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Abstract Book

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Conference on Computer Science &
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Athens, Greece.

Edited by Gregory T. Papanikos



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Preface

This abstract book includes all the abstracts of the papers presented at the *7th Annual International Conference on Computer Science & Information Systems, 13-16 June 2011* organized by the Athens Institute for Education and Research. In total there were 24 papers and 24 presenters, coming from 14 different countries (Algeria, Belgium, Canada, Czech Republic, Estonia, Iran, Lebanon, the Netherlands, Romania, Slovakia, South Africa, Taiwan, the United Kingdom, and the United States of America). The conference was organized into 7 sessions that included areas such as Computer Modelling and Theory, Management Information Systems and Information Assurance, Human Computer Interaction e.t.c. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books of ATINER.

The Institute was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 100 international conferences and has published over 100 books. Academically, the Institute is organized into four research divisions and nineteen research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
Director

FINAL CONFERENCE PROGRAM

Athens Institute for Education and Research

Arts & Sciences Research Division

Research Unit of Computer

7th Annual International Conference on Computer Science and Information Systems 13-16 June 2011, Athens, Greece

PROGRAM



Conference Venue: Titania Hotel, 52 Panepistimiou Avenue, Athens, Greece

Organization and Scientific Committee

1. Dr. Gregory T. Papanikos, President, ATINER.
2. Dr. Panagiotis Petratos, Vice-President of ICT, ATINER & Associate Professor of Computer Information Systems, California State University, Stanislaus, USA.
3. Dr. Nicholas Pappas, Vice-President of Academics, ATINER & Professor, Sam Houston University, USA.
4. Dr. Vladimir Akis, Head, Mathematics and Statistics Research Unit, ATINER & Professor of Mathematics and Computer Science, California State University, Los Angeles, USA.
5. Dr. Margarita Kefalaki, Researcher ATINER.
6. Ms. Lila Skountridaki, Researcher, ATINER & Ph.D. Student, University of Strathclyde, U.K.
7. Ms. Gina M. Bondi, Researcher, ATINER.
8. Mr. Apostolos Kotsaspyrou, Researcher, ATINER.

Administration

Fani Balaska, Chantel Blanchette, Stavroula Kiritsi, Eirini Lentzou,
Konstantinos Manolidis, Katerina Maraki & Syla Sakka

CONFERENCE PROGRAM

Monday 13 June 2011

08:30-09:15 Registration

09:15-09:30 Welcome and Opening Remarks

- Dr. Gregory T. Papanikos, President, ATINER.
- Dr. Panagiotis Petratos, Vice-President of ICT, ATINER & Associate Professor of Computer Information Systems, California State University, Stanislaus, USA.

09:30-11:00 Session I: Management Information Systems and Information Assurance I

Chair: Petratos, P., Vice-President of ICT, ATINER & Associate Professor of Computer Information Systems, California State University, Stanislaus, USA.

1. Hart, M., Professor, University of Cape Town, South Africa. Information Systems Issues in Contact Centres: Converting Customer Complaints into Compliments.
2. Liu, H., Associate Professor, TamKang University, Taiwan & Choi, B. Associate Professor, Louisiana Tech University, USA. Applying Search Engine Technologies for Internet Marketing.
3. Ross, P., Lecturer, University of Portsmouth, UK & Peart, A., Lecturer, University of Portsmouth, UK. Tracing the Origins of Distributed Denial of Service Attacks.
4. Tafran, C., Ph.D. Student, & Application Developer, Beirut Arab University, Lebanon & Belal, A., Professor, Beirut Arab University, Lebanon. Bounds on the Average Code Length of a Huffman Code with Two and Three Different code Word Lengths.
5. Walker, J., Assistant Professor, University of Arkansas, USA. Watermarking the Cloud.

11:00 -12:30 Session II: Human Computer Interaction

Chair: Hart, M., Professor, University of Cape Town, South Africa.

1. Foster, E., Assistant Professor, Keene State College, USA. Dynamic Menu Interface Designer.
2. Gnanayutham P., Researcher, University of Portsmouth, UK. Disabled Users Accessing Off-The-Shelf Software Using a Button Interface.
3. Kokabi, M., Professor, Shaheed Chamran University, Iran. How not to benefit from the Capabilities of a Computer Program to Design its User Interface?
4. Good, A., Researcher, University of Portsmouth, UK, Gnanayutham P., Researcher, University of Portsmouth, UK, Sambhanthan, A., Researcher, University of Portsmouth, UK, Panjganj, V., Researcher, University of Portsmouth, UK & Spettigue, S., Researcher, University of Portsmouth, UK. A Framework for the Requirements of a Second Life Virtual Therapeutic Community for the Support & Treatment of People with Borderline Personality Disorder.

12:30-14:00 Session III: Computer Modelling and Theory I

Chair: Foster, E., Assistant Professor, Keene State College, USA.

1. Papadopoulos, Y., Reader in Computer Science, University of Hull, UK. Optimisation of Fault Tolerance via Automatic Model Transformations.
2. Garey, L., Retired, University of New Brunswick, Canada & McNally, J.M., Retired, University of New Brunswick, Canada. Determining the Eigenvalues of Near-Toeplitz, Symmetric and Banded Matrices.
3. De Smedt, F., Ph.D. Student, Lessius Mechelen – Campus De Nayer, Belgium, Van Beeck, K., Ph.D. Student, Lessius Mechelen – Campus De Nayer, Belgium, Goedeme, T., Associate Professor, Lessius Mechelen – Campus De Nayer, Belgium & Tuytelaars, T., Associate Professor, Lessius Mechelen – Campus De Nayer, Belgium. Towards Robust Automatic Detection of Vulnerable Road Users: Monocular Pedestrian Tracking from a Moving Vehicle.
4. Salmi, C., Teacher & Researcher, Boumerdes University, Algeria. A Hybrid Evolutionary Algorithm for Vertical Partitioning a Relational OLTP Database.

