Naples University. Since A.A. 2005/2006 is professor of Tribology and of Complements of Mechanics. During this years Prof. Vincenzo Niola has been the chairman of his courses examination meetings, and was proposer of many degree thesis.. During his activity Prof. Vincenzo Niola was owner of financings from MURST and (in past and present) cooperate scientifically with research corporation and national industries (MERISINTER, MONTEFLUOS, INDESIT, ALENIA, C.I.R.A.). He's scientific member of Naples research unit for PRIN 2003. He's fellow of Italian Association of Theoretical and Applied Mechanics (AIMETA). He's member of IFToMM Linkages on cams committee. He belongs to the International Scientific Committee of the "World Scientific and Engineering Academy and Society (WSEAS). He is President of the WSEAS Italy Chapter on the “Analysis of the Mechanical Systems”. He was been Chairman and "invited author" in some session of Internatinal Conferences. He's author of more than 150 national and international papers. Is author of two chapters in the international books. In the past he focused his research activity on :

- Applied Mechanics
- Tribology
- Robot dynamics
- Funicular Railways
- Static and dynamic behaviour of rotors on lubricated journal bearings
- Industrial robot calibration
- Analysis of Mechanical systems by means Wavelet Transform.

Prof. Niola is member of the “Editorial Board” of two International Journals. He is also Editor-in-Chief of a International Journal.

During these years he has also been speaker of a lot of invited plenary lectures in the International Conferences.

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Plenary Lecture 3

To Do Data Compression not only to Compress Data

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Abstract: Compression is the coding of data to minimize its representation. In compressed form data can be stored more compactly and transmitted more rapidly. Recent advances in compression span a wide range of applications. For example Internet and the World Wide Web infrastructures benefits from compression, search engines can extend the idea of sketches that work for text files, image, speech or music data, etc.. Additionally, new general compression methods are always being developed, in particular those that allow indexing over compressed data or error resilience. Compression also inspires information theoretic tools for pattern discovery and classification, especially for biosequences. Today we know that data compression, data prediction, data classification, learning and data mining are facets of the same (multidimensional) coin. In this talk we will review some of the recent advances in the field and discover uncommon applications of data compression.

Brief Biography of the Speaker: Bruno Carpentieri (Member, IEEE) received the “Laurea” degree in Computer Science from the University of Salerno, Salerno, Italy, and the M.A. and Ph.D. degrees in Computer Science from the Brandeis University, Waltham, MA, U.S.A. Since 1991, he has been first Assistant Professor and then Associate Professor of Computer Science at the University of Salerno (Italy). His research interests include lossless and lossy image compression, video compression and motion estimation, information hiding. He has been, from 2002 to 2008, Associate editor of the journal IEEE Trans. on Image Processing, he was chair and organizer of the International Conference on Data Compression, Communication and Processing 2011, co-chair of the International Conference on Compression and Complexity of Sequences, and, for many years, program committee member of the IEEE Data Compression Conference. He has been responsible for various European Commission contracts regarding image and video compression.

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Plenary Lecture 4

On the Automated Localization of Retinal Optic Disk as a Support to Ophthalmic Analysis and Biometric Feature Extraction

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Abstract: Over the last years significant improvements in image processing for ophthalmology were introduced. Retinal imaging is an important modality to document both the health of human eyes and their biometric features. Recent advances in automated diagnostic systems actually enable eye doctors to perform a large number of screening exams for frequent diseases, such as diabetes or glaucoma. On this proposal, precise information about the Optic Disk (OD) reveals necessary to examine the severity of some diseases, since changes in the OD often indicate a pathologic progression. Diagnostic systems of analysis are usually based on the detection of the so-called Region of Interest (ROI) in the optic disc, which is a subset of the image domain important for each retinal analysis. In detail, a properly extracted ROI provides a smaller image containing the most diagnostic information and much less time-consuming when processed. Thus, in retinal imaging the localization of the OD, in terms of position of its centre and length of radius, has to be the best possible, being OD viewed as the main reference when analyzing every anatomic/pathologic retinal detail and the detection of its centre C as a key step in automatic extraction of retinal anatomic features. Since errors caused by artifacts and bright fringes on retinal images could affect results in image processing, in this speech a proposal for an accurate identification of the centre of OD is presented, which combines more systems to analyze retinal images in parallel and find possible values of the centre of optic disc in different ways. Locations of resulting pixels can then be processed to identify the point to adopt as the centre of the optic disc as effectively as possible.

