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14TH INTERNATIONAL CONFERENCE ON ADVANCES IN ICT FOR EMERGING REGIONS (ICTer) - 2014

CONFERENCE PROCEEDINGS

10th to 13th of December 2014
BMICH,
Colombo, Sri Lanka.

<http://www.icter.org/conference/>

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Proceedings of 2014 International Conference on Advances in ICT for Emerging Regions (ICTer)

Conference Website: <http://www.icter.org/conference/>

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MESSAGE FROM THE CONFERENCE CHAIR

Welcome to the 14th International Conference on Advances in ICT for Emerging Regions (ICTer 2014) held in Colombo. ICTer 2014 is proud to inherit the successful tradition of conducting a research cum professional conference in Sri Lanka since 1998. ICTer is now well known and widely accepted as a quality conference of its kind throughout the South Asian region and indeed in developed countries conducting research along similar themes.

This year's conference features five keynote talks by leading experts, four invited talks by researchers in software industry, seven pre and post conference tutorials, a poster session, a research for industry session and a professional forum. The keynotes are by Aditya Matur on Secure Cyber Physical Systems, Ajith Abraham on CPS Data Analysis, Margot Brereton on ICT Development, Antonia Huertas and Enric Mor on On-line Education and Tony Sahama on E-Health. The invited talks are by Srinath Perera on Data Analytics, Chaminda Ranasinghe on Secure Mobile Applications, Sankalpa Gamwarige on IoT and Sujeewa Ratnayake on Secure Financial Systems.

We received 125 submissions from 9 countries and were subjected to a peer review process with at least two reviewers commenting on each paper. Accordingly, 38 papers were selected for oral presentation and 22 as posters, reflecting an acceptance rate of 30%.

The technical programme is the highlight of the conference and covers areas in evolutionary computing, ICT for development, natural language processing, software development, social networks, computer networks, graphics and image processing, e-learning, project management and e-commerce, neural networks, UI design and ontologies.

As in previous years all presented papers will be indexed in IEEE Xplore database, and selected papers will be invited for publication in the sister journal ICTer.

The conference will also give out the best paper award selected on the basis of a short listing of papers reviewed on conference presentation.

As in previous years the local software industry partners, Codegen, Cambio, WSO2 and IFS have been very generous in funding ICTer, for which we are very grateful. Apart from main conference funding, the pre and post conference tutorials have been subsidized by DMS Electronics, VSIS and Softlogic.

I would like to thank all the 67 technical program committee members who in the midst of heavy work lend a hand for the successful completion of the paper review process. I would also like to thank all the steering committee members and especially, the program co-chairs Prof Hewagamage and Prof Wikramanayake for their active involvement and Mr Sumudu Herath the conference coordinator for his dedicated work throughout the 9 months preceding the conference. Last but not least, thanks are due to all the members of the logistics committee in realizing a quality conference outcome. I hope you will learn from each other from the many opportunities that the conference offers, and make it a productive and enjoyable event.

Dr. D. N. Ranasinghe, Chair, ICTer2014

FOREWORD BY THE CO-CHAIRS

We are pleased to organize this year's International Conference on Advances in ICT for Emerging Regions (ICTer2014) from 10th to 13th December 2014. The main conference will be held on 11th and 12th at BMICH, Colombo. Three parallel sessions will be held allowing participants to select their areas of interest. The conference schedule has already been published on the conference website (www.icter.org/conference) and will be available for the participants. The pre and post Tutorials of the conference will be held on 10th and 13th December at the University of Colombo School of Computing allowing participants to have more interactions with selected resource persons.

ICTer2014 is co-sponsored by IEEE Sri Lanka Section and is the successor to the seminal International Information Technology Conference (IITC) held in Sri Lanka since 1998. It provides an ideal platform to the researchers and practitioners alike to showcase research and development activities carried out in Computer Science and Information Technology. Proceedings of ICTer2014 will be published in both book and submitted to IEEE Xplore. Selected papers will be invited for publication in the special issue of ICTer Journal (www.icter.org/journal).