14:00-15:00 Lunch

15:00-16:30 Session IV: Health Informatics

Chair: Papadopoulos, Y., Reader in Computer Science, University of Hull, UK.

1. Viies, V., Associate Professor, Tallinn University of Technology, Estonia, Ennet, P., Data Analyst, Estonian Environment Information Centre, Estonia, Aigro, J., Student, Tallinn University of Technology, Estonia, Kinks, H., Student, Tallinn University of Technology, Estonia, Kullamaa, R., Student, Tallinn University of Technology, Estonia, Ozolit, O., Student, Tallinn University of Technology, Estonia & Salula, A., Student, Tallinn University of Technology, Estonia. Estonian Surface Water IS.
2. Griffiths, S., Head of Postgraduate Studies, Swansea Metropolitan University, UK & Jones, K., Head of the Centre for UG Studies, Swansea Metropolitan University, UK. Internet Ethics: Pharmaceutical Cross Border Trade.

21:00-23:00 Greek Night and Dinner

Tuesday 14 June 2011

08:30-10:00 Session V: Computer Modelling and Theory II

Chair: Kagaris, D., Professor, Southern Illinois University, USA.

1. Kurka, P., Professor, Center for Theoretical Study, Czech Republic. Algebraic Algorithms for Mobius Number Systems.
2. Esmaeili, M., Ph.D. Student, IAU Kashan Branch, Iran & Gabor, F., Associate Professor, University of Debrecen, Hungary. Using Decision Tree as a Feature Selector for Other Methods.
3. Furdik, K., Researcher, InterSoft, a.s., Slovakia, Mach, M., Associate Professor, Technical University of Kosice, Slovakia & Butka, P., Lecturer & Researcher, Technical University of Kosice, Slovakia. Data Structures for Collaborative Policy Modeling.

10:00 -11:30 Session VI: IT Education and Networks

Chair: Kurka, P., Professor, Center for Theoretical Study, Czech Republic.

1. Kagaris, D., Professor, Southern Illinois University, USA. Deployment of Wireless Sensor Networks with Fixed Monitoring.
2. Peart, A., Lecturer, University of Portsmouth, UK. A QoS Real Time Bandwidth Redistribution Transmission Algorithm in WiMAX.
3. Zlatareva, N., Professor, Central Connecticut State University, USA. Inconsistency Detection in Semantic Web Ontologies with Rules.
4. Abousharkh, M., Ph.D. Student, University of Ottawa, Canada & Mouftah, H., Professor, University of Ottawa, Canada. QoS-enabled SOA-based middleware for WBAN.

11:30-13:00 Session VII: Management Information Systems and Information Assurance II

Chair: Tafran, C., Ph.D. Student, & Application Developer, Beirut Arab University, Lebanon.

1. Wagenaar, P., Lecturer, Vrije Universiteit Amsterdam, the Netherlands & Kees, B., Vrije Universiteit Amsterdam, the Netherlands. Zooming in on the Panopticon: Privacy, Security and Digital Cameras at Schiphol Airport.
2. Rawas, S., Master Student, Beirut Arab University, Lebanon & Bilal, A., Chairman, Beirut Arab University, Lebanon. Limiting the Number of Route Changes in Data Networks.
3. Sireteanu, N.A., Lecturer, "Alexandru Ioan Cuza" University, Romania. A Survey of Rich Internet Applications Solutions.

13:00-14:00 Lunch

16:30-19:30 Urban Walk

20:00- 21:00 Dinner

Wednesday 15 June 2011

Cruise: Departure at 06:25 Return at 20:30

Thursday 16 June 2011

Delphi Visit: Departure at 07:25 Return at 19:30

Maha Abousharkh

Ph.D. Student, University of Ottawa, Canada.

Hussein Mouftah

Professor, University of Ottawa, Canada.

QoS-enabled SOA-based Middleware for WBAN

Advances in low power wireless sensor networks are enabling new exciting applications for wireless devices. Advances will allow a range of new medical applications that will significantly improve the quality of health care. One way to achieve this is by deploying Wireless Body Area Network (WBAN). WBAN typically consists of a gateway and a number of sensor devices attached strategically to a human body. These sensors are capable of sampling, processing, and communicating one or more vital signs such as heart rate, blood pressure and oxygen saturation.

Given the growing variety of sensor devices, application development will be a very challenging task. The whole potential of using a body area network with several sensors to monitor vital functions of a human body can only be tapped if we achieved the ease of use and the ease of configuration. Further, dealing with heterogeneous sensor networks is difficult, as the protocols and data access mechanisms are different. There is a need to have a framework that is based on open standards to simplify application development and deal seamlessly with heterogeneous WSNs.

In this paper, we are presenting a service oriented based middleware using web services that shields the underlying sensor hardware or OS/protocol stack from the applications. This will make application development process easier and faster is believed to be a potential solution for interoperability and ease of use and configuration challenges.

