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RECENT ADVANCES ON APPLIED COMPUTER SCIENCE

Recent Advances in Computer Engineering
A Series of Reference Books and Textbooks

Proceedings of the 8th WSEAS International Conference on APPLIED COMPUTER SCIENCE (ACS'08)

VENICE, ITALY, NOVEMBER 21-23, 2008

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Preface

This book contains the proceedings of the 8th WSEAS International Conference on APPLIED COMPUTER SCIENCE (ACS'08) which was held in Venice, Italy, November 21-23, 2008. This conference aims to disseminate the latest research and applications in Programming Languages, Software Engineering, Educational Software, Software Metrics, Object-Oriented Analysis and Design, Data Mining 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

Keynote Lecture: Multivariate Data Completion or Addition on a Single Curve Representation of a Hyperrectangulargrid via Fluctuation Suppression **13**
Metin Demiralp

Plenary Lecture I: Computational Design of Optical Fibers with Desirable Consumer Characteristics **15**
Les M. Sztandera

Plenary Lecture II: Adopting Agile Software Project Management Practices: Success Factors, Changes Required, and Challenges **16**
Subhas C. Misra

Plenary Lecture III: Artificial Intelligence Methods in the Interpretation of Statistical Testing of Genes under Hypothetical Balancing Selection **17**
Krzysztof A. Cyran

Plenary Lecture IV: A Risk Management Model for Software Project Management **18**
Khairuddin Hashim

Development of an Ansys Interface for FE Solid Modeling and Analysis of Corroded Pipelines **19**
Rita C. C. Silva, Joao N. C. Guerreiro and Patrvcia R. C. Drach

A System for Detection of Liver Disorders based on Adaptive Neural Networks and Artificial Immune System **25**
Humar Kahramanli and Novruz Allahverdi

Session Management Architecture for Implementing an FPGA-based Stateful Intrusion Detection System **31**
Seungyong Yoon, Byoungkoo Kim, Jintae Oh and Jongsoo Jang

Conceptual Analysis of Fuzzy Data using FCA **37**
Kyoung-Mo Yang, Eung-Hee Kim, Suk-Hyung Hwang and Sung-Hee Choi

Walking Assistant Device with GPS and Electronic Compass **43**
Krzysztof Tokarz and Michal Dzik

Optimization of Multiple Input Single Output Fuzzy Membership Functions Using Clonal Selection Algorithm **49**
Ayse Merve Acilar and Ahmet Arslan

Clustering Analysis Method based on Fuzzy C-Means Algorithm of PSO and PPSO with Application in Image Data **54**
Jeng-Ming Yih, Yuan-Horng Lin and Hsiang-Chuan Liu

Multimedia Traffic Routing **60**
Dan Mancas, Ecaterina-Irina Manole and Nicolae-Iulian Enescu

Application of Bloom's Taxonomy in Software Engineering Assessments **66**
Nurul Naslia Khairuddin and Khairuddin Hashim

Semantics Transformation of NFA to Z Notation by Constructing Union of Regular Languages **70**
Nazir Ahmad Zafar, Nabeel Sabir and Amir Ali

Quantitative Approach on Image Fusion Evaluation **76**
Zhengmao Ye, Hua Cao, Sitharama Iyengar and Habib Mohamadian

Designing Organic Reaction Simulation Engine using Qualitative Reasoning Approach **81**
Y.C. Alicia Tang, S.M. Zain and N.Abdul Rahman

Improving Network Intrusion Detection through Soft Computing and Natural Immunology **87**
Seyed A. Shahrestani

Enhancing the Reliability of Ad-hoc Networks through Fuzzy Trust Evaluation **93**
H. Hallani and S. A. Shahrestani

Adaptive Quantization for Video Compression in Frequency Domain **99**
Aree A. Mohammed and Alan A. Abdulla

Automated Diagnostic Systems: Arterial Disorders Detection **105**
Elif Derya Ubeyli