University of Colombo School of Computing (UCSC) is one of leading higher education institutes in Computing that belongs to University of Colombo and is the main organization that undertakes the responsibility of coordinating ICTer conference from its inception. UCSC uses its full capacity and resources to facilitate and to provide the due recognition of research and development work in computing by organizing this conference with the help of IEEE as well as local industry.

We would like to specially recognize the contribution of this year's conference chair to make this event as successful international event. At the same time, we would like to recognize the dedication of organizing committee members who have contributed in their best capacity to make ICTer2014 a successful conference.

Prof. G. N. Wikramanayake & Prof. K. P. Hewagamage, Co-chairs, ICTer2014

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- Dr. Kasun de Zoysa, University of Colombo School of Computing, Sri Lanka

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Designing Safe and Secure Cyber Physical Systems: Challenges in Defense and Testing

Professor Aditya Mathur, *Singapore University of Technology and Design, Singapore.*

➤ KEYNOTE 2

Cyber-Physical Systems: Challenges from Data Analysis Perspective

Dr. Ajith Abraham, *Machine Intelligence Research Labs (MIR Labs), Washington, USA.*

➤ KEYNOTE 3

Understanding People, Culture and Context as the basis for ICT development

Professor Margot Brereton, *Queensland University of Technology, Australia.*

➤ KEYNOTE 4

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Dr. Tony Sahama, *Queensland University of Technology, Australia.*

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Dr. Chaminda Ranasinghe, *Chief Executive Officer of IdeaHub (Pvt) Ltd., Sri Lanka.*

➤ INVITED TALK 2

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Dr. Sujeewa Rathnayake, *CTO of Axienta, Sri Lanka.*

➤ INVITED TALK 3

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Dr. Srinath Perera, *Director, Research, WSO2, Sri Lanka.*

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Dr. Sankalpa Gamwarige, *General Manager / Vice President of Engineering, Zone24x7, Sri Lanka.*

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KEYNOTE SPEAKERS

Designing Safe and Secure Cyber Physical Systems: Challenges in Defense and Testing

Professor Aditya Mathur,

Singapore University of Technology and Design [SUTD],

Singapore



An increasing frequency of unauthorized attempts to intrude into public infrastructure with (possibly) malicious intent has led to heightened research activity aimed at the design of safe and secure Cyber Physical Systems (CPS). In this talk, we focus on work related to the design and testing of systems such as water purification and smart grid using testbeds under construction at SUTD. We examine attacker models and potential attacks, and dwell on how one could test CPS to ensure their safety and security. We will also examine novel ideas of CPS defense and testing based on physical and logical invariants, hardware and software mutations that we call attacklets, and device-specific intelligent checkers. Our proposed methodology for CPS testing is aimed at generating suitable metrics for assessing the level of security and safety of a CPS and to assist designers in creating layered cyber defense infrastructure.

Cyber-Physical Systems: Challenges from Data Analysis Perspective

Dr. Ajith Abraham,

Machine Intelligence Research Labs (MIR Labs),

Washington, USA



We are blessed with the sophisticated technological artifacts that are enriching our daily lives and the society. It is believed that the future Internet is going to provide us the framework to integrate, control or operate virtually any device, appliance, monitoring systems, infrastructures etc. In this talk, we first present the concept of cyber-physical systems and various research challenges from several application perspectives. Finally, we present several adaptive representations for understanding all types of complex data from text to graphs networks.

Understanding People, Culture and Context as the basis for ICT development

Professor Margot Brereton,

Queensland University of Technology,

Australia



In this talk I will discuss ICT interventions that work and fail and the reasons that people accept or reject new technologies. I will draw upon case studies from both marginalized and mainstream communities in developed and developing countries.

