



Faculty of Technology and Environment

School of Computing and Mathematical Sciences

**ANNUAL POST-GRADUATE
RESEARCH CONFERENCE**

**PROGRAMME OF ABSTRACTS
2007/08**

ANNUAL POSTGRADUATE RESEARCH CONFERENCE

Wednesday 12th March 2008

| TIME | NAME | YEAR | TITLE |
|------|------|------|-------|
|------|------|------|-------|

Opening and Welcome by Professor Madjid Merabti
(09:25 - 09:30)

(Tea/Coffee from 9am)

Session Chair: Mengji Yu

Session Rapporteur: Dr Dave England

| | | | |
|------|---------------------|-----------------|---|
| 9.30 | Jasim Saeed | 3 rd | Increasing Throughput by Interference Reduction in Wireless Ad Hoc Networks |
| 9.55 | Suddath Indrasinghe | 3 rd | Conflict Free Distribution Address Auto Configuration Mechanism for Mobile Ad Hoc Networks (MANETs) |

Session Chair: Ali Al-Fayadh

Session Rapporteur: Dr. Dave England

| | | | |
|-------|---------------------|-----------------|---|
| 10.20 | Christopher Dennett | 1 st | State Synchronisation System for Distributed Peer-to-Peer Networked Multiplayer Games |
| 10.45 | Amjad Shaheed | 2 nd | Universal Virtual Environment |

Tea/Coffee Break (11.10 - 11.30)

Session Chair: Suddath Indrasinghe

Session Rapporteur: Dr Bob Askwith

| | | | |
|-------|---------------|-----------------|---|
| 11.30 | David Lamb | 3 rd | Software Engineering for the Observation of Large-Scale & Self-Organising Systems |
| 11.55 | Mengji Yu | 3 rd | Self-Regenerative Systems |
| 12.20 | Ali Al-Fayadh | 3 rd | An adaptive Hybrid Image compression Method and its Application to Medical Images |

Lunch (12.45 - 13.45 - Room 705)

Session Chair: David Lamb

Session Rapporteur: Dr Hala Mokhtar

| | | | |
|--------------|--------------------------------|-----------------------|--|
| 14.00 | Azizan Ismail | 2nd | Managing and Sharing Human Life Memories |
| 14.25 | Abdullahi Arabo | 1st | Identity Management in Mobile Ad-Hoc Networks (IMMANETs) |
| 14.50 | Ian Rhead | 1st | A Worldwide Sensor Web Framework |
| 15.15 | Shahzad Mohammad Tayyab | 2nd | Development of Non-Blocking Mechanisms for High Availability Distributed Database Systems |

Tea/Coffee Break (15:40 - 16:10)

Session Chair: Karim Mohammad Zaidul

Session Rapporteur: Dr. Sud Sudirman

| | | | |
|--------------|-----------------------|-----------------------|--|
| 16.00 | Naim Mohd Radi | 3rd | Guidelines for Designing Training and Testing Data for Predictive Neural Networks |
| 16.25 | Simon Cooper | 1st | Dynamic Interactive Storytelling for computer Games using AI Techniques |
| 16.50 | Adnan Sultan | 2nd | Clustering and Group Management in wireless Sensor Networks |

Close 17:20

ANNUAL POSTGRADUATE RESEARCH CONFERENCE

Thursday 13th March 2008

| TIME | NAME | YEAR | TITLE |
|------|------|------|-------|
|------|------|------|-------|

(Tea/Coffee from 9am)

Session Chair: Jasim Saeed

Session Rapporteur: Dr Qi Shi

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|------|----------------|-----------------|---|
| 9.30 | Kashif Kifayat | 4 th | Group Management for Secure Communication in Large-Scale Wireless Sensor Networks |
| 9.55 | Alam Farooq | 3 rd | Node Feedback Based Scheme for Mobile Ad-Hoc Network |

Session Chair: Ruth Thompson

Session Rapporteur: Dr Qi Shi

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|-------|---------------|-----------------|---|
| 10.20 | Thar Baker | 2 nd | Process-Oriented Programming Support for Autonomic Software Engineering |
| 10.45 | Taimur Farooq | 1 st | Security Visualisation Framework for IEEE 802.11 Home Networks |

Tea/Coffee Break (11.10 - 11.30)

Session Chair: Kashif Kifayat

Session Rapporteur: Dr Abdennour El Rhalibi

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|-------|-------------------|-----------------|---|
| 11.30 | Yousef Abuseta | 3 rd | An MDD Based Design Method for Autonomic Systems |
| 11.55 | Karim Mohd Zaidul | 3 rd | Convergence of OSS for the next generation of Wireless Networks |
| 12.20 | Asim Muhammad | 2 nd | A Fault Management Architecture for Wireless Sensor Networks |

Lunch (12.45 - 13.45 - Room 705)

Session Chair: Yousef Abuseta

Session Rapporteur: Dr David Llewellyn-Jones

| | | | |
|-------|-----------------------------------|-----------------|---|
| 14.00 | Ijaz Khan | 2 nd | As Self-Detection Scheme for Sensor Network Boundary Recognition |
| 14.25 | Stephen Tang (remotely) | 2 nd | Towards and Model-Driven Framework to Support 'Serious Games' Development |
| 14.50 | Mohamed Ahmed Al. Zawi (remotely) | 3 rd | Autonomic Computing Application in Power Systems Distributions |

Tea/Coffee Break (15:15 - 15.30)

Session Chair Alam Farooq

Session Rapporteur Dr Martin Hanneghan

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|-------|------------------|-----------------|--|
| 15.30 | Mazhar Ul Hassan | 2 nd | A composition security Service for Network Appliances in Peer-to-Peer Networks |
| 15.55 | Mohammed Haroon | 1 st | Wireless Mesh Networks |

Close 16:30

Increasing Throughput by Interference Reduction in Wireless Ad hoc Networks

Muhammad Jasim Saeed

Abstract

The proliferation of the Internet in the last two decades has increased the appetite for information among consumers and the need to have information on the move encouraged the use of wireless networks. Wireless networks and mobile computing research has until recently concentrated on single-hop networks (network nodes communicating directly to a fixed infrastructure), such as cellular or satellite systems. Ad hoc networking covers multi-hop scenarios (network nodes communicating via other network nodes) such as in conference, hospital, battlefield, rescue, monitoring scenarios.