The proposed system integrates a set of wearable wireless devices capable of sensing and transmitting biosignals. Sensors are coordinated by a gateway node which in turn retransmits data to a remote central monitoring unit and receives WBAN control information and queries from this central unit. The central node/server on the other hand will be in charge of storing the sensors data, sensor reconfiguration and resource management client, detecting alarms and sending the patients' information to the medical staff. Priority management, performance monitoring and data security will be considered in the design to satisfy users QoS needs. We believe that the use of Web Services will attract a larger pool of application developers, leading to more innovative applications.

Floris De Smedt

Ph. D. Student, Lessius Mechelen – Campus de Nayer, Belgium.

Kristof Van Beeck

Ph.D. Student, Lessius Mechelen – Campus De Nayer, Belgium.

Toon Goedeme

Associate Professor, Lessius Mechelen – Campus De Nayer, Belgium.

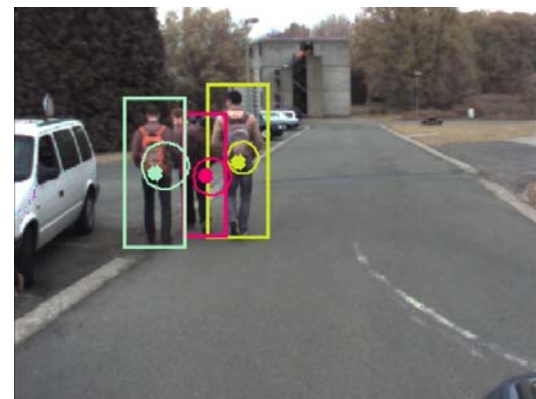
Tinne Tuytelaars

Associate Professor, Lessius Mechelen – Campus De Nayer, Belgium.

Towards Robust Automatic Detection of Vulnerable Road Users: Monocular Pedestrian Tracking from a Moving Vehicle

We present a first step towards the automatic detection of vulnerable road users in video. Such a system can e.g. be used as an automatic blind spot camera for trucks. When the system detects vulnerable road users in the camera images the driver is warned. Such an application implies severe constraints on the vision system, which introduce several challenges that need to be tackled. Firstly, vulnerable road users are a very diverse object class. Besides pedestrians, we also need to detect e.g. bicyclists, children, wheelchair users and mopeds. Therefore, the detection system has to deal with multi-class, multi-view and multi-pose object tracking. Secondly, the field of view of the camera covers the blind spot area on the side of the truck. This yields a camera image with a highly dynamic background. Other challenges include the real-time character of the application. Only limited time is available to detect the vulnerable road users. This contradicts with the need for a high precision and recall rate.

This paper presents a first step towards such an intelligent detection system. We extend existing appearance-based pedestrian detectors with specific motion information and constraints, resulting in a robust pedestrian tracker from a moving vehicle. First an initial detection is done throughout the entire frame. Based on the ego motion of the vehicle, combined with both spatial and temporal information, we can estimate where the pedestrians can be found in consecutive video frames. These constraints tremendously reduce the search area for the person detector, thus enabling real-time performance. Based on this prediction, a verification suffices to confirm the presence of a pedestrian. Using the pedestrian trajectories it is possible to predict whether they will impose a threat to the driver, and generate an appropriate alarm signal. Additionally, we propose a new dataset, recorded



with a real blind spot camera, and performed initial experiments with promising results.

Mahdi Esmaeili

Ph.D. Student, IAU Kashan Branch, Iran.

Fazekas Gabor

Associate Professor, University of Debrecen, Hungary.

Using Decision Tree as a Feature Selector for Other Methods

Feature selection is one of the frequently used techniques in data preparing for data mining. The goal of feature selection is a process that selects an optimal subset of original features. The purpose of feature selection methods can be broadly categorized into data reduction, visualization, data understanding, and performance improving.

On the other hand, one of the basic tasks of data mining and machine learning, building accurate and efficient classifiers has aroused the broad attention of researchers. Decision trees have become one of the most powerful and popular techniques to generate classifier. In the opinion of many researchers, decision trees are popular due to their simplicity and transparency. Several benefits of decision trees are high predictive performance, a suitable way for visualization, and easy to understand. Consequently, combination of two concepts decision tree and feature selection can be useful for various tasks.

Decision tree can be used as a feature selector for other methods and sometimes feature selection algorithms provide a preprocessing step for constructing a decision tree. In this paper, we use the most common decision tree techniques to test these two status but we concentrate on decision tree as a feature selector. The results show that decision trees employ a strategy in which a complex problem is divided into simpler sub-problems. The main conclusion of this work is that decision trees can be used to select and reduce features, even in high-dimensional space.

Elvis Foster

Assistant Professor, Keene State College, USA.

Dynamic Menu Interface Designer

Software engineering has come to the stage where speed of development, level of correctness, interoperability, user friendliness, usefulness, and reusability in different projects are very important factors in determining the success of a software engineering venture. Software consumers have become quite impatient and reluctant to persist with products that do not meet their expectations. Ironically, amidst this state of the market, software engineers and information system developers are expected to deliver projects on or ahead of schedule, or face the wrath and consequence of a disgruntled consuming public.

This paper proposes a *dynamic menu interface designer* (DMID) as a software component that has the potential of reducing software development duration. The DMID takes as input a data set that includes the essential information on the operational and security requirements of the system being constructed, and generates a menu of user options based on each user's profile. This component removes the burden of menu design and construction from the software construction phase of the *software development life cycle* (SDLC), thus giving the software engineer more time to concentrate on other pressing and important aspects of software construction.