Integrated Object-Oriented Framework-Based Testing Environment **111**
Jehad Al Dallal

Selective Regenerated Particle Swarm Optimization for Multimodal Function **117**
Chi-Yang Tsai and I-Wei Kao

Investigating Design Choices between Bitmap Index and B-tree Index for a Large Data Warehouse System **123**
Morteza Zaker, Somnuk Phon-Amnuaisuk and Su-Cheng Haw

Optimizing the DataWarehouse Design by Hierarchical Denormalizing **131**
Morteza Zaker, Somnuk Phon-Amnuaisuk and Su-Cheng Haw

An Online System for Sharing Image Data for Cardiac Modeling **139**
Fariza Hanum Nasaruddin and Maryam Zakeryfar

Loss Reduction of Double-Layer Networks with Holographic Optical Switches **145**
Jiun-Shiou Deng, Hsin-Hua Huang, Ming-Feng Lu and Yang-Tung Huang

Challenge of Knowledge Sharing: Integrating Customer in Product Development **150**
Seppo Sirkemaa

Introducing Mobility Concepts Into Geographic Information Systems **153**
Dejan Rancic and Bratislav Predic

Mining Sequential Patterns by PrefixSpan algorithm with approximation **159**
Ankhbayar Yukhuu, Sansarbold Garamragchaa and Hwang Young Sup

Research Study on Managing Web Site Quality in Croatia **165**
Mario Spremic and Ivan Strugar

Creating Operation Method Patterns for Automating Information System Operations **171**
Matsuki Yoshino, Norihisa Komoda and Michiko Oba

An Idea of Formalizing Web page Information Architecture **176**
Kishimoto Yorinori

Assertion-Based Dynamic Verification for Executable UML Specifications **181**
Masahito Sugai, Akira Teruya, Eiichiro Iwata, Nurul Azma Zakaria, Noriko Matsumoto and Norihiko Yoshida

A Methodology to Minimise Excessively Permissive Security Configurations **187**
Rukshan Athauda, Geoff Skinner and Brian Regan

A New Method for Assigning, the Eigenvalues Sign in Equations ($Ax = \lambda x$) and ($Ax = \lambda Bx$) **193**
Hashem Saberi Najafi and Maryam Shams Solary

An Efficient Multi-hash Pattern Matching Scheme for Intrusion Detection in FPGA-based Reconfiguring Hardware **199**
Byoungkoo Kim, Seungyong Yoon and Jintae Oh

An Architecture of Unknown Attack Detection System against Zero-day Worm **205**
Ikkyun Kim, Daewon Kim, Byoungkoo Kim, Yangseo Choi, Seongyong Yoon, Jintae Oh and Jongsoo Jang

RFID Rationale and Deployment Methodology **211**
Eugene Lutton, Geoff Skinner and Brian Regan

Predicting Tactile Fabric Comfort from Mechanical and Handfeel Properties Using Regression Analysis **217**
Les M. Sztandera

Identification of the Most Significant Sensory and Mechanical Properties Influencing Tactile Fabric Comfort **221**
Les M. Sztandera

Detection of Zonal Noise in the Textural Images **226**
Nicoleta Angelescu, Dan Popescu, Iulian Udroiu and Ioan Tache

A Technique for Operational IT Risk Management in Latvian Monetary and Financial Institutions **230**
Andrejs Romanovs, Yuri Merkuryev, Ruslan Klimov and Irina Solovjova

Traceability Patterns: An Approach to Requirement-Component Traceability in Agile Software Development **236**
Arbi Ghazarian

Providing Support Features for Novice Researchers using Semantic Approach **242**
Maizatul Akmar Ismail, Mashkuri Yaacob, Sameem Abdul Kareem and Fariza Hanum Nasaruddin

Embedded System Design Based on Aspect-Oriented Executable UML **247**
Akira Teruya, Eiichiro Iwata, Masahito Sugai, Masahiro Kimura, Nurul Azma Zakaria, Noriko Matsumoto and Norihiko Yoshida

