## ITI 2009 Keynote Address

JUNE 22-25, Cavtat / Dubrovnik, Croatia

Organized by University of Zagreb, University Computing Dr RAY ADAMS

#### Centre - SRCE Cognitive Science meets Computing Science

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<u>Centre - SRCE</u>

Centre Head

#### Dr RAY ADAMS

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## A Dedication

This keynote is dedicated to the memory of Professor Colin Tully



# A collision of two sciences

MY OBJECTIVES

Demonstrate the importance of cognitive science.
Demonstrate the importance of computing science.
Synergy between them!!!!



## PROBLEM: the diversity of

MY PROBLEMS

- The diversity of IST offerings.
- The accidental introduction of innovative, new problems
  - For example, GUI and screen readers
  - Competing commands
- Transfer between different systems
- Adapt the user to the system.Different systems but same



## PROBLEM: the diversity of users

MY PROBLEMS

- Strengths, weaknesses, abilities & disabilities.
- Background experience & training.
- Age-related differences.
- Cultural differences.
- Adapt the system to the user?
- Design for the designer.
- User centered design.
- User sensitive design.

## Why cognitive science?

• Focuses on USERS Supports Acceptability • Supports Accessibility • Supports Usability. - User Modeling - Human & Machine Learning - Universal Access

KEY QUESTION ONE

## Why computing science?

- Focuses on RESOURCES
- Focuses on Information Society Technologies
- Supports Functionality
- Supports HUMAN COMPUTER INTERACTION
- Supports Accessibility
- Supports Usability.
- Machine Readable User Modeling
- Human & Machine Learning

KEY QUESTION TWO

### FOUR THEMES

THEMES

- 1) UNIVERSAL ACCESS IN THE INFORMATION SOCIETY
  - $\checkmark$  Access anywhere, anytime, by anyone
- 2) USER MODELING FOR PEOPLE AND MICROCHIPS
  - $\checkmark$  Psychology of the person and the machine
- 3) BRAIN COMPUTER INTERFACES
  - The ultimate in accessibility and user modelling
- 4) FUTUROLOGY AND EPISTEMOLOGY
  - Explorations in Human Knowledge



## 1. UNIVERSAL ACCESS IN THE INFORMATION SOCIETY

Access anywhere, anytime, by anyone

UNIVERSAL ACCESS IN THE INFORMATION SOCIETY

#### UNIVERSAL ACCESS IN THE INFORMATION SOCIETY

When using this compu	ter, I would like assistance with:
Seeing Hear	ring Keyboard Mouse & Trackpad
VoiceOver:	Turn VoiceOver on or off: %F5
⊖On ⊙Off	Open VoiceOver Utility)
Zoom:	Turn zoom on or off: ೫℃8
⊖On ⊙Off	Zoom in: 第八= Zoom out: 第八- Options )
Display:	Switch to white-on-black: 第てへ8
● Black on White ○ White on Black	🗆 Use grayscale
Enhance contrast:	
r	Normal Maximum
	Reduce contrast: #\`^,

UNIVERSAL ACCESS IN THE INFORMATION SOCIETY

#### OUR UA RESEARCH (1)



#### OUR UA RESEARCH (2)

- Systematic identification of assistive technology needs.
- A framework within which to develop accessible systems.
- A framework within which to evaluate accessible systems.
- Capturing user requirements

UNIVERSAL ACCESS IN THE INFORMATION SOCIETY

### OUR UA RESEARCH (3)

	Universal Access & Inclusive Design.
	Adams, R. and Langdon, P (2003).
	<b>D SIMPLEX:</b> a simple user check-
	model for Inclusive Design.
	Vocational Context
	D Adams, R. and Keates, L. S.
	(2007).
	D Accessibility Research in a
	Vocational Context
	Insight and awareness in accessibility
	Adams, R. and Langdon, P.
	(2004).
	Assessment, Insight and
6/25/2009	/2009 Awareness In User Centred Design,
	that Includes Users With Special

#### OUR UA RESEARCH (4)

Universal Access & e-learning D Technology Enhanced Learning Worlds. □ Adams & Granić (2008). **D** The Potential of the BCI for Accessible and Smart e-learning 🗆 Adams, Comley & Ghoreyshi (2009). Universal Access & Multimedia. Evaluating the next generation of multimedia software D Adams, 2008. 6/25/2009

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#### OUR UA RESEARCH (5)

**Universal Access & Cognitive** Augmentation. **Adams**, R. (2006) Applying advanced concepts of cognitive overload and augmentation in practice; the future of overload. Universal Access & Ambient Intelligence. □ Adams, R. And Russell, C. (2006). Lessons from Ambient Intelligence Prototypes for Universal Access and the User Experience. User Modeling. Adams, R. (in press). 6/25/2009 User modelling & monitoring. 19

# 2. User Modeling (1)

 We needed a more systematic approach to the identification of user requirements



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# User Modeling (2)

This led us to

 a
 consideration
 of relevant
 theories of
 human
 cognitive
 psychology.



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NO 2 HB

## User Modeling (3)

• It turns out that such theories tend to fall into at least THREE categories

• Complex (ACT-R)

NO 2 HB



# User Modeling (4)

- We adopted the Maltese cross, as it is:
- Powerful
- Research based
- Modal
- Accessible.



NO 2 HB

# SIMPLEX ONE



OUTPUT

WORKING MEMORY



EXECUTIVE

#### LONG TERM MEMORY

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NO 2 HB

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# **User Modeling (6)**

- Adams (2007)
- Decision and Stress: Cognition and e-Accessibility in the Information Workplace.
- Universal Access in the Information Society. 5, 363-379.

• Validation for 6/25/2009 plex Two



INO 2 HB



WIE GEHT ES

#### 3. Brain Computer Interface • The Ultimate in:

- Accessibility?
- User modeling?

Experience the Next Generation User Interface

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# 3. Brain Computer Interface



- G.tech technology
- @ Middlesex University

## **Brain Computer Interface**



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- Links with accessibility research?
- Adams, Bahr & Moreno (2008).
- Brain Computer Interfaces: Psychology and Pragmatic Perspectives for the Future.

## **Brain Computer Interface**



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- BCI for e-learning?
- The Potential of the BCI for Accessible and Smart e-learning.
- Ray Adams, Richard Comley & Mahbobeh Ghoreyshi.
- HCI International 2009.

# 4) Surfing the Future



- What does the future hold?
- What can we learn from cognitive & computing science?

#### **Future Scenario One**

 Robots as appliances?





# Human & Machine Nature? Where is the soul?



When this

Becomes that?



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#### Now for a movie! ':-')

#### That's all, folks! '=)