

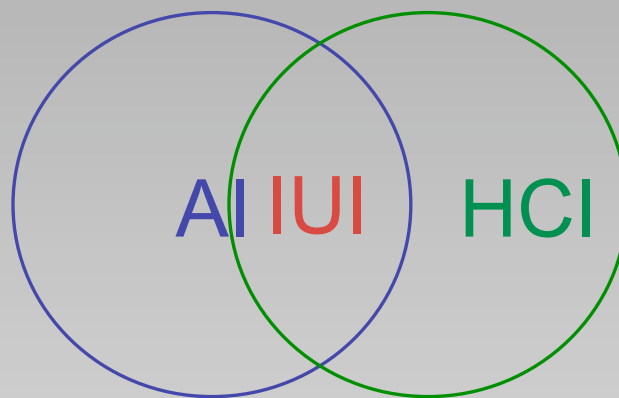


Overview

Intelligent User Interfaces

Professor Charles Rich
Computer Science Department
rich@wpi.edu

An Interdisciplinary Field



Four Underlying Propositions *

- 1) Serious interface problems are ultimately *semantic* problems
 - “ergonomics” of user interfaces fairly well understood (if not uniformly practiced)
 - e.g., selection from menu by mouse

* From: *Introduction to Intelligent User Interfaces*, Sullivan & Tyler, 1991.

Four Underlying Propositions *

- 2) Those semantic problems *cannot* be solved through good interface techniques *alone*
 - need a representation of the domain and tasks (offered by AI techniques)
 - e.g., a good menu system cannot make up for a poor task analysis

* From: *Introduction to Intelligent User Interfaces*, Sullivan & Tyler, 1991.

Four Underlying Propositions *

- 3) These problems *cannot* be solved by AI *alone*
- need to take context of use (physical, cognitive, social, etc) into account
 - e.g., lack of acceptance of early medical expert systems

* From: *Introduction to Intelligent User Interfaces*, Sullivan & Tyler, 1991.



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5

Four Underlying Propositions *

- 4) What is needed to address these problems is a *synthesis* of the two perspectives
- creative tensions
 - e.g., augmenting rather than replacing human (even if replacement "possible")

* From: *Introduction to Intelligent User Interfaces*, Sullivan & Tyler, 1991.



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6

11 “Sub-Areas” we are going to study

Basic Concepts , How Used , Readings

Goal/Task Based User Interfaces *	Intelligent Tutoring Systems	Automated GUI Design	Personal Assistants
Recommender Systems	Multimodal Dialogue	Collaborative Dialogue	Embodied Conversational Agents
Affective Computing	Human-Robot Interaction	Intelligent Environments	???

1. Goal/Task Based User Interfaces

- *Basic concepts:* goals/tasks, recipes, plans
- *How used:*
 - hierarchical task analysis (modeling)
 - planning
 - plan recognition
- *Readings:*
 - Rich & Sidner, DiamondHelp: A Generic Collaborative Task Guidance System, AI Magazine 2007
 - Lieberman & Espinosa, A Goal-Oriented Interface to Consumer Electronics using Planning and Commonsense Reasoning, IUI’06

2. Intelligent Tutoring Systems

- **Basic concepts:** goals/tasks, student (cognitive) model, tutorial strategies, assessment
- **How used:**
 - tutorial presentation and dialogue
 - diagnosis
 - knowledge tracing
 - data mining
- **Readings:**
 - Conati et al, On-Line Student Modeling for Coached Problem Solving Using Bayesian Networks, UM'97
 - Rickel & Johnson, Integrating Pedagogical Capabilities in a Virtual Environment Agent, AA'97

3. Automated GUI Design

- **Basic concepts:** goals/tasks, usage pattern (trace)
- **How used:**
 - automated layout
 - automated adaptation to device characteristics
 - maximizing user performance
- **Readings:**
 - Gajos & Weld, SUPPLE: Automatically Generating User Interfaces, IUI'04
 - Bunt et al, Supporting Interface Customization using a Mixed-Initiative Approach, IUI'07

4. Personal Assistants

- **Basic concepts:** goals/tasks, (mixed) initiative, collaboration, utility
- **How used:**
 - delegation of tasks
 - adaptation to user (learning)
- **Readings:**
 - Segal & Kephart, MailCat: An Intelligent Assistant for Organizing E-Mail, AA'99
 - Berry et al, A Personalized Time Management Assistant: Research Directions, AAI SS 2005

