An Intelligent Learning Environment for Traditional Chinese Medicine practitioners and students

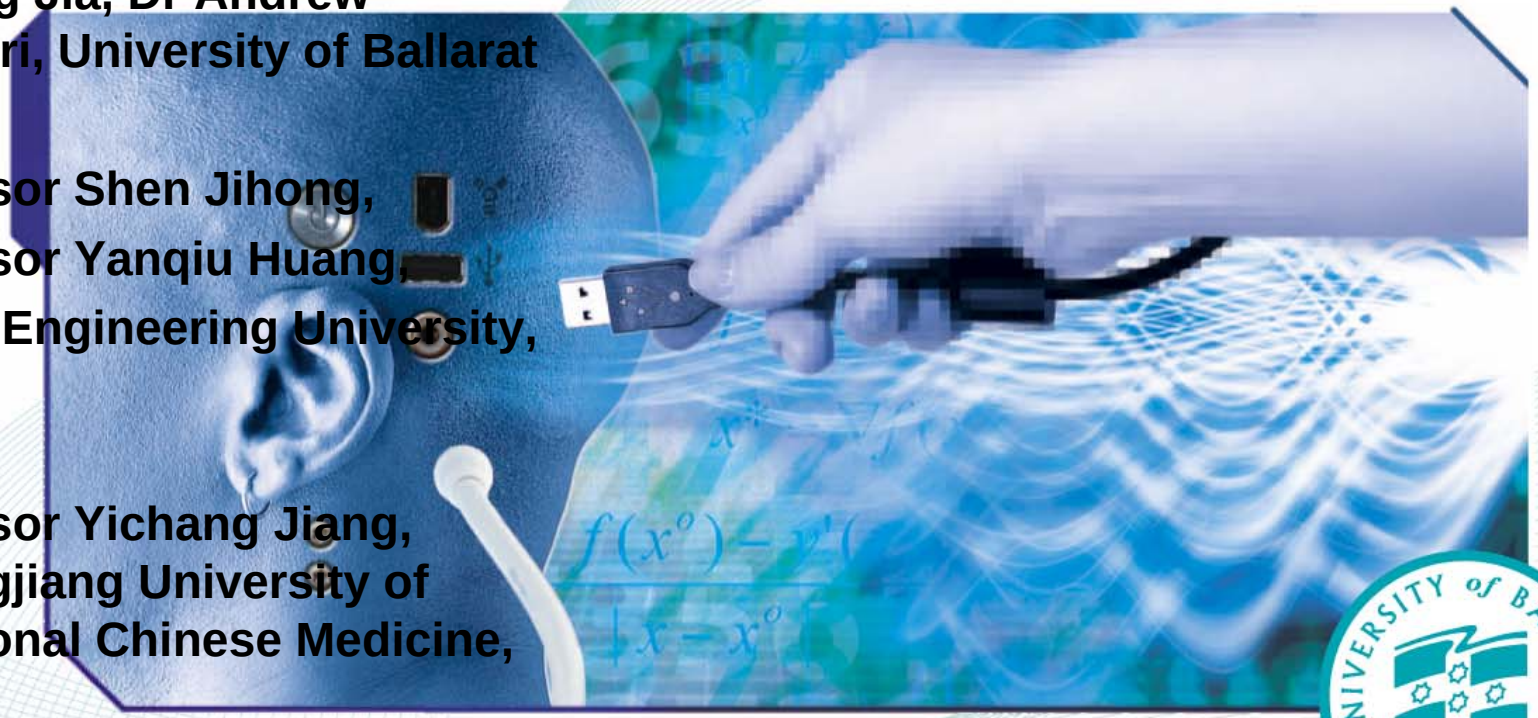
Dr Long Jia, Dr Andrew Stranieri, University of Ballarat

Professor Shen Jihong,

Professor Yanqiu Huang,

Harbin Engineering University, China

Professor Yichang Jiang, Heilongjiang University of Traditional Chinese Medicine, China