I will also discuss how we use people centered approaches to define and develop our significant research projects in the area of emerging technologies, many of which are funded by the Australian Research Council Discovery program:

(a) Designing the Internet of Things to engage the ageing population *

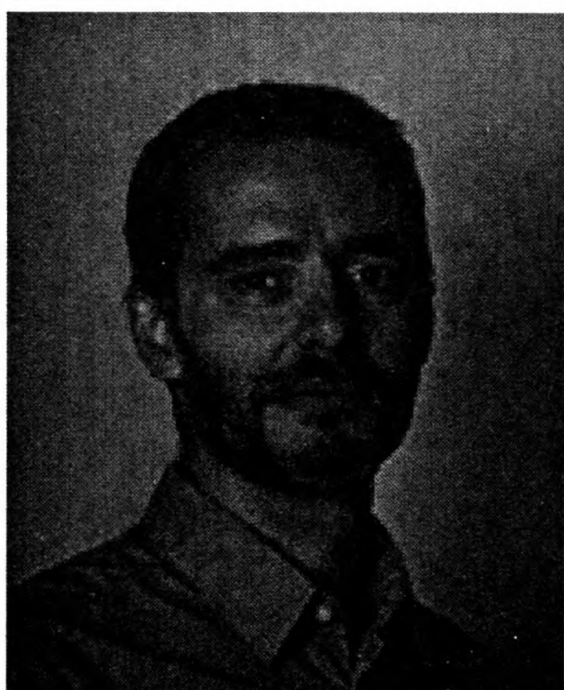
(b) Crowd sourcing recreational birdwatchers to analyze big environmental data.

Technology-Enhanced Assessment (TEA) in Online Education: challenges and opportunities

Dr. M. Antonia Huertas, and Dr. Enric Mor,

Universitat Oberta de Catalunya,

Barcelona, Spain



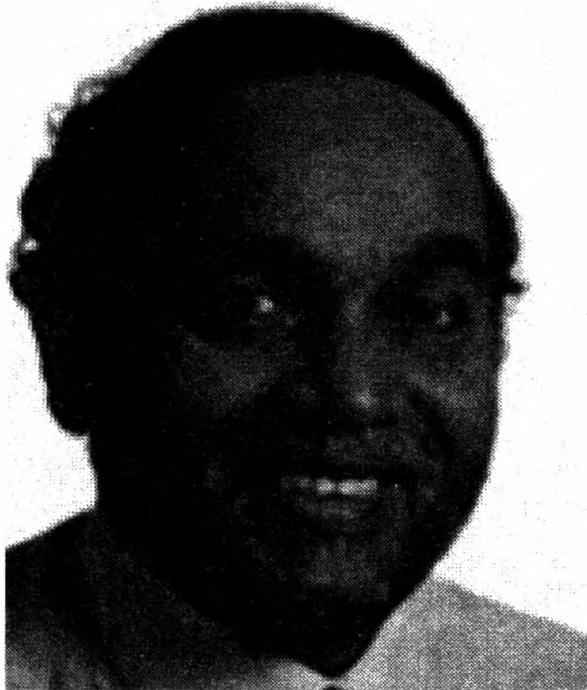
Technology is used in all educational contexts (online and blended education) and especially in learning activities, both for teaching (the point of view of the teacher) and for learning (the point of view of the learner). Thus, assessment is becoming ever increasingly important and interactive tools are needed to facilitate it. Learning technologies open new opportunities for more personalized, authentic, and engaging assessment experiences. However, the use of digital technologies for assessment, referred to as Technology-Enhanced Assessment (TEA), has yet to transform most of the current practices which often replicate traditional assessment methods. In particular, to generalize new experiences and ways to conduct assessment, deliver feedback and enhance the learning experience is a main challenge. The potential of TEA brings to technologists, educators and designers very valued challenges and opportunities to explore.

Health Information Exchange in the wake of 'big data' paradigm – the theme is from 'quality of information to quality of life'

Dr Tony Sahama,

Queensland University of Technology,

Australia



Health Information Exchange (HIE) is an interesting phenomenon. It is a patient centric health and/or medical information management scenario enhanced by integration of Information and Communication Technologies (ICT). While health information systems are repositioning complex system directives, in the wake of the 'big data' paradigm, extracting quality information is challenging.