Viewpoint of ISO GMITS and Probabilistic Risk Assessment in Information Security **253**
Naoki Satoh, Hiromitsu Kumamoto, Yasunobu Kino and Norihisa Komoda

SIP based Service QoS Parameters Impact Analysis According to DoS based Attack Rate **259**
Hongbin Yim, Jinwoo Hyun, Hwankuk Kim and Jaeil Jung

Color Features Comparison for Retrieval in Personal Photo Collections **265**
Daniele Borghesani, Costantino Grana and Rita Cucchiara

Applying A Genetic Algorithms Programming to Natural Cheese Products **269**
Ratchadaporn Oonsivilai and Anant Oonsivilai

Context Dependent Class Language Model based on Word Co-occurrence Matrix in LSA Framework for Speech Recognition **275**
Welly Naptali, Masatoshi Tsuchiya and Seiichi Nakagawa

Adaptive Progress Indicator for Long Running SQL Queries **281**
Mario Milicevic, Krunoslav Zubrinic and Ivona Zakarija

Translation, Scaling and Rotation Invariant Spot Matching using Delaunay Triangulation **285**
Ankhbayar Yukhuu and Hwang Young Sup

Complexity Threshold in RNA-World: Computational Modeling of Criticality in Galton-Watson Process **290**
Krzysztof A. Cyran

On Optimisation of the Rough Set-based Decision Rule Extraction **296**
Urszula Stanczyk

eCommerce Solutions and eLeadership: Impact Analyses at Historically Black Colleges and Universities and Their Organizational Leadership **302**
Wilhelmina Djoleto

A New Inductive Learning Algorithm Based on Monotone System Theory **310**
Peeter Roosmann, Leo Vohandu, Rein Kuusik, Tarvo Treier and Grete Lind

Using Direct Sequence Spread Spectrum in Marine Radio Communication **317**
Jacek Wszolek and Jacek Danda

NBM: An Efficient Cache Replacement Algorithm for Nonvolatile Buffer Caches **320**
Junseok Park, Kern Koh, Hyunkyoung Choi and Hyokyung Bahn

FCM Algorithm Based on Unsupervised Mahalanobis Distances with Better Initial Values and Separable Criterion **326**
Jeng-Ming Yih, Yuan-Horng Lin and Hsiang-Chuan Liu

CBR Period Dependent Adaptive Routing Algorithm for MANET **332**
Jin-Woo Hyun, Yoo-Seung Won, Sang-Eon Kim and Jae-Il Jung

LARMA: Location-Aided Route Maintenance Algorithm for Mobile Ad-Hoc Networks **337**
Yoo-Seung Won, Jin-Woo Hyun, Sang-Eon Kim and Jae-Il Jung

The Probability of Link and Route Maintenance In Multi Hop Mobile Ad Hoc Networks **343**
Yong Shou Wu, Do-Hyeon Lee, Eun Su Kim and Jae-Il Jung

Multiple Continuous Queries Evaluation over Data Streams **346**
Hong Kyu Park and Won Suk Lee

Development of a Container Terminal Educational Simulator **351**
Hyun Soo Kim, Hyung Rim Choi, Jae Un Jung, Jae Young Park and Hui Yun Kim

A Study on SOA Based Multi Agent under RTE Environment **357**
Min Je Cho, Hyung Rim Choi, Hyun Soo Kim, Soon Goo Hong, Young Jae Park, Jae Un Jung and Jung Ho Son

Development of an RIA-based User Interface for Promotion of Effectiveness in Marine Transportation **366**
Young Seong Park, Jeong Hee Lee, Hyung Rim Choi, Hyun Soo Kim, Jae Un Jung and Jae Young Park

On-line Evaluation of a Data Cube over a Data Stream **373**
Woo Sock Yang and Won Suk Lee

