Editors:
Prof. Imre Rudas, Budapest Tech, Hungary
Prof. Metin Demiralp, Istanbul Technical University, Turkey
Prof. Nikos Mastorakis, Technical University of Sofia, Bulgaria

Education & Web Engineering

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Preface

This year the 9th WSEAS International Conference on DISTANCE LEARNING and WEB ENGINEERING (DIWEB '09) was held in Budapest, Hungary, September 3-5, 2009. The Conference remains faithful to its original idea of providing a platform to discuss web-based education, virtual school, intelligent teachers, intelligent communications, intelligent mobile networks, intelligent algorithms, web examinations, web voting etc. with participants from all over the world, both from academia and from industry.

Its 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 this conference are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this 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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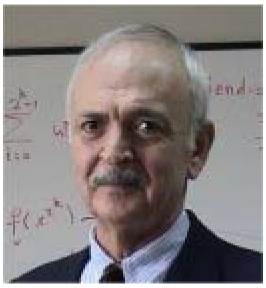
Keynote Lecture

Optimization Based Matrix Decomposition Methods and their Utilization in Applications



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Abstract: Matrix decomposition methods play important roles in the theoretical aspects of the matrix theory beside their utilization in approximations. The main purpose is to represent a matrix in terms of the rather simple matrices. The linear combination type representations are mostly preferred to get the benefits of the linearity. The simple matrices in the linear combination are chosen in as lower ranks as possible. The one-rank matrices or in other words outer products are mostly preferred ones. For example, spectral decompositions use outer products constructed as the product of each normalized eigenvector of the considered matrix by its transpose or hermitian conjugate and the linear combination coefficients are the corresponding eigenvalues when the symmetry or the hermiticity exists in the matrix under consideration. If the symmetry or hermiticity does not exist then the cases should be investigated separately for two different categories first of which involves the matrices with eigenvalues whose algebraic and geometric multiplicities are same while the second one covers the matrices at least one of whose eigenvalues has different algebraic and geometric multiplicities. The first group matrices have spectral decompositions almost same as the symmetric or hermitian matrices with the only difference in the construction of the outer products which are now constructed as the product of the right eigenvectors by their companion transposed left ones. Although the individual normalizations of the left and right eigenvectors are not necessary the mutual normalizations are required to give unit norm to each outer product. The second group matrices can not be expressed in the abovementioned form of spectral decompositions because they can not be diagonalized. Hence, their reducibility to Jordan canonical form must be reflected to the decomposition. What we have stated above is for square matrices. The similar decomposition for the rectangular matrices is based on the idea of the forward and backward transitions between two different dimensional Euclidean spaces. The result is called singular value decomposition where the outer products are constructed from the left and right singular vectors while the linear combination coefficients of the decomposition are the singular values of the matrices which are in fact the square root of the eigenvalues of the product of the transposed form of the matrix by itself. All these decompositions can be connected to the optimization theory by defining appropriate cost functionals and constraints. The cost functional has quadratic natures in general. The constraints may also be quadratic although the bilinear forms are encountered as well. The structure of the cost functional uniquely defines the characters of decomposition. It is possible to define new and more general decompositions by changing the structures of the cost functional and the constraints. There have been certain efforts to do so in recent years. The author and his colleagues are attempting to construct new schemes to decompose matrices and to use them in modern applications related to data processing. The talk will focus on the issue in a more general perspective and try to adress to the works by emphasizing on the recent ones from and outside the group of the author.

Brief Biography of the Speaker: Metin Demiralp was born in Turkey on 4 May 1948. His education from elementary school to university was entirely 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 was mostly working on methodology for computational sciences and he is continuing to do so. 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. Herschel 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 the same group in 1979–1980.

Metin Demiralp has more than 70 papers in well known and prestigious scientific journals, and, more than 110 contributions to the proceedings of various international conferences. He has given many invited talks in various prestigious scientific meetings and academic institutions. He has a good scientific reputation in his country and he is the full member of Turkish Academy of Sciences since 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.
The important recent focii in research areas of Metin Demiralp can be roughly listed as follows: Fluctuation Free Matrix Representations, High Dimensional Model Representations, Space Extension Methods, Data Processing via Multivariate Analytical Tools, Multivariate Numerical Integration via New Efficient Approaches, Matrix Decompositions, Quantum Optimal Control.