It is anticipated that in this talk, ICT enabled healthcare scenarios with big data analytics will be shared. In addition, research and development regarding big data analytics, such as current trends of using these technologies for health care services and critical research challenges when extracting quality of information to improve quality of life will be discussed.

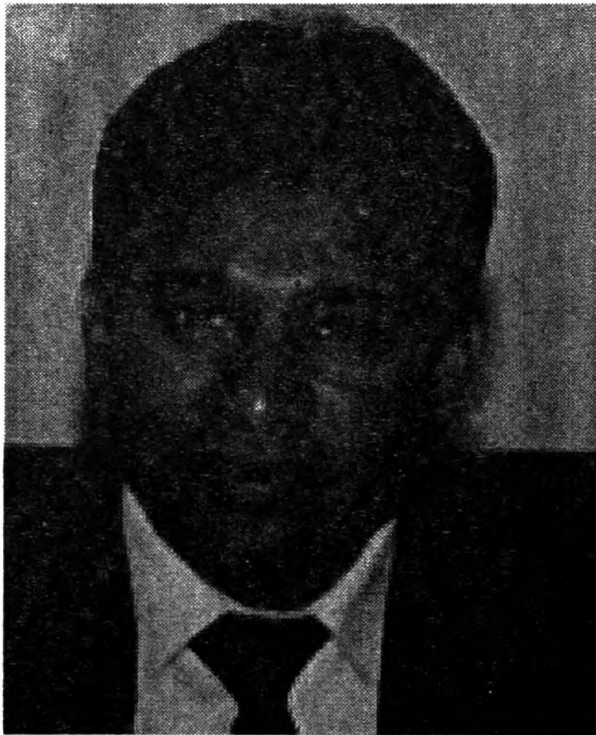
INVITED TALKS

Developing Secure Mobile Applications

Dr. Chaminda Ranasinghe,

CEO - IdeaHub,

Sri Lanka



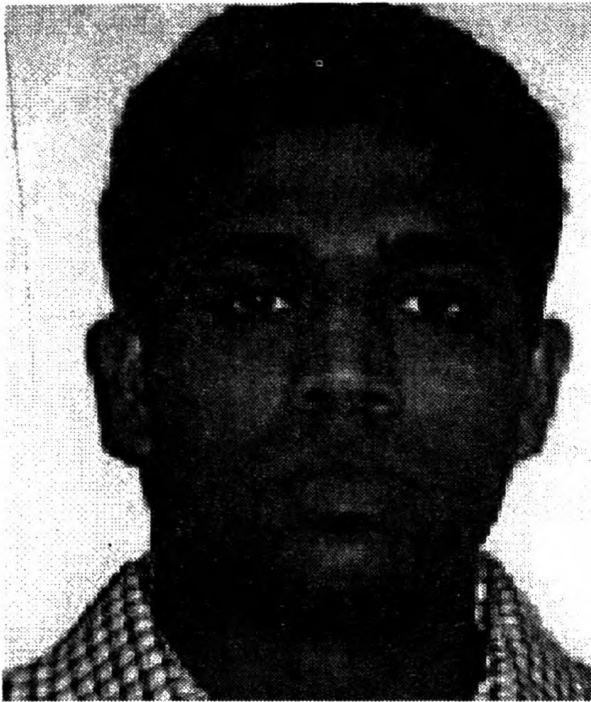
In the rapidly growing mobile eco-system, mobile application security is an important aspect for many stakeholders. Mobile application development incorporates new design principles that require developers to pay attention to new methods for ensuring data security. Proper design of mobile applications and associated infrastructure with alignment to security can be an effective way to increase the long-term success of your solutions.