A lot of research has taken place in the field of Mobile Ad hoc Wireless Networks (MANETs) but it still has a lot of issues that need to be addressed for its proper and multi-purpose utilization. Design of MAC protocols is a very important element in solving some of the issues. A well designed MAC protocol should be able to maintain the fairness among nodes and deal with issues related with interference and also be able to maximise the throughput of the network. This presentation will explain the basics of the Ad-Hoc networks, how my solution for interference cancellation will work and a general background that explains how IEEE 802.11 deals with these issues. Also this presentation will explain a new MAC protocol that implements transmission range reduction to make more nodes available for transmission while controlling the interference through partial back off scheme. The reduction in transmission range is controlled with the use of Signal Strength to Distance (SSD) ratio and hence making every node capable of calculating its distance with other nodes.

In order to analyse the performance of the proposed protocol it is being implemented within simulated environments, for that purpose GTNetS is being used. This presentation will also present some of the performance results obtained from the simulations.

Conflict Free Distributed Address Auto Configuration Mechanism for Mobile Ad Hoc Networks (MANETs)

Sudath Indrasinghe

M.P.Indrasinghe@2004.ljmu.ac.uk

Abstract; A Mobile Ad-hoc Network (MANET) has received much interest due to their applicability to the requirements of today's networks. Within this environment a plethora of hosts and devices are required to connect, exchange data and carry out transactions, often forming temporary relationships. However, the question remains as to how best organise such a dynamic environment. Dynamic and distributed network operations are desirable for deploying MANETs due to host mobility. Many schemes have been proposed for address generation and configuration but these are without their problems. Our developed main distributed algorithm is based on allocating a conflict free address to all newly arrived hosts, by using multiple disjointed address spaces, whereby each host in the MANET is responsible for allocating a range of addresses, disjoint from the ranges of all other hosts.

MANET partitioning is a more general case of hosts departing the network and it could frequently occur. A single MANET will split into two or more MANET partitions in either a graceful or abrupt manner. A group of hosts abruptly departing network can have a severe effect to MANET communication and it is necessary to resolve it efficiently. Also merging frequently happens in MANET environments. This merging may involve previously partitioned or independent networks. Prior to merging, each partition will have independently configured addresses. After merging, two hosts in the merged network may have the same address, thereby creating an address conflict. It is necessary to resolve this situation immediately and efficiently for correct MANET communications.

Our research has identified the importance of an alternative approach for MANET partitions and merging and developed mechanisms to redress situations.

State Synchronisation System for Distributed Peer-to-Peer Networked Multiplayer Games

Chris Dennett

Abstract

The aim of this research is to investigate and develop a new system which allows for the synchronisation of large amount of data and information in peer-to-peer networked multiplayer games. The system should enable scalability, good partitioning, and support flexible dead-reckoning mechanisms which can make predictions in the absence of assured information within constraints specified by the game developer.

The system should take into account Area of Interest Management (AoIM) to avoid transmission of the entire game state alongside other techniques, and should be flexible enough to be suitable for the needs of a number of different types of games and game systems. The end result should be that a game developer no longer needs to worry about the intricacies of networking when developing a peer-to-peer based networked multiplayer game. The networking features should attach to standard programming concepts, practices and paradigms to be as transparent as possible (for instance, the model-view-controller pattern which is often used).

Universal Virtual Environment

Amjad Shaheed

Abstract

There is undoubtedly an increase in the number of consumer appliances that are enjoying networking capabilities. With data throughput increasing among devices that are renowned to be less capable than personal computers, we see an increase in the consumption of multimedia. In parallel, gaming and social networking are at the forefront of next generation entertainment systems where new and novel usage scenarios are pushing technological boundaries. Mobile devices are becoming more like computers and vice versa and television is becoming more interactive. These advances have undoubtedly provided a platform for innovation, where a natural progression would be to blur the gap between the aforementioned technologies. For example content sharing over networked devices, beyond simple file sharing is becoming a reality.

Furthermore, many devices are forming closer relationships with different virtual worlds, such as World of Warcraft and Second Life. In one sense the gap between the two is becoming increasingly more blurred. Consequently, this opens up many new avenues for content sharing, not only between devices but also between sophisticated virtual worlds. Given such interoperable platforms a natural progression sees content that seamlessly resides within either. This will open up new opportunities where third-party content providers and users alike will now be able to create and share content over these new platforms.

This provides obvious benefits. First, the freedom this affords allows us to very easily move between real and virtual environments where the content and services we use and own are always at our disposal. Second, utilising the benefits being connected brings will allow us to manage our content and services independently of where they reside, whether this is on the device itself or remotely via its associated avatar. Lastly, and perhaps less obvious is it will significantly influence the applications underpinned by digital content where solutions not yet envisioned will emerge, such as dynamic game development, immersive and interactive 3D multimedia, and on-the-fly scene analysis and manipulation. We aim to provide a basis on which this vision can be realised where mechanisms have been developed that facilitates the sharing of virtual world objects across different virtual environment.

Software Engineering for the Observation of Large-Scale & Self-Organising Systems

David Lamb

Email: D.Lamb@2005.ljmu.ac.uk

1. ABSTRACT

As software systems increase in size and complexity, the need for self-regulation and automated fault notification and diagnosis increases accordingly. However, given their increased size and complexity, the cost of exhaustively monitoring these systems often carries a computational load greater than can be sustained for real-time observation, event processing, and related alerting. Additionally, the evolving nature of system organisation can lead to monitoring components relying on design-time-specified observation patterns that no longer adequately reflect the system they are supposed to monitor.

Therefore, this research concentrates on the refinement of Software Engineering techniques to develop monitoring subsystems that are both scaleable and adaptive. They should adjust their observation granularity to balance both coverage and computational-load requirements, and reason on appropriate monitoring strategies that suit the present system organisation, and wherever possible, exploit structural and topological features to most efficiently observe a system's state and behaviour.