An Application Generator Based on UML Specification **379**
Kresimir Fertalj and Mario Brcic

Evaluating the Correlation between the Increasing of the Correctness Level and McCabe Complexity **385**
Nicolae-Iulian Enescu, Dan Mancas, Ecaterina - Irina Manole and Stefan Udristoiu

Requirements Visualization Techniques: A Comparative Analysis **391**
Nurul Naslia Khairuddin and Khairuddin Hashim

Security Principles and Management Method for Secure S/W Introduction **396**
Jae Hong Han, Ho Seong Kim, Wan S. Yi and Yoo Jae Won

Enterprise Level IT Risk Management **401**
Nadhirah Azizi and Khairuddin Hashim

SIP Intrusion Detection and Response Architecture for Protecting SIP-based Services **405**
KyoungHee Ko, Hwan-Kuk Kim, JeongWook Kim, Chang-Yong Lee and HyunCheol Jeong

Software Application Implement in Java for Electrical Lines Dimensioning **411**
Cristian Abrudean and Manuela Panoiu

Route Optimization with Q-learning **416**
Semiye Demircan, Musa Aydin and S. Savas Durduran

Shopping Search Engine Technology Based on Services **420**
Lihailong and Liuyu

Cluster Based Evolving FCBR for Flow Time Prediction in Semiconductor Manufacturing Factory **424**
Chen-Hao Liu, Pei-Chann Chang and I-Wei Kao

Incorporating Global Positioning Data in Real Time P2P Audio/Video Streams for Mobile Devices **430**
José-Vicente Aguirre, Rafael Álvarez, Leandro Tortosa and José-Francisco Vicent

AESGT Extension to support Explanation Facilities That Answers "How", and "Why Asking" Types of Questions **436**
Ahmed Fouad Said and Ahmed Rafea

Author Index **445**

Keynote Lecture

Multivariate Data Completion or Addition on a Single Curve Representation of a Hyperrectangulargrid via Fluctuation Suppression

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

Abstract: This work is somehow about multivariate interpolation. If an N–variate function is given at certain points of the cartesian space of the N independent variables and its value at a point which is outside the data given points is sought then various methods available in the literature can be used to find this value. However, there is almost no unique universal way to do so and each method has its own capability, efficiencies, deficiencies and pitfalls. Data completion and data mining techniques can also be considered amongst them.

The work focuses on a finite hypergrid in N–dimensional cartesian space first and then a multivariate function's values are assumed to be given at certain nodes (we call them full nodes) of this grid. The next step is the dimension reduction. To this end we construct a single continuous curve passing through all nodes of the grid with respect to an appropriately chosen ordering. Curve construction is not unique and depends on the ordering of the nodes. It is better to choose the curves whose mathematical definitons are rather simple. This construction leaves us to use just a single parameter to specify any location on the curve. Although the nodes are defined as N tuples in the N–dimensional cartesian space their locations can also be given in terms of the curve parameter. Hence, the data completion or addition problem is converted to a univariate interpolation which is rather simple.

The full nodes are now represented by ordered pairs whose first elements are the position parameter values on the constructed curve while the second elements are the multivariate function's values at those points. Data completion (to inject one or a few missing data to a data set which is almost full everywhere) or data addition (to evaluate the function's value at an empty node within a sparsely data given hypergrid) then becomes to seek the multivariate function's value at a specified node which corresponds to a unique position on the curve.

There are a lot of univariate interpolation methods, each of which can be used for the interpolation on the curve defined above depending on the nature of the demands and produces some unavoidable errors. Quite recently a new method of interpolation is developed by Demiralp. It uses the Fluctuationlessness Theorem (conjectured and proven by Demiralp recently). Theorem dictates us that the matrix representation of a function over a subspace of the Hilbert space for analytic and square integrable functions is equal to the image of the independent variable's matrix representation on the same subspace under the same function as long as the fluctuation terms (differences between the means of specified powers of the independent variable and the same specified power of the mean of the independent variable). This fact can be used to approximate an integral and a quadrature like formula (the linear combination of the function values at certain points with positive linear combination coefficients (we call weights) can be obtained. The quality of the approximation depends on the dimension of the subspace mentioned above and becomes better as the dimension increases. Hence the two sufficiently high consecutive dimension will give the same value for the integration under consideration within a prescribed accuracy.

