

Research Methods  
comp4809/7809  
Lecture 10

## Announcements

### Hints for Seminar Timing

- Finishing on time is worth 10% regardless of anything else
- Hints
  - Time each slide or get each slide to time for you
  - Place your watch next to the mouse
  - Practice practice practice

### D9 Description of Research Methodology and Analysis or evaluation techniques

- Clearly describe the planned methodology for your project. Use diagrams where relevant. This should be in a form that may be directly useful for your final project report (minimum 1 page)
- Describe the results you intend to collect and the form in which they will be collated. Use tables or graphs to show the relevant variables or axes. (minimum 1 page)
- Clearly describe the analysis or evaluation techniques that are relevant to your project. Refer to particular analyses in the literature, and where relevant include specific diagrams that you will be using as a model for your own project. (minimum 200 words)

### Practical tips for improving

- Reading papers
  - CogComp: 6 hours to 10 minutes
  - Find the main ideas
- Writing
  - Bob Brown: 2 paras to 10K words per day
  - Know the structure of each draft, avoid blocking, write every day
- Finding the gap
  - Ask the specific questions from Swales
- Designing the global structure
  - Use templates, use concept mapping
- Getting the details right
  - Check published work, write drafts and seek feedback
  - Look up stats and other methods

### Posters and Demos

- What's a poster?
  - Examples at [http://www.itee.uq.edu.au/~comp4809/Sample projects](http://www.itee.uq.edu.au/~comp4809/Sample%20projects)
- Questions at a poster or demo session  
The art of explaining your work
  - 30 seconds (The elevator pitch)
  - 2 minutes
  - 5 minutes
  - Four hours (The NIPS poster experience)

## Sample posters

- In discussion with the person next to you, critique the poster
  - Global structure
    - What aspects are effective
    - What could be improved
  - Communication of message
    - What is the overall goal of the research
    - What were the specific aims
    - What were the results
    - What is the significance of the results

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### Ensuring Reliability in Business Processes

Maree Mason and Dr Shazia Sadiq

**Aim**  
Provide reliability in business processes by ensuring that the process will complete satisfactorily. Dealing with unanticipated exceptions is an essential aspect of ensuring reliability.

**Background**  
Reliability is about coping with failures. Failures occur any time.  
- System (hardware) failure  
- Application (semantic) failure  
Business process failures are more semantic so traditional transaction models are not as applicable.

**About Exceptions**  
Exceptions are unanticipated business events that cause a semantic failure.  
Need to avoid backward recovery (undofloss of work) as far as possible.

**Handling Exceptions**  
There are 3 phases of exception handling – detect, diagnose, resolve.  
**Detect**  
Recognise that an exception has occurred. Detect exception-raising events.  
**Diagnose**  
Determine the cause of the exception and how the exception will be resolved.  
**Resolve**  
Automate the integration of the diagnosed EH into the workflow instance.

Generic approaches to EH integration:  
- Parallel  
- Diversion  
- Mediated (inc. skip, replace, redo)

Guarantee correctness of the change for control flow and state information.

Transactions are used by DBMSs to ensure reliability in case of system failures.

Input: -the event that caused the exception  
Output: -exception-handling sub-process (EH) -data relevant to resolution

Workflow model

(a) Workflow instance before resolution  
(b) New workflow instance with EH and new states. EH replaces path from B to synchronizer coordinator.

Activity States:  
- Initiated  
- Scheduled  
- Active  
- Completed  
- Aborted

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### Artist Friendly Interaction Specification System for Virtual Reality

Presented by Kevin Purnama, Supervisor: Geoff Ericksson

**Why Mix Art & VR?**  
- Scientific data visualization with VR technology is an active research area. Current methods don't take into account presentation, making the information hard to absorb. Art conveys complex information such as emotions and experiences. Science could benefit from some artistic scene.  
- VR is becoming mainstream. Research must be focused on previously under-developed areas of developer-friendliness & user interaction. Artists promote development of these.