The paper proceeds under five sections: Section 1 underscores the importance of good user interface design as an important component of software design. It ends by introducing the idea of a DMID. Section 2 provides a rationale for the DMID, showing how it could significantly reduce the development time for a software engineering project. Next, the architecture of the DMID is discussed in section 3. This is done from a database perspective, as well as a user interface perspective. Section 4 discusses implementation of the project. Finally, section 4 provides a summary of the project.

Karol Furdik

Researcher, InterSoft, a.s., Slovakia

Marian Mach

Associate Professor, Technical University of Kosice, Slovakia.

Peter Butka

Lecturer & Researcher, Technical University of Kosice, Slovakia.

Data Structures for Collaborative Policy Modeling

This paper addresses a new trend in e-Governance by enlarging the service provision paradigm towards a broader active participation of general public and relevant stakeholders in a collaborative public policy creation. This approach was adopted in the European FP7 ICT project OCOPOMO (Open Collaboration for Policy Modelling, <http://www.ocopomo.eu>) aiming at the design and development of a software platform that is capable to support collaborative policy development at local, regional and national level of public administration. The proposed solution integrates tools for foresight scenario generation, agent-based social modelling and simulation, and active participation of stakeholders into a single web-based application.

General principles and key concepts of the collaborative policy modelling are discussed in the paper and, together with analysis of existing approaches, are further elaborated into a design of the application. The main functionality of the proposed solution is briefly described and the architecture of system components is presented. Specifically, we will describe the design of information resources and data structures that can integrate narrative scenarios with related simulation models by means of semantic knowledge bases and annotation techniques. The overall approach is demonstrated on an example of pilot application focused on the development of a strategy for exploitation of renewable energy resources.

Lawrence Garey

Retired, University of New Brunswick, Canada.

J. M. McNally

Retired, University of New Brunswick, Canada.

Determining the Eigenvalues of Near-Toeplitz, Symmetric and Banded Matrices

The matrices examined here are banded non-singular matrices that can be written as the sum of a particular matrix and its powers. They can arise when finite difference methods are used to approximate continuous problems as well as in connection with weighted graphs. Here, the interest is relating the eigenvalues of (2,2)-band, (3,3)- band , and in general (l,l)- band matrices.

This paper is bases on a conference presentation of 2000,see [5] and has been updated with about 25 % of new theoretical work and eigenvalues play an important role in connection with the solution of ordinary differential equations with two point boundary conditions, whose general form is given by $Ax = cBx$ where c is an eigenvalue.

The work is based on discretization methods and involves matrix system and involves methods of solution such as Numerov's.

Paul Gnanayutham
Researcher, University of Portsmouth, UK.

Disabled Users Accessing Off-The-Shelf Software Using a Button Interface

As medical care has improved, the number of people who survive a brain injury has increased [3, 4]. Powell [6] reports that the number of brain injured people has increased since the 1970s, because the mortality rate has dropped since that time. As medical technology advances, more people survive brain injury. However, survival is not the same as quality of life. Rehabilitation is the process of regaining lost skills, or developing coping mechanisms to replace them, allowing cognitively impaired people to function safely, productively and independently [7]. Rehabilitation has two stages: the acute stage, where medical professionals stabilise the patient. The second stage is where family and carers take over [4]. Mateer [7] highlights some general principles for successful cognitive rehabilitation. These include: the need to take an individualised approach; to involve clients and caregivers in all aspects; and clear and realistic goal setting.

This paper described the present work carried out in accessing off-the-shelf software and rehabilitation games using a button interfaces. At first, this seems a very limiting user interface. However, Berbank-Green [1] discusses one-button games in many ways in which games can be played using only one button. A one-button interface, as the name suggests, has only one control: a button which can be pressed or not pressed. This is the most minimal control a user can exercise, and so is the most “universal”, in the sense of being accessible to the maximum number of users [2]. Such an interface clearly has its limits, and will not be suitable for all types of software. In this paper we discuss contexts in which a one-button interface will bring benefits to severely disabled people, by providing an immediately usable interface.

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Arun Sambhanthan

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Researcher, University of Portsmouth, UK.

A Framework for the Requirements of a Second Life Virtual Therapeutic Community for the Support & Treatment of People with Borderline Personality Disorder

The advent of social networking has in recent years, given rise to online support groups for people with mental health problems. A recent survey on healthcare related activities using Second Life shows that patient education and awareness building as the major health related activity undertaken. Mental health groups in Second Life featured the largest number of members at 32% of the total users (Norris, 2009). In terms of categories of groups, 15% of the health support groups in Second Life were dedicated to mental health. There is then potential scope to utilise Second life in providing further support to individuals, by creating 3D virtual therapeutic communities. Research also shows that therapeutic communities (TCs) have been shown to be a valid contribution into the significant improvement into the patients' ability to cope with their negative behavioral and emotional issues (Norton, K. & Hinshelwood, R. D. (1996)

This paper aims to present the current position of the ongoing research into developing the requirements and acceptance of a virtual therapeutic community in Second Life, specifically for people with Borderline Personality Disorder (BPD). The research has identified this particular user group given that people with BPD often require high levels of support, which can result in emergency hospital admissions, in addition to the significant economic cost of treating people BPD in relation to other mental illnesses (NCCMH, 2009). The research is also intended to be used as framework for other mental health conditions. This work is a continuation of the research carried out in exploring the potential of virtual therapeutic communities based on existing models of therapeutic hospitals as well as virtual treatments and support, in treating people with BPD. An interdisciplinary approach to this

research features collaboration from areas in HCI, forensic psychology and psychotherapy.