Self-Regenerative Systems

Mengji Yu

Abstract

Self-regenerative systems (SRS), with remarkable biologically-inspired features, have become a new trend in the design of survivable distributed systems for the next generation of computing and information systems. Technologies of these systems apply attributes of human cognition to tolerate various unintentional and unpredictable changes (e.g. system component failure) or system requirements in the harsh operational networked environments. In most of cases, manually applied maintenance or refresh routines are impractical regularly. Such systems are thus expected to take requirements or high-level objectives from administrators or system users, and manage themselves for a long period of times ranging from days to years. To achieve that, they learn, regenerate themselves, and autonomously improve their ability to maintain and continuously deliver critical services according to various requirements. In this talk, we will first examine few desirable features of SRS systems including self-management, self-optimization, self-diagnosis, and self-healing etc. We then study on how some or these biological features can fit into the design of robust software systems in Wireless Sensor Networks (WSNs), a typical example of networking in pervasive computing. In addition, we are particularly interested in inspecting the self-regenerative feature to restore software system capabilities in WSNs to full functionality following a component failure.

AN ADAPTIVE HYBRID IMAGE COMPRESSION METHOD AND ITS APPLICATION TO MEDICAL IMAGES

Ali Al-Fayadh

ABSTRACT

Image compression plays an important role in the transmission and storage of image information as a result of bandwidth and storage limitations. The goal of image compression is to obtain a representation that minimises bit rate with respect to some distortion constraint.

Medical image compression plays a key role as hospitals move towards filmless imaging and go completely into computerized imaging. The use of medical images for diagnosis purposes has become necessity. But the storage demands of such images are very high. This has provoked significant interest in the field of medical image compression. Image compression will allow Picture Archiving and Communication Systems (PACS) to reduce the file sizes on their storage requirements while maintaining relevant diagnostic information. Teleradiology sites benefit since reduced image file sizes yield reduced transmission times.

Image compression techniques can be classified into two categories: Lossless compression and Lossy compression. In Lossless compression, the reconstructed image is identical to the original one and results in low compression ratio, the compression ratio could be as low as 2:1 to 3:1. On the other hand, Lossy compression methods allow a loss in the actual image data, so the original image cannot be created exactly from the compressed image. Its main advantage is higher compression ratio, it can provide compression ratios more than 10:1 with little perceptible difference between reconstructed and original images; however, lossy compression introduces some error in the data because of the loss in the actual image data. The motivation for lossy compression originates from the inability of lossless algorithms to produce as low bit rates as desired. It is expected that the volume of uncompressed data produced by hospitals will exceed capacity and drive up costs even as the capacity of storage media continues to increase.

An efficient adaptive lossy image compression technique using classified vector quantiser and singular value decomposition for compression of medical magnetic resonance – brain images is presented. The proposed method is called adaptive hybrid classified vector quantisation. A simple but efficient classifier based gradient method without employing any threshold to determine the class of the input image block in the spatial domain that results in a high-fidelity medical compressed image was utilised. The proposed technique was benchmarked with JPEG-2000 standard. Simulation results indicated that the proposed approach can reconstruct high visual quality images with higher Peak Signal-to Noise-Ratio than the benchmarked technique, and also meet the legal requirement of medical image archiving.

MANAGING AND SHARING HUMAN LIFE MEMORIES

Azizan Ismail

Email : A.B.Ismail1@2006.ljmu.ac.uk

Abstract

Everyone has their own lifetime memories either happy or sad moments which are kept in mind forever. Unfortunately our memory sometimes cannot retrieve back all the details about when, where and why it happened. Today, with advanced technology, we are capable to capture our lifetime memories as digital images, video, audio, text and other forms of data in huge capacity of storage. In this project, we propose a flexible and scalable system, and sharing digital personal lifetime with friends without central server through a peer to peer network. The system also capable of linking media data based on features. The system will support capture, storage, retrieval reporting, and annotation.

As explained in the UK Grand Challenge in Computing 2003, there is a real challenge in the development of techniques for storing personal serendipity moments and other lifetime memories in a manner that is robust to changes in hardware, operating systems and indexing strategies. The computer and programs that operate on the data will change frequently over a human lifetime, but the data must outlast the systems that analyze it.

There are three fundamental questions that we need to solve in the design of systems for management of serendipity moments (personal life memories) as follows.

- i. How to capture our personal lifetime memories?
- ii. How to store and manipulate it in the future?
- iii. How to share it with friends or other people?

This project will provide a tool to support all three fundamental questions above. With the rapid growth of digital photography (video and photo), smart mobile phones, digital storage (memory cards and hard disks), we can capture almost every second of our life experience. We can even share our joyful or sad moments of our life with (trusted members) through peer to peer networking.

2. RESEARCH PROPOSAL

Identity Management in Mobile Ad-hoc Networks (IMMANETs)

Student: Abdullahi Arabo (a.arabo@ljmu.ac.uk)

Supervisors: Qi Shi and Madjid Merabti

School of Computing & Mathematical Sciences
Liverpool John Moores University

3. ABSTRACT:

The network is becoming more versatile as a result of the availability of various computing resources and communication technologies as well as the increasing use of mobile handheld devices within the business and individual context. These devices are now essential tools that offer competitive business advantages in today's growing world of ubiquitous computing environments. This results in the proliferation of wireless technologies such as mobile ad-hoc networks (MANets), which offer attractive solutions to the services that need flexible setup as well as dynamic and low cost wireless connectivity. Hence, MANets are increasingly used to support mobile and dynamic operations such as emergency services, disaster relief and military networks. However, this growing trend also raises serious concerns over identity management due to a dramatic increase in identity theft. The problem is even greater in services oriented architectures, where partial identities are sprinkled across many services and users have no control for such identities. To tackle these problems, it is essential to allow users to have control over their own identities in MANet environments. So far, the development of such identity control remains a significant challenge to the research community.

In response to the above challenge, this research project aims to propose an identity management framework for MANets, which should be user-centric, context-aware, lightweight and user-friendly. The user-centricity aspect is all about putting users in control of the application, in this case the control of their identity usage and disclosure rather than it been controlled by the application or service providers. The context-awareness refers to the way an application either automatically adapts to discovered context, by changing the application's behaviour or passively presents the new or updated context to an interested user or makes the context persistent for the user to retrieve later. Where context is defined as the set of environmental states and settings that either determines applications behaviour or in which an application event occurs and it's interesting to the user. Due to the heterogeneity of devices used in MANets, the lightweight feature is necessary for enabling the framework to be operable in devices with limited resources such as low computing power and small memory. Additionally, most users are not compassionate in knowing technical details involved in identity management, particularly in complex MANet settings. It is thus crucial to build the user-friendliness in the way that separates users from complicated technical implementation issues of identity management in MANets and allows them to focus on policy aspects of identity management.