**What's The Problem?**  
Artists have a difficult time adjusting to existing VR technology. This steps them from exploiting the technology fully, and contributing to its development. This problem is prevalent in interaction systems that either aren't flexible or require the developer learn to script. Scripting is hard for non-programmers. Many existing systems also support a unique scripting language.

**What's The Solution?**  
The INTRAC system is a VR interaction system that is developer-friendly. It removes any scripting by allowing graphical editing.  
- A set of simple building blocks is defined that can be manipulated with drag-and-drop principles.  
- Relationships are defined that act as the glue that binds these elements and allows them to work together.  
- A method is defined that processes these elements and translates them into interactive VR objects.  
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- A method is defined that processes these elements and translates them into interactive VR objects.

**How Well Does It Work?**  
Professional artists have indicated the INTRAC system is simple, yet fulfills their needs. Explanation of the system took 20 minutes, during which the artists were able to actively ask questions. This indicates they had basic understanding in a short time.  
Design is complete and an implementation of basic features has been produced that works well. Further implementation is required to test out the full range of functionality provided by the system.

**Central Figure: Schematic Example of an Interaction Specified Using the INTRAC System**

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### DEVELOPMENT OF FILTERING AND PARTICLE PICKING ALGORITHMS TO AID IN 3D STRUCTURE DETERMINATION.

R. S. Pantelic & B. D. Hankamer

3D structural determination of macromolecular structures: The single particle approach

Electron Cryo-Microscopy images collection of particles → Filter electron micrographs to enhance signal and remove noise → Pick particles → Single particle analysis → Focused model of macromolecular structure

**Particle picking**  
**Objective:** To develop a high accuracy algorithm for detecting particles in noisy low contrast micrographs.  
**Problem:** Large particle datasets are required to resolve 3D structures. Automated particle picking applications are required to collect these datasets.  
**Solution:** Particle picking algorithms which use a trained neural network for recognition can detect particles in noisy micrographs with 95.8% accuracy (Toshiko & Sato, Journal of Structural Biology VOL. 145: 95-105).  
**Results:** The neural network based particle picking application was able to detect particles in low contrast and noisy micrograph conditions. The algorithm is currently being improved to increase accuracy.

**Filtering**  
**Objective:** To develop a filter which removes noise from electron cryo-microscopy data which retains high resolution and edge detail.  
**Problem:** Most filters already developed to remove noise but also degrade high resolution information and edge detail.  
**Solution:** The bilateral filter is a type of anisotropic filter. Anisotropic filters remove noise but maintain high resolution edge detail.  
**Results:** The bilateral filter developed smooths out noise whilst maintaining edge and high resolution detail. Blurred motifs within the unfiltered image become visible.

Micrograph of low contrast asymmetric particles → Particles are detected but coordinates are not centered → Micrograph of noisy, low contrast asymmetric particles → Particle edge and motifs are enhanced & sharper, noise is reduced

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### A Metadata Workflow Management System to support e-Science

Kwok Cheung Supervisor: Dr. Jane Hunter, Professor Kevin Burrage

**Objective:**  
This project aims to enable teams of geographically-distributed scientists carrying out in-silico experiments in predefined sequences, to capture, share and exchange precise, high-quality data and results over networks. The use of metadata standards facilitates future data integration and knowledge mining.

**Background: Workflow/Metadata Capture**

Manufacture → Performance Analysis → Sectioning → Microscopy → Image Analysis → Semantic Inferring, Querying, Integration, Presentation → Knowledge Extraction

OME, JPEG-2000, MPEG-7, FUSION, OWL

**Technologies:**  
- WS (Web Services)  
- SOAP (Simple Object Access Protocol)  
- BPEL4WS (Business Process Execution Language for Web Services)  
- BPWSL (Business Process Execution Language for Web Services Java Run Time)

**Outcome: Manufacture**

Slip Batching → WS-1  
Tape Casting → WS-2  
Firing → WS-3  
Microstructure  
Performance Testing

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