Brief Biography of the Speaker: Leonarda Carnimeo is an Associate Professor of Electrical Sciences at the Engineering Faculty of the Politecnico di Bari, Bari, Italy. Since 1988 her scientific activity dealt with various aspects in the field of Circuit Theory and Applications. At first, her research interests concerned with various aspects of analysis and decoupling of electric power networks, stability analysis of continuous-time and discrete-time cellular neural networks, associative memories design, synchronization of chaotic circuits with applications to secure communications. She was successively involved in various research activities concerning with the development of new techniques for the design of NN-based/CNN-based associative memories with application to artificial vision systems. Then, she was the Responsible in a 2001 Italian PRIN project in the field of Neural Networks and Nonlinear Circuits. Later she was the Responsible in an Italian PRIN project 2004-2006 for the Synthesis of a Cellular Neural System and Development of Innovative Techniques for a Real-time Ophthalmic Image Processing System as a Support in Retinal Pathology Diagnosis and Laser Therapy. She is author of more than 100 scientific papers, with a significant amount published on International journals and chapters of books. Prof.Leonarda Carnimeo, member of the National Group of Coordination of Electrical Sciences, develops her scientific activity within the following interdisciplinary themes: Synthesis of neural systems for retinal imaging in aid of diagnostics and biometric identification; Nonlinear cellular architectures for the spatial novelty detection in stereoscopic vision systems; Cellular associative memories for statistical process control; Modelling of the european Interchange Energy Network.

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Plenary Lecture 5

Integrated and real-time optimization: models, algorithms and applications

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Abstract: A major challenge in supply chain management is the development of computational models and methods for integrated and real-time optimization at the operational level. Companies are facing constant pressure to reduce their costs and improve customer service. As a consequence, they are forced to keep low inventory levels across the supply chain, to increase their responsiveness to customers, and globally to improve their operational performance. To achieve these goals, it is fundamental that planning and scheduling is made in an integrated and coordinated way across the different functions of the companies from procurement to delivery planning. Real-time optimization is used to address the inherent variability that characterizes any real system. It involves recomputing the plans and schedules with a high frequency to account for unpredicted events and new data that becomes available during execution. The goal is to reduce the planning cycles to incorporate real-time data, and respond effectively to new requests without compromising customer service.
The potential benefit of integrated and real-time optimization is widely recognized. Despite this clear practical relevance, research on integrated and real-time optimization at the operational level is very recent, and it focused essentially on heuristic methods. Mixed Integer Programming (MIP) can be very valuable tool in this context. MIP has gone through major developments in the last decades. Combined with the constant progress in hardware, MIP has been applied successfully to the resolution of complex and large size problems in many sectors, such as the telecommunications and the commercial airline industry. Recently, different authors have reported successful applications of MIP-based methods to specific integrated and real-time optimization problems. In this talk, MIP-based approaches for these optimization problems will be discussed. Additionally, we will explore a new modeling technique that leads to models with a pseudo-polynomial size that can be managed dynamically so as to handle efficiently the spatial and temporal integration that characterize these problems.

Brief Biography of the Speaker: Claudio Alves graduated in Systems and Informatics Engineering from the University of Minho (Portugal) in 1998. He obtained a MSc in Industrial Engineering and a PhD in Production and Systems Engineering from this University in 2000 and 2005, respectively. He specialized in the fields of optimization and operations research, and he has conducted active research in integer programming and related applications. He studied different problems including cutting and packing and vehicle routing problems. He is author of more 40 papers published in international journals, conference proceedings and as book chapters. Currently, he is assistant professor at the University of Minho.

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