A Worldwide Sensor Web Framework

Ian Rhead

Email: cmprhea@livjm.ac.uk

Abstract

The ability to obtain, correlate and analyse environmental data is key in understanding the processes at work within the physical world. In addition to this, the ability to adequately visualise the data in a meaningful way enables organisations, scientists and governments to effectively make decisions based on this data. There are many methods used to collect environmental information, however much of the obtained data is currently collected for specific purposes; to answer questions about a particular natural phenomenon within a restricted geographical region. The provision of a scalable, extensible Worldwide Sensor Web allows an unprecedented level of access to a wide variety of sensing devices in order to provide data relating to a particular phenomenon whilst allowing its wider effects to be also appreciated. The presentation will discuss the provision of a Worldwide Sensor Web in terms of the research issues and related works.

Development of New Non-Blocking Mechanisms for High Availability Distributed Database Systems.

Shahaz Mohammed

ABSTRACT

Recently, the interconnection of massive data-sites has given rise to the formation of power- distributed systems. In such situation, the execution overhead for distributed transaction becomes more problematic than movement of large amount of data in the network. Due to existence of highly reliable database Management system, it is expected to performe in better way beside the complex issues such as location of data, different database-platforms, complexity of distributed transaction etc. Commit protocols, in distributed transaction execution, ensures transaction atomicity to keep the data consistent. System performance of commit protocol depends on whether commit protocol is blocking in nature and how expensive it might be to achieve atomicity in terms of communication overhead. Many protocols have been proposed to achieve atomicity, for example 2PC, 3PC, Presumed Commit etc. Majority of these protocols are blocking in nature; which emphasis on minimizing the communication cost. The presentation highlights the new proposed protocol. This protocol is non-blocking in nature and has low communication cost. Non-blocking is achieved employing extra site called mediator which maintains information of protocol execution. Mediator accelerates commit execution process and in case of coordinator failure acts as coordinator to avoid blocking.

Naim Radi

Dynamic Interactive Storytelling for Computer Games Using AI Techniques

Simon Cooper

s.cooper@2003.ljmu.ac.uk

Abstract

In this research project we propose to investigate Artificial Intelligence techniques that will enable novel approaches to procedurally generating digital interactive storytelling for computer games. These techniques will provide new and immersive experiences for players. Many systems based on rules and planning have been proposed in related literature, but these have many limitations and drawbacks. We propose to develop systems based on heuristics and meta-heuristics to provide a new view of emerging digital storytelling. These techniques will be developed in the form of a Storytelling engine, applied and evaluated within a variety of game genres involving interaction, non-player-character groups, dialogue and cinematography.

This presentation will provide an overview of some of the previously written papers in this field and the approaches that they have taken to create interactive digital stories and sketch the possible alternatives based on a new planning model.

Clustering and Group Management in Wireless Sensor Networks

Adnan Sultan

Abstract

Similar to other communication networks, scalability is one of the major design quality attributes of the WSNs. The single-gateway architecture is not scalable for a larger set of sensors covering a wider area of interest since the sensor nodes are typically not capable of long-haul communication. To allow the system to cope with additional load and to be able to cover a large area of interest while maintaining dependable services, network clustering is usually pursued. Another technique is to divide and manage a huge WSN into small groups of specific nodes that are managed locally by a group leader called Group Management; that could lead to a successful operation and long life of a WSN. Group management plays a key role in WSNs as it provides support high level middleware services such as object tracking, security, fault tolerance, power management and so on. There should be a localized management and coordination between the sensor nodes in WSNs. Nodes in a group can only communicate with their local neighbours instead of the whole network; it is only the group leader which is responsible for communication outside the group. It is easy for a user or the base station to query some specific nodes directly in a group deployed in some geographical location instead of the whole network, which will save the power and communication channels that will ultimately increase the lifetime of a WSN.

The existing group management services are application specific; they may be working well in one environment but may not be suitable in another. A generalised group management services for WSNs should follow some principles similar to those applied to Mobile Ad Hoc Networks, such as: *Resource saving* i.e. the overhead of group management should be affordable for resource-constrained devices; *Distributed* i.e. Group management cannot accommodate a centralized solution where a single node is always responsible for managing the group. This is due to node mobility and the necessity of load balancing; and *Dynamism* i.e. the group management service must accommodate to the highly dynamic group members. These group members' dynamics are caused by network topology changes, power level changes and group management behaviour. The group management services have the following issues. Group Member Discovery, Group Initialization, Group Dynamics Management.

This project is concerned with developing solutions and mechanisms to these issues by creating a framework. Our progress so far has been the proposal for the aimed framework. In the next 12 months we will be able to develop our proposed framework.

Group Management for Secure Communication in Large-Scale Wireless Sensor Networks

Kashif Kifayat

Email: K.Kifayat@2004.ljmu.ac.uk

4. ABSTRACT

Achieving security in resource-constrained Wireless Sensor Networks is a challenging research task. Many key management schemes have been developed recently to provide secure communication between source and destination in wireless sensor networks, but a serious threat highlighted in all of these schemes is that of node capture attacks. Such an attack involves an adversary gaining full control over a sensor node through direct physical access. The compromised sensor node can be an aggregator node, cluster head node or a normal sensor node. This can lead an adversary to compromise the communication of an entire sensor network, creating significant risk to data confidentiality.

In previous work we have presented our Density Independent Group Based Key Management Protocol for tackling this problem and providing secure communication between a node and the sink. The scheme relies on the use of groups controlled by group-leader nodes able to undertake key management and secure data aggregation. In this talk we will discuss this protocol further and describe our work on extending it to include group-leader election capabilities. Such capabilities are essential in light of the fact that group-leader nodes may themselves become compromised, expend all of their battery power, suffer destruction through environmental factors, or lose connectivity as a result of mobility.