Mitigating information security risk in Financial Sector

Dr. Sujeewa Rathnayake,

CTO of Axienta,

Sri Lanka



Number of incidents of information security violations are increasing year by year. Organizations are now suffering more from data theft than from physical theft. Financial sector became an obvious target as "that's where the money is". At the same time, companies are spending huge amounts of money trying to secure systems that are unlikely ever to be attacked.

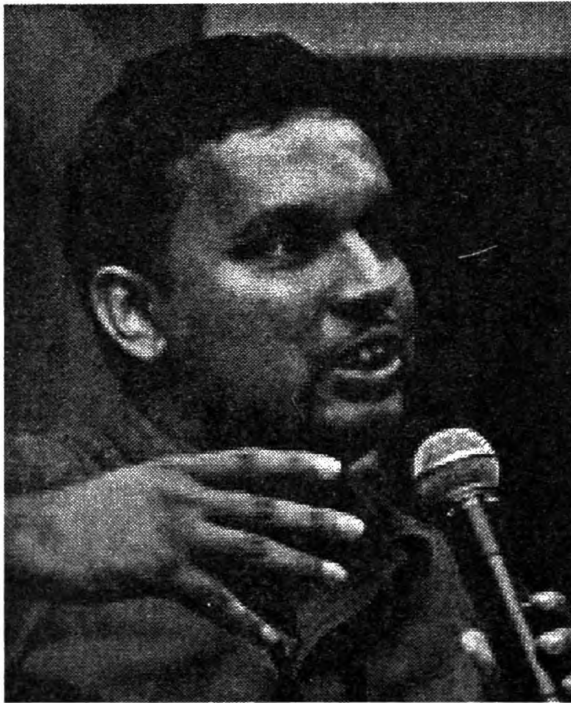
Hence the investigative journey into what is information security and how it encapsulate Information system security and broader sphere of other non-electronic formats of information. Then to share some real life examples of information security violations. Finally to discuss information security risk mitigation framework for financial sector.

Large Scale Data Processing in real world: from Analytics to Predictions

Dr. Srinath Perera,

Director - Research, WSO2,

Sri Lanka



Large scale data processing analyses and makes sense of large amounts of data. Although the field itself is not new, it is finding many usecases under the theme "Bigdata" where Google itself, IBM Watson, and Google's Driverless car are some of success stories. Spanning many fields, Large scale data processing brings together technologies like Distributed Systems, Machine Learning, Statistics, and Internet of Things together. It is a multi-billion-dollar industry including use cases like targeted advertising, fraud detection, product recommendations, and market surveys. With new technologies like Internet of Things (IoT), these use cases are expanding to scenarios like Smart Cities, Smart health, and Smart Agriculture. Some usecases like Urban Planning can be slow, which is done in batch mode, while others like stock markets need results within Milliseconds, which are done in streaming fashion. There are different technologies for each case: MapReduce for batch processing and Complex Event Processing and Stream Processing for real-time usecases. Furthermore, the type of analysis range from basic statistics like mean to complicated prediction models based on machine Learning. In this talk, we will discuss data processing landscape: concepts, usecases, technologies and open questions while drawing examples from real world scenarios.

Reference architecture for a complex system of connected smart things in the enterprise

Dr. Sankalpa Gamwarige,

General Manager / Vice President of Engineering, Zone24x7,

Sri Lanka



There are different smart things available in today's enterprises, designed with diverse processing capabilities (starting from 8 bit uC to multi-core uPs), ranging from handling specific simple tasks (sensing and actuation) to sophisticated duties. With today's diversified wired and wireless communication modes, these smart things can be easily connected to the enterprise IP network either directly or through network gateways. Once these millions of heterogeneous smart things are connected together, an enterprise wide complex system emerges. However in reality, it brings forth many technical challenges to be addressed, in order to attain expected business objectives.

This presentation shares the experience of the speaker and his R&D engineering team, in handling such challenges with fortune 500 global enterprises during the past 7 years through more than 16 successful different designs and implementations. The discussion focuses towards a connected system in line with a common architecture blueprint, to expedite and ease such custom solution development.