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Norton, K. & Hinshelwood, R. D. (1996) Severe personality disorder: treatment issues and selection for in-patient psychotherapy. *British Journal of Psychiatry*, **168**, 723-731

Steve Griffiths

Principal Lecturer & Head of Postgraduate Studies, Swansea
Metropolitan University, UK.

Karen Jones

Principal Lecturer & Head of the Centre for UG Studies, Swansea
Metropolitan University, UK.

Stephen Hole

Senior Lecturer, Swansea Metropolitan University, UK.

Rhian Pole

Lecturer, Swansea Metropolitan University, UK.

Internet Ethics: Pharmaceutical Cross Border Trade

The pharmaceutical market is predicted to be worth £14.1 billion by 2013. This growth is reflected in *online* pharmaceuticals. The range of pharmacy services on the internet varies; at one end of the spectrum there are pharmacies that use the internet as an advertising tool and the other end there are the pharmacies that offer complete pharmacy services from distribution of drugs to health care plans and baby care. A major contributor to this growth is the emergence of online cross border pharmacies. Companies are developing generic drugs which can be sold for up to 40% cheaper than their brand name counterparts. These sales are usually achieved over the internet through cross border trade.

Online pharmaceutical websites that operate from within the UK are perceived as safe sites as they are regulated by the Royal Pharmaceutical Society of Great Britain, and must conform to the same laws that govern UK pharmacies. However, customers who wish to purchase drugs without prescription, based on self-diagnosis of medical complaint, and with no understanding of the implications to their health, can do so on the internet from any non-UK based online organization.

This research analyses the ethical risks to users of online pharmacies, and the mechanisms to control those risks. It also evaluates whether the use of the internet to purchase drugs creates new ethical dilemmas. It describes the results of a qualitative content analysis that evaluated the web pages of a cross section of online pharmaceutical sites. The frame work for the content analysis of the web sites is an original framework created for this purpose based on issues identified in a literature review; these include levels of customer anonymity, customer age verification, access to medical advice and published ethical/privacy policies.

Mike Hart

Professor, University of Cape Town, South Africa.

Soraya Mohideen

University of Cape Town, South Africa.

Information Systems Issues in Contact Centres: Converting Customer Complaints into Compliments

In most countries there has been a major growth in the use of call and contact centres. Established initially to save costs, they are now often a key area of communication with customers, influencing corporate reputation and customer loyalty. Through outsourcing and offshoring they have also become a useful source of job creation and foreign investment in various countries. The contact centre agent or consultant needs access to a wide range of information systems and contact centre technology, and may communicate with customers through many channels including phone, email, SMS, chat, online self service and fax. Customer service and satisfaction may be affected negatively or positively by the availability, accessibility, consistency, and accuracy of customer information, and its effective integration across organisational functions and systems and customer communication channels.

This study examines a subset of information- and information systems-related incidents entered into a South African customer service portal, where initial customer complaints have through appropriate responses been converted into compliments. Using thematic analysis, a set of themes and subthemes for complaints across many industries is inductively derived. These include information disparity, lack of IS integration, mismanagement of multi-channel issues, lack of self service options, and no single view of the organisation. This confirms that increased use of technology is not beneficial to customers unless efficiently integrated and managed. Responses to the customer complaints by the organisations concerned are similarly analysed, and this incident data is then triangulated through a number of interviews with contact centre agents, managers and quality assessors.

A conceptual model based on the customer satisfaction aspects of the ServQual framework and Kano Model is proposed to uncover understanding into the customer's fundamental, desired and latent service expectations in organisational responses to their complaints. This capability framework of responses for converting dissatisfied customers can be used by contact centre practitioners to improve

conversion of customer complaints to compliments, particularly around information systems issues.

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Deployment of Wireless Sensor Networks with Fixed Monitoring

We address the problem of maximizing the lifetime of a wireless sensor network (WSN) deployed over a field with fixed targets. The target areas to be covered are assumed to be known a priori, but the distribution of the locations of the sensors after their deployment on the field is assumed to be only partially controllable in the sense that it is considered to be random except from the fact that the number of nodes closer to the base station is larger than the number of the nodes further from the base station. The intention is to optimally assign some of these sensor nodes to monitor the targets while assigning the remaining nodes to serve only as relay nodes of the data generated by the proper sensor nodes and/or other relay nodes. We formulate an optimal solution via an integer linear program formulation. To reduce the computational complexity a heuristic is also proposed that assigns as monitoring sensor nodes the nodes that have the lowest dispatch cost for each target. The approach is compared with a traditional scenario where all sensor nodes both sense and relay data (regardless of the location of the actual targets) as well as with the scenario where only the monitoring sensor nodes comprise the WSN (the presence of the relay nodes is ignored) but their total battery amount is redistributed in a scaled battery-level scheme.

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How Not to Benefit from the Capabilities of a Computer Program to Design its User Interface?!