5. NODE FEEDBACK BASED SCHEME FOR 6. MOBILE AD-HOC NETWORK

FAROOQ ALAM

Abstract

Mobile network allows a more flexible model of communication than traditional networks since the user is not limited to a fixed physical location. A mobile ad-hoc network (MANET) is a special type of wireless network. It consists of a collection of mobile nodes that are capable of communicating with each other without help from a fixed infrastructure. Mobile ad-hoc networks can be deployed anywhere any time especially in emergency situations e.g. earthquakes, floods disasters, meetings etc. Because of its unique structure mobile ad-hoc networks have many problems. Some of the challenges in this area are frequent changing topology, routing, security, energy consumption etc.

TCP is the reliable connection oriented transport layer protocol widely used for the Internet. But its performance decreases when deployed over mobile ad-hoc networks. TCP assumes all packets losses are due to congestion therefore invoking congestion control mechanism thus reducing network throughput. Many schemes have been developed to improve TCP performance over mobile ad-hoc network but our work shows that there are shortcomings to these solutions.

We have proposed a node feedback based TCP scheme for mobile ad-hoc network dealing with congestion control and slow start mechanism of TCP. In our approach route failure notification is used to inform TCP sender about path breaks or route failure. After route failure, once the communication is re-established nodes which were in active communication before the route failure is responsible to inform about the link capacity to the TCP sender. TCP sender adjusts the size of congestion window (CWND) according to the link capacity of the established connection. In this way TCP doesn't need to invoke slow start mechanism. We believe our approach could yield a TCP based solution which can give an impressive data delivery ratio in mobile ad-hoc network.

We are in the process of further enhancing our initial proposed structure of the above mentioned scheme. This will involve implementation and evaluation to verify associated operation of our proposed mechanism. We understand comparison of this scheme against some of the dominant schemes could yield a clear performance view of the proposed mechanism against some similar schemes. In this context our future plan will have series of experiments to conduct evaluation and comparison study after the implementation phase of our research project.

Process-Oriented Programming Support for Autonomic Software Engineering

Thar Baker

Abstract

Software engineering aims for the systematic, principled design and deployment of applications that fulfil software's original promise: applications that retain their full malleability "flexibility" throughout their lifetime and that are as easy to modify when deployed as they are on the drawing board. Whilst significant advancement in the field has been made to meet these goals through the development of high-level languages and models, structured development using object orientated design, and software configuration abstraction through policy definition, software remains fragile to changes in its environment and its perceived requirement.

Indeed, the complexity and wide dissemination of today's service orientated architectures has meant designing and maintaining their configuration is even harder to achieve and more critical to accomplish effectively. In such architectures, with the layers of services and interwoven dependencies from which they are comprised, it is often the case that a failure in one service can produce failures in a set of services. This makes promoting reliability, robustness, and scalability difficult to design and implement. Thus, the need for software that intelligently reacts and adapts to the circumstances and situations within which they are executed, is paramount to future effective development of next generation software systems.

SECURITY VISUALISATION FRAMEWORK FOR IEEE 802.11 HOME NETWORKS

TAIMUR FAROOQ

ABSTRACT

Wireless networking provides flexibility in home, office and public places and a means to easily connect to the Internet. With the increasing demand for wireless networks in all sizes of organisation, security remains a central challenge in the deployment of wireless networks. There are many security solutions available on the market; however there is no single complete solution for security of wireless networks. Users have to piece together various technologies to secure their wireless networks.

Moreover most of the security products currently available require detailed technical knowledge for their configurations. However, wireless networking is very common in home and small offices environments because of its flexibility. The users responsible for setting up wireless networks in small office home office (SOHO) environments are not always technical. The software supplied with networking devices such as wireless routers is often too complicated for non technical users and as a result these users often fail to utilise security feature in those devices. The importance of securing wireless networks has increased in homes and offices for a variety of reasons, such as use of new e-services provided by governments, banks and other organisations. The provision of these services has increased the risk of loss of or control of information to home and business users.

In recent years researchers have begun considering visualisation techniques as a means to solve network security problems. However, these various different methods target specific vulnerabilities and little consideration has been given to the question of how visualisation can provide improved security for non-technical users in the home or small office environment. There is therefore scope for the development of a novel framework that is not only extensible, but also able to incorporate effective techniques for visualisation able to accommodate the needs of non-technical users.

The purpose of this research is to find a security solution for wireless networks using some interesting visualisation technique which can help less technical users to secure their networks. Visualisation would be used by end users to aid them in easily spotting vulnerabilities in their wireless networks and help them in securing usage of these networks. This research will therefore develop a framework for security visualisation which will present security information in a manner appropriate to users.

An MDD Based Design Method for Autonomic Systems

Yousef Abuseta,

Liverpool John Moores University

Abstract

The increasing complexity and cost of today software systems has made their management and maintenance task extremely difficult to achieve. This is due to the distributed, dynamic, open and heterogeneous nature of these systems in which applications are made up of different components written by different vendors and implemented in different platforms. In such systems, the task of troubleshooting technical problems can tie up systems and information technology (IT) professionals for significant periods of time while affecting the business performance in a negative way. Estimates show that from 30-70% of resources are used by IT professionals, in medium to large companies, for troubleshooting problems and the outrage costs per hour on business critical systems can range from thousands to millions of dollars. To make the situation even worse, there is a shortage in the number of highly skilled people who can manage and handle the complexity of such computing environments. Since the existing tools and methodologies are incapable of managing the complexity of these systems and could not meet their requirements, an appropriate solution had to be adopted; otherwise the IT sector is heading for what it has been termed a *software crisis*.

To overcome such a crisis and address the software management complexity, researchers had to consider alternative approaches based on strategies employed by the biological systems. As a consequence, the autonomic computing, coined by IBM, has emerged as a new paradigm and approach to the design of complex distributed systems. It is inspired by the mechanisms of the human nervous system and its main objective is the design of self managing systems. This was first introduced by IBM to the National Academy of Engineers at Harvard University in March 2001. In such a paradigm, software systems will have the responsibility for managing themselves, given only high-level policies, and therefore shielding the human user or the system administrator from handling and performing this rather difficult task. Here, software systems should have the ability and the quality required to exhibit the self healing, self configuring, self optimising and self protecting characteristics.