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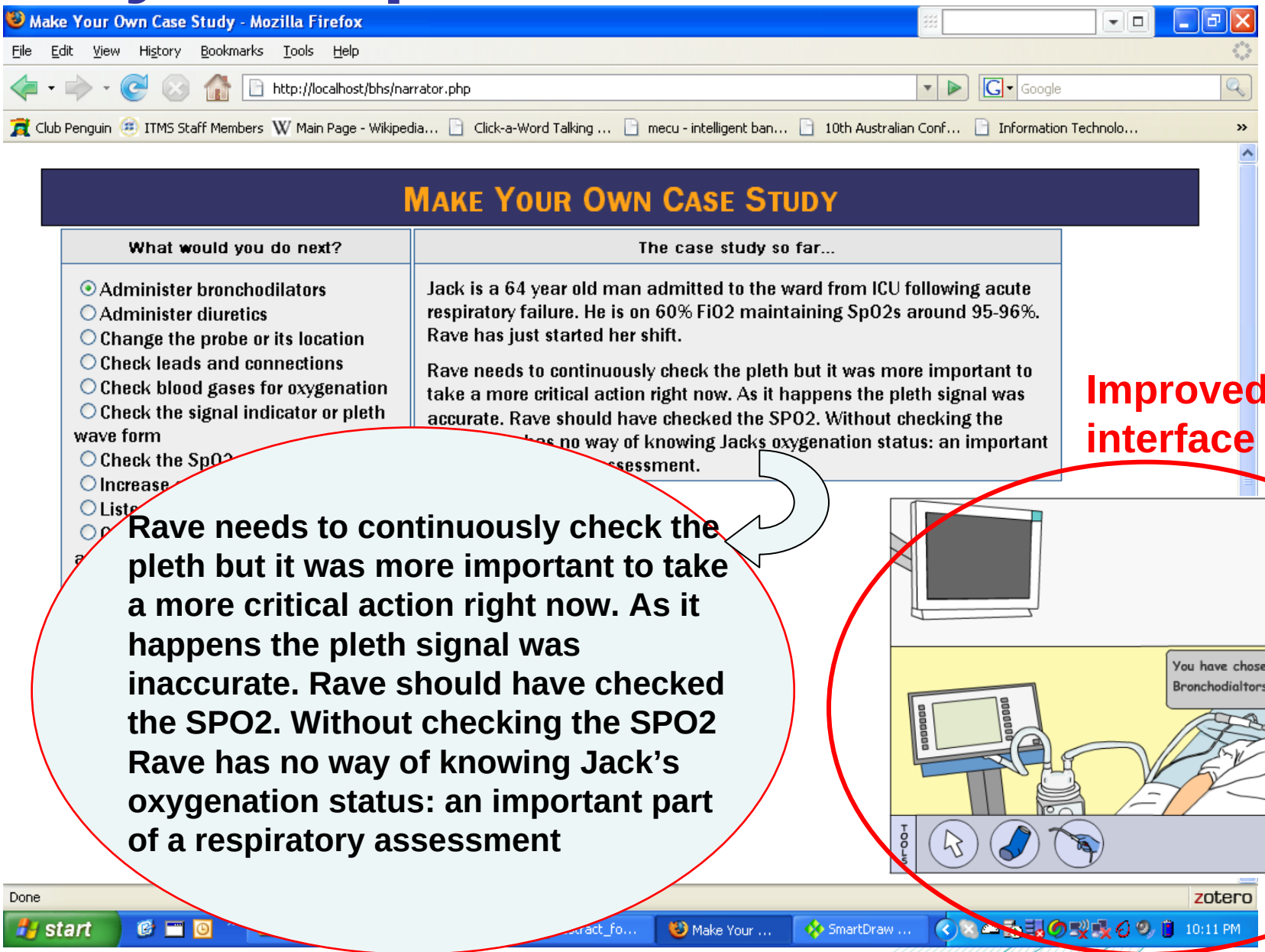
Outline

- **What we are doing**.
  - Modelling diagnosis of bi-syndromes by expert TCM practitioners
  - Embedding the model in a "***Make your own virtual case study***" online tutorial with intelligent feedback to the student
- **Why we are doing it.**
  - Apply lessons learnt from conventional medicine informatics to complementary medicine
  - Improve exposure to 'best practice' diagnostic reasoning for students.
  - Explore new knowledge representation approach
  - In line with growth in Complementary Alternate Medicine
- **How we are doing it.**
  - Use Argument tree and Ripple Down Rule representations of reasoning from artificial intelligence to develop a model
  - Interview experts practitioners on diagnosis of bi-syndromes to build model on paper
  - Embed the model in an online tutorial software prototype developed for intensive care unit nursing