The integrand of the abovementioned integral is chosen in such a way that it becomes a linear combination of given values of the multivariate function for, say, n dimensional subspace while the same value is expressed as another linear combination of the given function values and the single sought values of the same function for the (n + 1) dimensional subspace. Since these two expressions should produce the same value it is possible to extract the sought value of the function under consideration. Presentation will focus on these topics and certain remarks.

Acknowledgment:
Author is grateful to Turkish Academy of Sciences for its support.

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

Computational Design of Optical Fibers with Desirable Consumer Characteristics

Professor Les M. Sztandera

Based on research project with Xi Chen and Hugh Cartwright

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Abstract: Taking advantage of techniques from the field of Artificial Intelligence, the goal of our research is to construct systems that can computationally design polymer optical fiber formulations with specified desirable consumer characteristics. Polymers can offer cost effective and easily handled and installed optical components provided that materials are found that possess the necessary optical properties and reliability, so as not to be a barrier to commercial insertion. In this research we are focusing on two of the parameters, glass transition temperature and refractive index that influence a desired outcome in polymer optical fibers. Previous research indicated that performance can be optimized by engineering a polymer that exhibits a lower refractive index and glass transition temperature.

Brief Biography of the Speaker: Les M. Sztandera is a Professor of Computer Information Systems at Philadelphia University and served as Distinguished Fulbright FLAD Chair in Information Systems. He earned an MS from University of Missouri, MO, and a PhD from the University of Toledo, OH. His research interests focus on computational intelligence, while teaching areas encompass information systems, data mining and decision support systems. He has been involved in a variety of research activities.

Plenary Lecture II

Adopting Agile Software Project Management Practices: Success Factors, Changes Required, and Challenges

Dr. Subhas C. Misra

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Abstract: Agile software development (ASD) is an emerging approach in software engineering, initially proposed and promoted by a group of seventeen software professionals who practice a set of "lightweight" methods, and share a common set of values of software development. They consolidated their thoughts, and defined these methods as "agile". The approaches are based on experiences and best practices from the past by the above-mentioned group of seventeen software professionals. ASD practices give importance to development around motivated individuals, give them the freedom and flexibility to make them productive, and "think outside of the box". The agile philosophy believes in project implementation around motivated individuals. Motivated individuals should be provided the environment, and support needed for them to make them successful. As an emerging approach of this century, agile software development has undergone limited number of empirical studies. In this keynote lecture, I advance the state-of-the-art of the research in this area by conducting survey-based ex-post-facto empirical (quantitative) studies by identifying the success factors from the perspective of software practitioners in agile software development projects. In this keynote lecture, I also suggest a ranked list of changes required and challenges involved in adopting agile software development methodologies by projects practicing plan-driven software development.

Brief Biography of the Speaker: Dr. Subhas C. Misra is currently a V. Scientist at Harvard University, Boston, USA. He received his Ph.D. degree from Carleton University, in Ottawa, Canada, and M.S. and M.Tech. degrees respectively from the University of New Brunswick, in Fredericton, Canada, and the Indian Institute of Technology (IIT), at Kharagpur, India. Dr. Misra has several years of experience working in the academia, and the public and private sectors in research, teaching, consulting, project management, architecture, software design and product engineering roles. His current research interests include the areas of software management, software quality management, and information systems security, which are multidisciplinary, combining the fields of software engineering, information systems, organizational behavior, and technology and operations management. Dr. Misra has authored over 50 scholarly research papers and published 5 books.