Another issue which is of almost equal importance to the software industry is the tackling and dealing with the increasing rate of change of technology¹. A great deal of technologies has been introduced and adopted by many organisations over the last few years. With this rapid change of technology, those organisations and companies could be at real risk since adopting a new promising technology is rather difficult which can be put down to the fact that it is very difficult to make the desirable migration once a system has been designed and developed from the beginning with one and only one

¹ ranging from middleware options (EJB, J2EE, CORBA, .NET, etc.), architecture frameworks (client-server, N-tier, peer-to-peer, etc.), quality of service specification, persistent and transactional services, security infrastructure and programming languages

specific technology and platform in mind. To address this problem, systems and applications should not be, where possible, designed to target and be deployed on only one specific platform which means the level of abstraction of the software development has to be raised. In other words, systems should be designed in a neutral platform manner which enables such systems to target any existing technologies and platforms as well as any possible promising future ones. As a response to this crucial issue, the Model Driven Development (MDD) paradigm has emerged. In such a paradigm, models are treated as first class entities on which transformations are performed in order to extract one model form another. The process of software development, according to the MDD paradigm, goes through some well defined stages. The first stage to start at is the Platform Independent Model (PIM) where the specific technology aspects must be abstracted away and completely hidden from the system developer. The next stage involves adding some information to target a specific technology and platform from which the Platform Specific Model (PSM) results. In the last stage, code can be generated by applying appropriate transformations to the mode obtained in the previous stage.

This project generally intends to tackle and address the complexity and management issues of the distributed systems as well as the potential problem associated with the fast pace at which technologies are changing. More specifically, this project is concerned with providing a novel design method for the autonomic systems and augmenting this design method with the Model Driven Development (MDD) paradigm to raise the abstraction level of software development and eliminate, or at least minimise, the technology change effect.

Convergence of OSS for the next generation Wireless Networks

Mohammad Zaidul Karim

M.Z.Karim@2007.ljmu.ac.uk

Abstract

The communications industry is undergoing profound redefinition, driven by the forces of consolidation, competition, convergence, and customers' increasing demand for convenience. These factors together with the vision of next generation networks pose significant challenges for convergences and transformation to an appropriate architecture for operation, administration and maintenance of future wireless networks services.

In order to maintain a competitive advantage it is necessary to rise these challenges by making the systems environment more flexible and extensible so that it does not present any technical or economic barriers to change. As the expected next generation networks (NGN) will be all IP based and Voice, video, and data are becoming the service foundation with Internet Protocol (IP) as the medium, So the network operators should change, overhaul and even replace their OSS infrastructures to cope with the demands of NGNs and the range of services these new networks will support. Convergence for NGN not to become a replica of the challenges we see in present days networks, the network management side of it has to be treated in parallel and with equal importance. To adopt OSS with the NGN, we will face two way challenges from service providers and from the system developers as there is no point in rolling out broadband and IP networks unless their OSS can support the services.

The main objectives of this research are, to identify the needs, trends and technology drivers of the telecommunication industry concerning OSS/BSS in NGN service and to evaluate the major issues/challenges need to consider for convergences and provide the required solutions which will capable to offer unique service platform for NGN and works together with TMFs service model.

A Fault Management Architecture For Wireless Sensor Network

Muhammad Asim

School of Computing and Mathematical Sciences
Liverpool John Moores University,
Byrom Street, Liverpool L3 3AF, UK.
M.Asim@2006.ljmu.ac.uk

Abstract: Advancement in wireless communication and electronics has made possible the development of low cost sensor networks. Sensor networks facilitate monitoring and controlling of physical environment from remote location with better accuracy. They can be used for various application areas (e.g. health, military, home). Due to their unique characteristics, they are offering various research issues that are still unsolved. Sensors energy cannot support long haul communication as changing energy supply is not always possible in WSN. Also, failures are inevitable in wireless sensor networks due to inhospitable environment and unattended deployment. Therefore fault management is an essential component of any network management system.

We proposed a fault management architecture for wireless sensor networks. In our solution the network is partitioned into a virtual grid of cells to support scalability and perform fault detection and recovery locally with minimum energy consumption. Specifically, the grid based architecture permits the implementation of fault detection in a distributed manner and allows the failure report to be forwarded across cells. A cell manager and a gateway node are chosen in each cell to perform management tasks. Cell manager and gateway nodes coordinate with each other to detect faults with minimum energy consumption. . It does not require stopping network operation as both will back up each other in case of any of them get faulty. We assume a homogenous network where all nodes are equal in resources.

A Self-Detection Scheme for Sensor Network Boundary Recognition

I. Khan

I.M.Khan@2006.ljmu.ac.uk

Dr. H. Mokhtar

H.M.Mokhtar@ljmu.ac.uk

Prof. M. Merabti

M.Merabti@ljmu.ac.uk

ABSTRACT

One of the exigent problems in wireless sensor networks is the detection of boundary nodes at the whole network's boundary or at the boundary of the holes. In this paper, we propose an algorithm in which every node in the network self-detects whether it is a boundary node or an interior node. Our algorithm is based upon the idea that a node will get information locally from its direct neighbours and construct a path among them. If the path forms a cycle then the node is an interior node otherwise, in case of a broken cycle the node will consider itself as boundary node. Our algorithm does not involve flooding; it neither needs the use of any location awareness devices nor does it involve complex mathematical or statistical computations. The approach has been validated and evaluated analytically. By comparing it to similar schemes we show that our approach is much simpler and more efficient.

7. TOWARDS A MODEL-DRIVEN FRAMEWORK TO 8. SUPPORT 'SERIOUS GAMES' DEVELOPMENT

Stephen Tang (O.T.Tang@2006.ljmu.ac.uk)

8.1

8.2 Abstract

Digital games are a lucrative new media industry that serves entertainment to the public. Today its presence is becoming a culture and it is certainly a vehicle for spreading information and influence in a rich and interactive environment. In recent years the application of digital games and related technologies in learning has gained the interest of many researchers. Game-based learning as an extension of edutainment has great potential in promoting deep learning and transforms learners to become active learners through such an interactive medium. The use of games technologies in training has been proved to be successful in military and corporate training and has produced some very positive results for use in education. However, realization of such a vision presents huge challenges to the many domain experts who intend to engage learners through such a medium particularly in the context of serious games creation which often involve huge budgets. This research attempts to address such issues through the development of a model-driven game development environment that features an assistive user interface and automated code generation to enable domain experts to create serious games easily, and to investigate relevant pedagogical aspects of serious games. This research presents the current state of the art in this research field and the progress made so far towards our goal.