System provides feedback



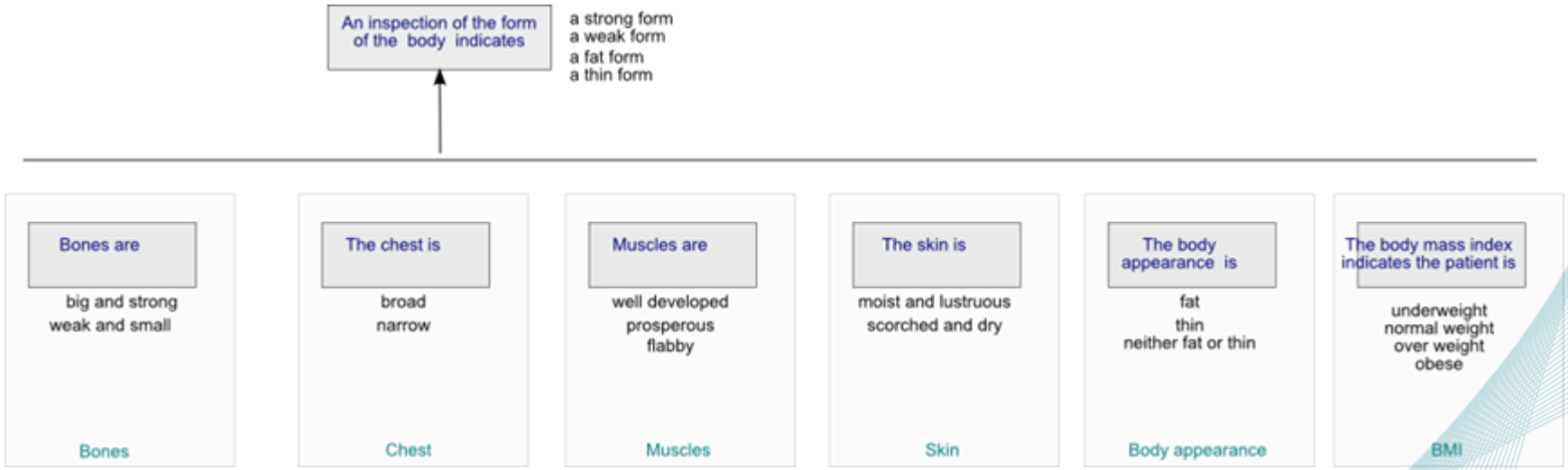
Improved user interface

Why we are doing it

- Apply lessons learnt from conventional medicine informatics to complementary medicine
  - Decision support/expert system deployed in many TCM applications (Suryani 2007 for a survey). However, decision support/expert systems failed to live up to their promise in conventional medicine. Avoid the same mistake and deploy decision support in useful ways in TCM
  - Many other opportunities and challenges for TCM/CAM health informatics
- Improve exposure to ‘best practice’ diagnostic reasoning for students
  - Comparative diagnostic studies indicate high diagnostic variation between TCM practitioners on the same patients. (eg Zhang et al 2005)
  - University taught TCM has less opportunity for exposure to patients than traditional master/apprentice training
- Explore new knowledge representation approach
  - Ripple down rules promise of knowledge bases where new rules can readily be added so the kbs ‘evolves’ over time
  - Argumentation structuring provides a way to organise multiple rdr trees
- CAM growing
  - Chinese MOS aim to ‘export’ TCM, integrate more fully into Western medicine
  - In the West, trend toward CAM linked with client empowerment