The integrated library system of the National Library and Archives of the Islamic Republic of Iran (NLAI), called RASA, is the system employed in, and accessed through NLAI website since September 2006. This paper examines the user interface of the software. The purpose of the study is to clarify whether the system has benefitted from the capabilities of both IRANMARC and UNIMARC, the programs it claims is based on. The study made it clear that, in spite of the designers' claim as to base the software on IRANMARC, the software has not benefitted fully from the capabilities of both MARCs. The software can be much better than what it is now by making advantage of capabilities of IRANMARC and UNIMARC, especially fields in blocks 6– (Subject analysis block) and 7– (Intellectual responsibility block) in both MARCs. The software needs redesigning based on all the abilities of IRANMARC and the UNIMARC updates. Suggestions as to how to improve the user interface of the software using illustrations, have been presented.

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Algebraic Algorithms for Mobius Number Systems

While the floating-point system is still dominant in computer arithmetic, alternative systems which allow arbitrary precision and on-line algorithms have been considered as well. The classical ones are based on redundant positional systems. In an unpublished but influential manuscript, Gosper [2] shows that continued fractions can be used for arithmetical algorithms, provided they are redundant (see also Vuillemin [5] or Kornerup and Matula [3]). These number systems are based on the principle that digits represent certain mappings, and words of digits represent compositions of these mappings. There is a connection to the iterative contractive systems (see Barnsley [1]) which possess unique attractors. The points of these attractors are represented by infinite words of digits. The classical symbolic representations of compact unit intervals in positional number systems are of this kind.

In Kurka and Kazda [4] we have considered number systems based on iterative systems of Mobius transformations. An infinite word of digits represents a real number x , if the images of the Cauchy measure by the prefixes of the word converge to the point measure concentrated on x . A Mobius number system is given by a subshift (obtained by forbidding some finite words), on which the symbolic representation map is continuous and surjective. In arithmetical algorithms we use subshifts which are obtained when we expand real numbers according to some interval cover. In the present paper we analyze algorithms for expansions of rational and algebraic numbers, for computation of rational functions of one or more variables and for some transcendental functions. Then we give conditions which ensure that rational numbers have finite expansions.

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Applying Search Engine Technologies for Internet Marketing

This paper reports the results of the authors' current research in search engine technologies and provides pointers that are useful to marketers and anyone creating their own webpages and wanting them to be visible on the vast Internet. One of the first and most important aspects of Internet marketing is to direct customers to online stores. Since most people use search engines to find what they need and want, the knowledge of search engine technologies will help Internet marketers and webmasters to better optimize their online marketing strategies. This paper describes how search engines find webpages and what additional steps are needed for search engines to find our webpages. It describes how search engines rank the search results and how to get our webpages to the top of the lists. It discusses how search engines classify webpages and how to put our webpages into the right categories. It also outlines current developments and how to keep up with the advanced web technologies. As information researchers focus solely on technologies and marketers focus solely on sales, there is a need to join forces. The technical knowledge may help the marketers to better make use of the technologies and understanding social demands may help information researchers to develop more advanced technologies to better serve social needs. This paper makes the leading search engine technologies accessible for anyone wanting their webpages to be reachable on the vast Internet.

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Optimisation of Fault Tolerance via Automatic Model Transformations

New processes for the design of dependable systems must address not only dependability but also cost concerns. They should maximise the potential of automation to address the increasing technological complexity and cope with the potentially expansive design spaces that need to be explored. In this paper we describe a design process that can address some of these concerns by integrating system modelling, automated dependability analysis, and evolutionary optimisation techniques to achieve the optimisation of designs with respect to dependability and cost from the early stages. In the context of this process, HiP-HOPS - a scalable automated dependability analysis and optimisation tool - provides substantial support by easing difficult aspects of fault tolerant design such as decisions on the type and location of fault detection and fault tolerant strategies. The objective of the optimisation is to augment the architecture of a basic functional model of the system with fault detection and fault tolerance capabilities in a way that optimal tradeoffs between dependability and cost can be achieved. The optimisation is performed by a multi-objective genetic algorithm which progressively improves a Pareto set of non-dominated design solutions that represent optimal tradeoffs among the parameters of the optimisation. In this approach, optimisation is driven by system cost and dependability measured as risk, which in turn is measured as product of failure probability and severity of failure. The approach is generic and can be easily adapted to accommodate other measures of dependability, such as reliability, safety or availability.

The paper makes two contributions: firstly, it shows how architectural patterns commonly used for fault detection and fault tolerance (self correction, self checking, checkpoint recovery and restart) can be modelled and then used for compositional dependability analysis and optimisation in HiP-HOPS style analysis. Secondly, it defines a generic approach to modelling the detectability (or not) of errors propagated among components of a system. In this approach, non-coherent compositional failure modelling (i.e. modelling that

employs NOT gates) is employed to achieve analysis of the effect of detectability of errors on the dependability of the system. The process is demonstrated via application to a pre-collision system for vehicles and benefits are shown in comparison with conventional manual design processes.

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A QoS Real Time Bandwidth Redistribution Transmission Algorithm in WiMAX

WiMAX connectivity uses two components, a Base Station (BS), where the WiMAX signals are broadcast and a Subscriber Station (SS) which is a device, or a group of devices that receives the signals. The SS will request bandwidth in the uplink (UL) from the BS, and the BS will allocate the bandwidth accordingly. As WiMAX can achieve a range of 30 miles with a throughput of 72 Mbps with LOS and 4 miles with NLOS, promoting mobility but effective QoS is difficult to achieve. QoS is challenging to achieve due to unpredictable channel conditions such as signal fading and frequency interference.