Wireless Mesh Networks

Muhammad Haroon

M.Haroon@2007.ljmu.ac.uk

Abstract

A Wireless Mesh Network (WMN) is a network that employs one of two connection arrangements, full mesh topology or partial mesh topology. In the full mesh topology, each node is connected directly to each of the others. In the partial mesh topology, nodes are connected to only some, not all, of the other nodes.

WMNs provide network access for both mesh and conventional clients. Rapid progress in terms of their application has been shown in recent period of time. they can deliver wireless services in personal, local and wide areas. But despite the advances there still remain some challenging research issues.

In this talk we present a study of possible architectures of WMNs and their characteristics. We will also be able to know the differences between WMNs and traditional ad hoc networks. The rapid growing applications of WMNs in different areas are also discussed. Recent advances in protocol designs and critical factors influencing them are a part of our discussion. Prior to concluding our talk, we will have a look at the challenging research issues and some more things in WMNs.

March 6, 2008

**2008 LJMU Faculty of Technology and Environment
Research Students' Conference
March 12-13, 2008
Liverpool, UK**

**ABSTRACT
RESEARCH IN PROGRESS**

**e-VOLUTION OF GOVERNMENT - A 'PENTAGONAL' ANALYSIS
(ARGENTINA, CANADA, EGYPT, KENYA AND ROMANIA)**

**Shauneen Furlong
Ottawa, Ontario**

Executive Summary

eGovernment has not progressed around the world to the degree originally anticipated, nor has it been the driving force hoped for to revitalize and modernize the public service. Though some countries, especially Canada, have been extremely successful having been recognized internationally as number one in the world by Accenture; the public service, in some ways, remains pretty much the same as it was almost 8 years ago when eGovernment (or Government On-Line) was first initiated in Canada in 1999. Because of this, and an international push for eGovernment developments, there has been much analysis as to why it has or hasn't developed, both in Canada and around the world, and how the experiences of those 'who have gone before' can be shared with those approaching the starting line.

The author, by working with the World Information Technology and Services Alliance (WITSA), an organization representing the national technology associations in 67 countries, conducted two eGovernment surveys within the last two years to examine the reasons for the lack of progress (or at least disappointing progress). At the WITSA Public Policy Conference held in Cairo in November 2007, the author released the results of the latest survey and moderated an eGovernment panel that included four countries; namely, Argentina, Egypt, Kenya and Romania. Following this panel discussion, it was agreed that these four countries, along with Canada would contribute to the development of a 'pentagonal' (five-sided) analysis of eGovernment in these five countries. This paper briefs the reader on this research in progress, and anticipates being able to complete and report upon the results of this research by June 2008.

Introduction

The purpose of this paper is to report upon the research in progress comparing approaches, challenges and potential solutions to advance eGovernment in five countries (Argentina, Canada, Egypt, Kenya and Romania). In a recent Global Public Policy Conference (www.witsa.org) of the World Information Technology and Services Alliance (WITSA), an organization representing the national technology associations in 67 countries, the author moderated an eGovernment session involving Argentina, Egypt, Kenya and Romania. The objective of the conference was to highlight world-wide ICT public policy issues. eGovernment was on the agenda as a key contributor and agent to drive modernization and transformation of the public sector and government services through the use of technology. As part of the eGovernment panel, it was agreed that these four countries plus Canada would participate in an international analysis in the preparation of a case study documenting comparative eGovernment strategies, successes and lessons learned.

Background

On the WITSA website (www.witsa.org), a report released in October 2006 acknowledged that the WITSA members (representing 67 countries) and their Washington, D.C. Secretariat recognized that eGovernment developments are vital to each country's progress in revitalizing their public sector institutions and practices to compete and survive in the 21st century. Around the world, almost all public sector institutions are struggling with either entering the eGovernment market, or advancing and realizing its success. Regardless of your position on the eGovernment continuum, all can benefit from having access to the experiences and knowledge already gained from international colleagues. Based upon this insight, in November 2005, the WITSA Secretariat initiated the development of an eGovernment survey that would serve to collect, and act as the medium to share eGovernment knowledge. In May 2006, the survey was launched in Austin, Texas at the WITSA Public Policy Committee Meeting, and the results released in Athens, Greece in October 2006.

Based upon an analysis of the survey results supported by a number of intense conversations and follow-up analysis with individual countries, a second survey was conducted in October 2007 to seek agreement that a revamped project management methodology and the use of technology within the project management field itself could be developed as one solution to potentially address some of the challenges and barriers identified as hindering success and international progress within the eGovernment field. The results of this second phase of the eGovernment project were reported in Cairo, Egypt in November 2007. The four countries who participated on the eGovernment panel in Cairo, and who have been invited to participate in this international comparative study, will also be approached to seek their support in testing a revised project management methodology designed to address more directly the need of eGovernment projects.

Approach

The attached email (Appendix I) confirming the participation of each of the five participants and suggesting a proposed implementation strategy was sent to all four countries on December 3, 2007. {The author as a previous Government of Canada Executive Director in eGovernment and part of the Treasury Board Government On-Line Implementation Team will respond on behalf of Canada in consultation with other public and private sector officials.} Included in this email was a proposed case study format that outlined a list of suggested information to be collected per country required to conduct a comparative analysis on their respective motivations, current situation, assessment, next steps and recommendations (Appendix II). This correspondence also outlined the proposed time frame and approach to complete this research, and as well invited the participating countries to be part of an international forum to test a revamped project management methodology. Project management in its current form was identified as a potential inhibitor to successful eGovernment in a previous WITSA eGovernment study, and therefore considered ripe for change.

Once each of the participating countries completes the case study format and responds to the data collection request, their input will be collated and examined by all contributors to identify commonalities, similar approaches, dissimilar points of interest, and conclusions and recommendations that can be drawn from this material. This collated material will be reviewed and revised based upon consultation with the other four country participants. Depending upon the final product, it may also be shared with other WITSA countries and distributed within the technology associations, and more broadly by the contributors themselves.

Time Frame

The WITSA Global Public Policy Conference, where the author represented Canada on behalf of the Information Technology Association of Canada (ITAC), was held in Cairo, Egypt from November 4-6, 2007. Correspondence to the four participating countries was sent on November 18, 2007 with confirmation received by November 28 that all (Argentina, Egypt, Kenya and Romania) would participate. The email that outlined the proposed format and time frame to provide the data collection and analysis was sent on December 3, 2007. The first

draft of the comparative analysis report prepared by the author will be submitted to the five countries for comments by the end of April 2008 with a target completion date by the end of June 2008.