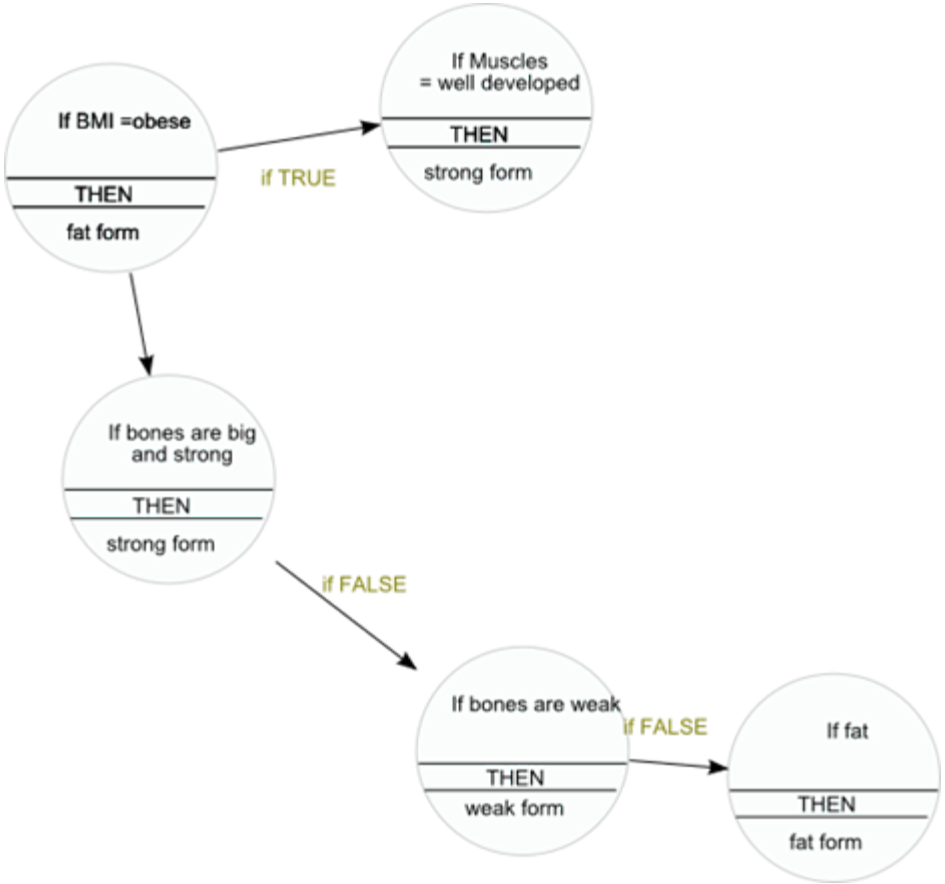
How are we doing it

- Knowledge acquisition using argument trees
  - Dr Jia to work in Harbin with Dr Shen. Harbin Engineering University have developed an expert system for TCM diagnosis of bi-syndromes
  - Dr Jia to model correct diagnostic reasoning with Prof Jiang at Heilongjiang University using argument trees – hierarchy of factors
  - Dr Stranieri/Jia to convert the argument trees to ripple down rule trees



Ripple down rules

- Knowledge acquisition conversion of argument trees to ripple down rule trees
  - UNSW developed knowledge representation that has demonstrated great application in contexts where knowledge grows eg St Vincent's Hospital Sydney Pathology support system.



Mapping to syndromes

		Exterior	Interior	Half interior-half exterior	Cold	Hot – Heat syndrome	Distinguising hot and cold	Right Qi
Whole body five color complexion	White				•			
	Yellow							
	Red					•		
	Blue-green				•			
	Black without lustre							
	Black and dry							
Whole body vitality	Spiritedness							•
	Lack of vitality							
	Loss of spirit							

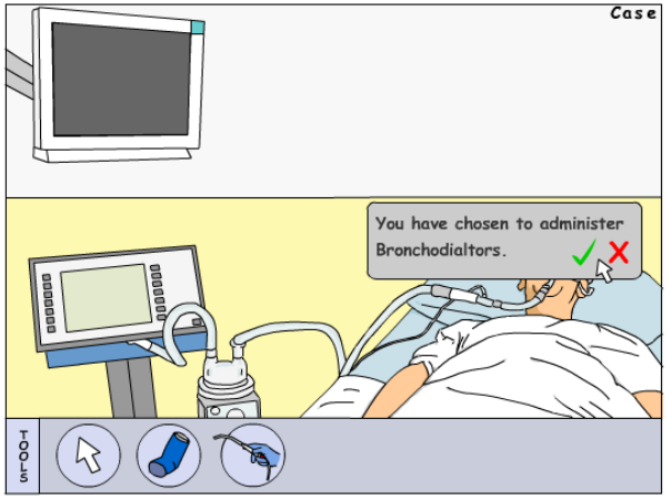
Model Consequences

- Consequences of taking an incorrect action
  - Checking the pulse was not the best thing to do now
  - Consequence of checking the pulse at this point is an unnecessary use of time that could lead you straight into differential diagnosis without considering trauma to the joint

- Consequences of not taking the correct action
  - Forgetting to ask the patient about recent accidents has consequences in that you increase the risk of mis-diagnosis and also diminish the trust the patient has

Build system

- Requirements
  - Web based so that single knowledge base for updating
  - Student user can make cases, question the validity of system advice
  - Expert user can add to the ripple down rule knowledge base when the system provides sub-optimal advice
  - System will grow over time. Eg St Vincents Hospital Ripple Down Rule system now has thousands of rules
  - Visually appealing. Multi-lingual.
  - Standards. Use international TCM standards being developed



Validate knowledge

- Validation 1 Early refinement
  - TCM student evaluation at Harbin
- Validation 2 Expert refinement
  - TCM practitioner workshop evaluation at Beijing
- Validation 3 International expert refinement
  - TCM student and practitioner evaluation in Australia (collaborators sought)
- Establish a panel of experts to oversee maintenance

Conclusion/Vision

- Thousands of TCM students will log on to a web site and practice their diagnostic skills on ‘virtual patients’.
  - Doubts they have about system advice are presented to their lecturers. If lecturers think the system has provided sub-optimal advice, the virtual case is presented to the expert panel who add/change rules/consequences if required
  - Over time the knowledge base grows
  - IT contributes to a community of TCM practitioners in discussing ‘virtual case diagnosis’
- Lessons for TCM learnt from ‘failed’ decision support/expert systems in conventional medicine
  - Make sure the knowledge base is readily updatable so it grows over time. Use ripple down rules. Make it web based.
  - Make it narrative based. Make your own case study compelling, fun, informative