He has won Best Research Paper Award in an international conference held in the United States. He was also the recipient of more than 15 academic awards and fellowships such as the Achievement Award at the 2007 World Congress held in Las Vegas in the United States for "contribution and dedication" to his field, and the Canadian Government's NSERC Post Doctoral Fellowship. A mention about him and his work has also appeared in the June 8, 2007 issue of the Carleton Now newspaper. His biography has also been selected to appear in the Cambridge Blue Book, Cambridge, England, 2008.

Dr. Misra is the Managing Editor/Associate Editor of more than ten international journals. He was invited to serve as Program chair, Organizing Chair, and Session Chair in different international conferences. He has been serving in the program committees of over a dozen international conferences.

Dr. Misra was also invited to offer keynote lectures in more than a dozen international conferences in different countries of North America, Europe, and Asia. Recently, he was invited to deliver a keynote lecture in the World Congresses held in UC Berkeley (California, USA) and Imperial College (London, USA).

Plenary Lecture III

Artificial Intelligence Methods in the Interpretation of Statistical Testing of Genes under Hypothetical Balancing Selection

Professor Krzysztof A. Cyran

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Abstract: The detection of natural selection at the molecular level is one of the crucial problems in contemporary population genetics. There exists a number of statistical tests designed for it, however the interpretation of the outcomes is often obscure, because of the existence of factors like: population growth, migration and recombination. The author has proposed the multi-null methodology, and he applied it for four genes implicated in human familial cancer: ATM, RECQL, WRN and BLM. Because of high computational effort required for estimating critical values under nonclassical nulls, mentioned methodology is not appropriate for selection screening. Therefore, the author in this plenary lecture presents novel, artificial intelligence based methodology, helpful in the interpretation of the tests outcomes applied only versus classical null hypotheses. This method does not require long-lasting simulations and, as it is shown in a lecture, it gives reliable results. As examples of artficial intelligence methods the rough set theory and artificail neural networks are used in the aforementioned problem.

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

A Risk Management Model for Software Project Management

Professor Khairuddin Hashim

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Abstract: Risk management is an important element in software project management due to increase in budget investments of software development projects and stiff business competition requiring urgent deadlines. The presentation will discuss a risk management model to support software project management that includes risk identification, risk analysis, risk prioritization, risk monitoring and risk control. The model incorporates problem analysis of historical data of projects which gives a good basis for risk projection of future projects.

Brief Biography of the Speaker: Prof. Dr. Khairuddin is currently professor at the Department of Software Engineering, Tenaga Nasional University, Malaysia. He graduated with a Ph.D. in computing science from the University of Bath, United Kingdom, in 1989. His has research interest, publications and international conference presentations on requirements engineering, software reuse, software risk management, software project management, human computer interaction and adaptive learning.

Dr. Khairuddin has over 20 years experience in academia spread over three academic institutions - University of Malaya, Tun Abdul Razak University and Tenaga Nasional University. He was a visiting professor at McGill University in 1995 and a research scholar at Kyoto University in 1993. Dr. Khairuddin was consultant for SIDA (Swedish International Development Agency) in 2003. He was also a member of several international conference paper committees. He held top level administrative university posts such as Deputy President (Academic), Vice President (Technology) and Dean of Faculty.

Apart from university related work, Prof. Dr. Khairuddin is/was also involved in being: panel member of Open System Expert Group for the Public Sector, Chief Editor of the Malaysian Journal of Computer Science, Software Engineering Consultant to Malaysian Institute of Microelectronic Systems (MIMOS), panel assessor for DAGS (Demonstrator Application Grant Scheme) for National IT Council, panel assessor for the Industry Research and Development Grant Scheme (IGS), member of Expert Group Service Sector (Information Technology) for IRPA (Intensified Research in Priority Areas), MSC Research & Development Grant Scheme Technology Assessment Consultant, Science Fund ICT Assessor and TechnoFund ICT Cluster Technology Assessment Consultant.