5. Recommender Systems

- **Basic concepts:** rating, user profile, “taste” space (neighbors)
- **How used:**
 - recommend item (with constraints)
 - predict rating for given item
 - collaborative or single-user
- **Readings:**
 - Schafer et al, Collaborative Filtering Recommender Systems, LNCS 2007
 - Pazzani & Billsus, Content-Based Recommendation Systems, LNCS 2007

6. Multimodal Dialogue

- **Basic concepts:** speech, gesture, gaze, vision, graphics (smell?, touch?)
- **How used:**
 - both as input to system (e.g., reference resolution)
 - and as output (e.g., presentation planning)
- **Readings:**
 - Chai et al, A Probabilistic Approach to Reference Resolution, IUI'04
 - Horchani et al, A Platform for Output Dialogic Strategies in Natural Multimodal Dialogue Systems, IUI'07

7. Collaborative Dialogue

- **Basic concepts:** goals/tasks, focus of attention, collaboration, (mixed) initiative
- **How used:**
 - conversation (natural or artificial language)
 - discourse interpretation and generation
- **Readings:**
 - Allen et al, Chester: Towards a Personal Medication Advisor, J. Biomedical Informatics 2006 [*long paper*]
 - Rich et al, COLLAGEN: Applying Collaborative Discourse Theory to Human-Computer Interaction, AI Magazine 2001

8. Embodied Conversational Agents

- **Basic concepts:** avatar (on-screen “body” --not robot)
- **How used:**
 - facial expression and body language
 - multimodal interaction
 - personal relationship
- **Readings:**
 - Pelachaud, Multimodal Expressive Embodied Conversational Agents, MM'05
 - Bickmore & Picard, Establishing and Maintaining Long-Term Human-Computer Relationships, ToCHI 2005 [*long paper*]

9. Affective Computing

- **Basic concepts:** emotion model
- **How used:**
 - relating emotion to goals/tasks and world state
 - displaying emotion
 - recognizing display of emotion in others
- **Readings:**
 - Gratch & Marsella, Lessons from Emotion Psychology for the Design of Lifelike Characters, AAI 2005
 - D'Mello et al, Towards an Affect-Sensitive AutoTutor, IEEE Intelligent Sys. 2007

10. Human-Robot Interaction

- **Basic concepts:** tasks/goals, sensors, actuators, collaboration, engagement
- **How used:**
 - multimodal interaction
 - humanoid (“anthropomorphicizable”) robots (and not)
 - teleoperation (esp. for multiple autonomous vehicles)
- **Readings:**
 - Morency et al, Head Gestures for Perceptual Interfaces: The Role of Context in Improving Recognition, AIJ 2007 [*long paper*]
 - Breazeal et al, Learning From and About Others: Towards Using Imitation to Bootstrap the Social Understanding of Others by Robots, Art. Life 2004 [*long paper*]

11. Intelligent Environments

- **Basic concepts:** pervasive sensors & actuators
- **How used:**
 - office environment (e.g., meeting support)
 - home environment (e.g., heat, lights)
 - outdoor environments (e.g., mobile)
- **Readings:**
 - Hanssens et al, Building Agent-Based Intelligent Workspaces, ABA'02
 - Youngblood et al, A Learning Architecture for Automating the Intelligent Environment, IAAI'05

Goal/Task Based User Interfaces <i>-all (except maybe recommender systems)</i>	Intelligent Tutoring Systems	Automated GUI Design	Personal Assistants
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CS 525U (S 09) 19