Different types of traffic will require different services from a network, including differing priority status; bandwidth levels and latency tolerances. For example, electronic mail is insensitive to delay, but loss of data is its priority, compared to video, which is delay sensitive but data loss insensitive. Applications such as interactive graphics are sensitive to both delay and data loss. This paper proposes a QoS bandwidth allocation algorithm that would sample what has been transmitted so far on a periodic basis and compare to the total amount of bandwidth that SS has allocated to it. If there is a significant difference, the bandwidth allocation can be cut down allowing that bandwidth to be utilised by another SS. This would ensure that the bandwidth is directed to the transmissions that actually require it rather on the assumption of bandwidth requirement based on the classification of data being transmitted.

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Limiting the Number of Route Changes in Data Networks

Routing protocols are used to determine minimum cost paths between routers. Routers that use these routing protocols update its routing path on a predefined time to find a new optimal route.

In this paper we investigate the problem of limiting the number of route changes in a weighted network with a-priori known cost changes.

In a given weighted network when the link costs are known over a specified period $[0, T]$ the optimal route between a pair of routers S, T will constantly change with time. We ask the question: if we want to limit the number of route changes between S, D to k changes only, when do we make those changes and how do we compute those optimal routes.

We show in the paper that for $k=0$, the one optimal route to use over the whole period $[0, T]$ is the optimal route between S, D computed for the network with each link cost replaced by its average link cost over the period $[0, T]$. We then show how to solve the problem for the case $k=1$ and give a general algorithm based on dynamic programming to find optimal routes for $k > 1$.

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Tracing the Origins of Distributed Denial of Service Attacks

Distributed Denial of Service (DDoS) attacks, the cousin of Denial of Service (DoS), paralyse their target resource and on occasion inflict permanent damage, preventing it from serving its legitimate users. DoS (Denial of Service) has long been a method of cyber attack to render a host unavailable to its users through the use of various methods that either consume the victims resources or force it into a reset. Either way the target host is unable to serve its legitimate users. More recently DDoS attacks have become popular, commonly in the form of SYN flooding and exploitation of the HTTP GET method. The majority of DDoS attacks make use of a bot-net, using a large group of unwillingly infected computers that can be unknowingly commanded to carry out a DoS attack on a specific target. IP spoofing commonly used in such DDoS attacks makes it difficult for attacks to be traced, this paper will look at the problems faced by victims of DDoS and proposes a new method of finding the origin of attack when the IP has been spoofed. The proposed method builds upon current techniques of tracing the attack back and uncovering the perpetrator's IP by reconstructing attacks paths and computationally compared them to identify false positives in the trace. This in turn will provide a more accurate trace back path to the perpetrator with the aim to eliminate the DDoS promptly.

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A Hybrid Evolutionary Algorithm for Vertical Partitioning a Relational OLTP Database

Vertical partitioning is a technique of physical database design which aims to improve access performance of user transactions. This technique consists to partition a relational table into a set of smaller physical files, each containing a subset of the attributes of the original table. The reason of using this technique is that applications access to only some attributes of a table. Thus, if we can divide the basic relation to a set of sub-files that correspond closely to the requirements of transactions, the access time will be significantly improved. The vertical partitioning is NP-hard problem and its solution is heuristic in nature. Generally vertical partitioning algorithms proposed in the literature contain two essential parts: an optimization method and an objective function. To search the optimal partitioning schema for a relation with m attributes, an exhaustive algorithm must traverse a search space where the number of possible partitions is at least equal to the m^{th} Bell number (for $m=30$, $B(m) = 10^{15}$).

This means that this algorithm has a complexity of $O(m^m)$. Thus, it is more convenient to use heuristic methods to find solutions that are close to the optimal. The partitioning of data was studied in different context: centralized, distributed, parallel databases and data warehouses. In the case of distributed systems vertical or horizontal partitioning is often associated with the allocation problem of various partitions on the nodes of the network supporting the database. Data partitioning was also applied in data warehouses where the fact table is partitioned according to the horizontal or vertical partitions of the dimension tables. In this paper we present a hybrid approach combining a genetic approach and the simulated annealing algorithm for vertically partitioning a relational database in a centralized environment. Our experiments on real databases running on the Oracle DBMS show that this approach reduces significantly the processing time for OLTP queries.

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A Survey of Rich Internet Applications Solutions

In the present paper we investigate the challenges of using the current RIA technologies in building desktop, web and mobile applications. Considering that a lot of different mobile or desktop browsers are being used, we investigate the requirement of „write once, run anywhere“. The current study focuses on the challenges of using the latest Adobe RIA development tools in competition with the existing others tools. As an example, we analyze the functionalities that may be included in a desktop and web application developed for the northeast jobs market place in Romania.

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Bounds on the Average Code Length of a Huffman Code with Two and Three Different Code Word Lengths

Minimum Redundancy prefix codes have a wide range of applications in science and engineering. Given a set of weights (w_1, w_2, \dots, w_n) whose sum equals 1, we assign n binary codes with lengths (L_1, L_2, \dots, L_n) such that the average code length $L(av) = w_1L_1 + w_2L_2 + \dots + w_nL_n$ is minimum. This code can be obtained in time $O(n \log n)$ for general weights and in $O(n)$ time if the weights are sorted.