Anticipated Results

The comparative study will highlight the similarities and differences between countries in developing and responding to eGovernment challenges. It will also summarize the key lessons learned and recommendations offered by these five countries along with their experiences as a potential knowledge piece to be shared with other WITSA countries also interested in advancing eGovernment.

Augmenting Navigation for Visually Challenged People

Hulya Francis

Abstract

Keywords: *Navigation, GIS, visually challenged users, web technology, tactile, auditory, olfactory senses.*

Abstract: *This paper describes a navigation system that includes an enriched information model and a technology to deliver information useable by the visually challenged person. The paper introduces the technical challenge to the creation of a digital database for the navigation server that stores appropriate data. . Conventional navigation systems based on geo-maps alone are of little use to a visually challenged pedestrian. Navigating urban streets without sight is fraught with difficulty and is often dangerous. Visually challenged people rely on ancillary equipment such as a white cane to probe the immediate area in front of them as well as developing other pre-existing personal physiological senses such as tactile, auditory, and olfactory senses, to train themselves to walk along pavements. A prototyped digital navigation model of Hoylake Town Centre, UK has been used to test and validate the proposed model. This paper describes the role and function, and outlines the architecture for the Web-based mobile computing location-based services navigation support systems*

Understanding Software Environment Modelling Requirements for Efficient Software Self-Management

9. HENRY FORSYTH

(Email: H.Forsyth@ljmu.ac.uk)

9.1 ABSTRACT

In terms of environment a system can be viewed as either an “open” or “closed system”. In an open system all interactions with the environment are considered whereas in a closed system no interactions with an environment are considered.

The difficulty with producing an effective closed system is that it is often increasingly difficult to specify the requirements for such a system unless it is an extremely well defined problem. An effective open system presents a different challenge in that in the environment of such a system could effectively include everything that is not included in the system.

The behaviour of systems is not determined exclusively by the internal properties of the system but also by external factors occurring in the “real world”. Furthermore, the behaviour of the system may also influence the external environment of the system. This is increasingly the case when systems are tethered to “real world” applications where there is variety in the environment.

For a system to survive and fully exploit opportunities in such an environment it seems reasonable to suggest that the system to hold a “view” or “model” of the environment. Whilst, without this model it may be possible to respond to environmental change the basis for this change would seem to be less convincing. It may well be that a hybrid approach is taken where certain elements of the environment need to be modelled whereas others do not.

We must then consider how the system senses and manages it’s environment. We will require our sensors/probes to interact with our environmental “Environmental Control Centre” (ECC) in order to perform a number of functions and allow the control centre to pass higher order information to the deliberative and decision making functions of the system.

Our environmental control centre will consist of a number of major functions including:-

- Sensor Manager
- Pattern Analyzer
- Forecaster
- Environmental Model Selector
- Environmental History Logger

A Causal Model Method for Fault Diagnosis in Wireless Sensor Networks

by
Shih-Hao Chang (Henry)

Abstract:

Wireless sensor networks can distribute deployed over a geographic region to perform tracking or monitoring according to user requirements. These features make wireless sensor network is very attractive for large-scale applications like environment monitoring, military surveillance, medical sensing, and disaster relief. Since these sensor nodes are typically operated with limited energy, computing and communication capabilities and distributed deployed in harsh environment that suffers numerous attackers. Therefore, wireless sensor networks more prone to failure than other wireless networks and constraint numerous tradeoffs.

This inherent challenge highlight network level faults in wireless sensor networks are mainly come from sensor node system, communication and resource failure. Our main objective is how to effectively provide node level self-diagnosis algorithm. In this proposal, we concerned the node level fault tolerance in wireless sensor networks. To achieving this goal, we identify the following key requirements for fault-tolerance in wireless sensor networks:

1. Awareness of the system operation and the status of the system resources.
2. Ability of deeply understand the fault reasons and provide self-diagnosis strategy.
3. Adaptability to the fault conditions and changes the functionality of the node itself.

We proposed a novel method which we call CMM (Causal Model Method for Fault Diagnosis in Wireless Sensor Networks). This CMM approach will collect failure information from the sensor components, classify the sensor node failure causes and provide simple methodologies to recovery these faulty behaviors. This could provide efficient fault tolerance method to support dynamic deployed, wild field environment. Extensive simulations evaluation will be conduct by our proposed algorithm.

9.1.1.1.1 *Supporting Crime Detection and Operational*

9.1.1.1.1.2 *Planning with Enhanced GIS*

9.1.1.1.1.3 *By*

9.1.1.1.1.4 *Peter Kinloch*

9.1.1.1.1.5 *Abstract*

Merseyside Police has suffered from information starvation for a great number of years². Although major advances have been made in information technology and information systems serving the police authority, this has done nothing to alleviate the information starvation problem front line officers face when trying to carry out their duties. Therefore, the poor provision of information to front line officers has had a direct effect on policing in the Merseyside constabulary. To combat this problem it is proposed that a new approach to providing information to assist officer decision making when performing front line duties is developed.

It is suggested that the information provided needs to be better suited for officer's requirements. It is proposed that improving the provision of relevant information will have a positive effect on policing in the Merseyside constabulary. This positive effect will be demonstrated through better informed officers leading to a fall in crime rates and an increase in detections. This improvement can be achieved by integrating modern computing concepts in a newly developed information model. Autonomic computing and self-adaptive principles will be utilised to ensure that information is provided to officers in a reliable and timely manner through their ability to cope efficiently with change and accurately interpret user requirements. This research will concentrate specifically on examining the integration of autonomic and self-adaptive principles in the storage, retrieval and collection of data, along with appropriate information presentation by assessing officer's needs and information requirements.

To achieve this appropriate methodologies are selected to facilitate the design, development and implementation of the newly developed information model. The selected methodologies will be applied to assess the information requirements within Merseyside Police and to determine how to integrate the concepts of autonomy and self-adaptation into the new information model.

² Reacting to Crime: The Management of Police Resources. Barrie Irving, David Faulkner, Steve Frosdick & Phil Topping. Home Office research paper, 1996.