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CS 525U (S 09) 20

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CS 525U (S 09) 21

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CS 525U (S 09) 23

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CS 525U (S 09) 26

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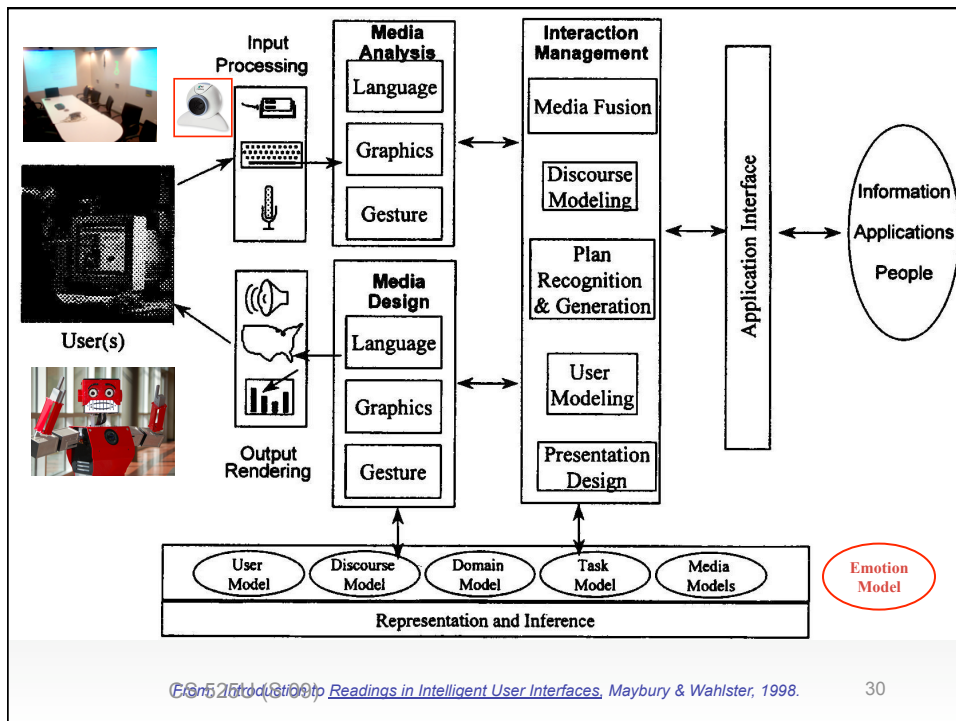
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CS 525U (S 09) 29



Three important sub-areas not covered

1) Information Visualization

- Closely related to automated GUI design
 - CS 525D - special topics course taught occasionally by Prof. Ward
 - S.K. Card, J.D. Mackinlay & B. Schneiderman, Readings in Information Visualization, Morgan-Kaufmann, 1999.

Three important sub-areas not covered

2) Example/Demonstration Based Systems

- Use generalization techniques to replace manual programming
 - cover in this course next time?
 - H. Lieberman, Your Wish is My Command: Programming by Example, Morgan-Kaufmann, 2001.

Three important sub-areas not covered

3) Evaluation

- Same issues as evaluating any interactive system
 - CS 546 - grad HCI course, taught alternate years
 - H. Sharp, Y. Rogers & J. Preece, Interaction Design: Beyond Human-Computer Interaction, 2nd ed., Wiley, 2007

Resources

- J.W. Sullivan & S.W. Tyler, Intelligent User Interfaces, ACM Press, 1991.
- M.T. Maybury & W. Wahlster, Readings in Intelligent User Interfaces, Morgan-Kaufmann, 1998.
- ACM International Conference on Intelligent User Interfaces, 1993-2008 (www.iuiconf.org)

* Program Cochairs: Charles Rich and Nuno Nunes

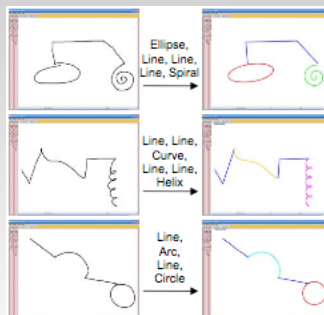
 <p>2007 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Hawaii, USA Jan. 28-31, 2007</p>	 <p>2006 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Sydney, Australia Jan. 29 to Feb. 01, 2006</p>	 <p>2005 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>San Diego, USA Jan. 9-12, 2005</p>
 <p>2004 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Island of Madeira, Portugal Jan. 13-16, 2004</p>	 <p>2003 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Miami, USA Jan. 12-15, 2003</p>	 <p>2002 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>San Francisco, USA Jan. 13-16, 2002</p>
 <p>2001 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Santa Fe, USA Jan. 14-17, 2001</p>	 <p>2000 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>New Orleans, USA Jan. 9-12, 2000</p>	 <p>1999 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Los Angeles, USA Jan. 5-8, 1999</p>
 <p>1998 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>San Francisco, USA Jan. 6-9, 1998</p>	 <p>1997 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Orlando, USA Jan. 6-9, 1997</p>	 <p>1993 CFP INTERNATIONAL CONFERENCE ON INTELLIGENT USER INTERFACES Committee Program SPONSORED BY: </p> <p>Orlando, USA Jan. 4-7, 1993</p>

Highlights of the 2008 Conference



Sketch-Based Interfaces

- PaleoSketch: Accurate Primitive Sketch Recognition and Beautification
 - Brandon Paulson, Tracy Hammond, Texas A&M



Intelligent Fitting Room

- An Intelligent Fitting Room Using Multi-Camera Perception
 - Wei Zhang (Oregon State), Takashi Matsumoto (Keio), Juan Liu, Maurice Chu, Bo Begole (PARC)