An interesting open problem is the following: many different weight sets can produce minimum redundancy codes with exactly the same code word lengths, that is, many assignments for (w_1, w_2, \dots, w_n) will produce the same set of code lengths (L_1, L_2, \dots, L_n) and each will have a different average code length $L(av) = w_1L_1 + \dots + w_nL_n$. We ask the question, what will the minimum and the maximum values for $L(av)$ be?

That is to say for all sets of weights that will produce a minimum redundancy code with code words (L_1, L_2, \dots, L_n) how should we choose these weights to make $L(av)$ a minimum and/or a maximum?

In this short paper we answer the question for the two special cases when the set of code word lengths L_1, L_2, \dots, L_n have only two and three distinct values. In other words we consider sets of weights that will produce Huffman trees with all leaves are either on two levels or three levels.

For example for $n = 13$, all the weights that will produce code words with lengths $3, 3, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5$ the average code length will always be between the two values $L(av)_{min} = \frac{88}{10}$ and $L(av)_{max} = \frac{41}{11}$.

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Estonian Surface Water IS

European Union Water Framework Directive commits member states to achieve good qualitative and quantitative status of all water bodies by 2015. To reach the goal, one of the most demanding tasks is the selection of cost-effective measures to tackle various pressures on waters. Estonian Environment Information Centre (EEIC) collects, processes, analyses and distributes information about the nature in Estonia, the state of the environment and the factors that impact them.

Our aim is to develop a IS for to help the selection of measures, to provide reliable environmental information for decision-makers as well as wider public and. This IS includes different applications (models for river basin, river and costal sea) to analyse the status of Estonian water environment. Water quality models are linked between themselves – results of one model is input to next model. This technique allows coincidently take into account the influence of different measures on environment in whole basin. The models are also linked to EEIC databases for automatical installation and initialization. IS user interface is realised using GIS technology.

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Zooming in on the Panopticon: Privacy, Security and Digital Cameras at Schiphol Airport

On traveling to Greece we've experienced it again: airports like Schiphol (Amsterdam) are heavily surveilled. Not only are we questioned before boarding, are our identities checked, our clothes frisked, our belongings searched, and our bodies scanned, we are constantly watched as well: through digital cctv. An airport is, to borrow a term from Foucault, a 'panopticon'. Behind the screens of the digital CCTV monitors 'social sorting' takes place. The state is watching us to decide whether we are fit to use the airport or not. And, as the cameras in use are digital, images are stored, and kept on hard disk for 28 days. Exactly because they are digital, these data can be very easily searched, which is why much of Schiphol's surveillance consists of electronic data retrieval nowadays.

Or is Schiphol not a panopticon? As it happens, it is CCTV operators who do the actual sorting. They can be officers of the Dutch military police, but also employees of various private security companies. And, as always, they form communities of practice, that have their own rules for sorting - which might differ enormously from each other - and might have difficulties cooperating (Norris 1999).

What methods do the Schiphol Airport control room operators use to do their sorting? How are these transmitted between control rooms? Which consequences does this have for the 'all-seeing eyes' of the state? In how far is a digital age airport like Schiphol really a panopticon? These questions will be answered in the paper we hope to present.

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Watermarking the Cloud

Cloud computing is the next evolutionary step in on-demand software services or service-oriented architectures (SOA), which deliver an integrated and orchestrated suite of functions to a user through a composition of both loosely and tightly coupled functions or services. Based on existing network architectures. The major principles of these network architectures are well understood, by most developers, users, and security engineers. This is evident by the many cloud-computing systems developed in the last half decade that share common core components. Although these new systems do offer unique security challenges, as to how to ensure user data, software, and processes beyond the user's reach is secured, using highly reliable and available services. Therefore, a set of holistic security services are required by the cloud computing community that provides the necessary infrastructure to support the entire cloud infrastructure. This paper examines one facet of cloud computing systems using watermarking/digital fingerprinting of data, software and processes to ensure verifiable integrity of data, software, and processes within a cloud-computing world.

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Inconsistency Detection in Semantic Web Ontologies with Rules

Ontologies are the major building block of the emerging Semantic Web. They provide a shared model of common domains accessible to both, humans and computers, and support various types of information management, including storage, sharing, and processing of data on the web. As the number, size and complexity of web ontologies grow the necessity to evaluate and ensure their consistency and interoperability is becoming a major issue. Inconsistencies, both logical and semantic, can be introduced at any stage of ontology development, as well as when merging consistent ontologies to create new ones. A process called *ontology alignment* is intended to identify cases of the later, and it is not much different than screening a single ontology for hidden or explicit inconsistencies. In the paper, we will discuss and characterize types of inconsistencies in heterogeneous web ontologies containing both data and rules. We will present a case study of different ontology evaluation tools, such as *Racer* and *FaCT*, and discuss their inconsistency detection capabilities. We will show that *Racer*, a reasoner based on Description Logics, is capable of computing inferred class hierarchies, performing consistency checking, and examining the possibility for a class to have any instances, but its inference capabilities are limited to satisfiability, subsumption, equivalence and disjointness, thus leaving some common types of inconsistencies undetectable. We will present examples of such inconsistencies, and will argue that Semantic web reasoners should be able to not only identify inconsistencies, but also to maintain them during the inference process preserving at the same time the validity and meaningfulness of derived knowledge. We will show how one truth maintenance logic can be tailored to carry out this task in ontologies which are not fully and/or consistently specified.