

DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF TORONTO

CSC 318F

THE DESIGN OF INTERACTIVE COMPUTATIONAL MEDIA

Fall Term, 2002-03 (VERSION 4 — 4 December 2002)

LECTURES	Wednesdays, 4-6 P.M., BA 1170
TUTORIALS	Thursdays, 4-5 P.M., BA 1170, BA B024, BA 1230, BA 2135
LECTURER	Ronald Baecker, Professor of Computer Science, Electrical and Computer Engineering, and Management Bahen Building Room 7228, 978-6983, rmb@kmdi.toronto.edu Office hour: Wed. 3:30-4:00, 6:00-6:30, or by appointment
TEACHING ASSISTANTS	Gonzalo Ramos, bonzo@dgp.utoronto.ca Krista Strickland, krista@dgp.utoronto.ca Mike Wu, mchi@dgp.utoronto.ca Shengdong Zhao, sszhao@dgp.utoronto.ca
ADMINISTRATIVE SUPPORT	Kelly Rankin, Bahen 7214, 946-8512, kelly@kmdi.toronto.edu

COURSE DESCRIPTION

The focus of this course is on the design of interactive computational media that enhance and support the cognitive and creative processes of their users, and on user interface design.

Topics include:

- I) **Introduction:** Interactive computational media. Brainstorming and creativity. Group processes, team building, team management.
- II) **Design:** The user-centred iterative design of interactive systems. Design methodologies and principles. Metaphors and mental models. Interdisciplinary design; the role of the design disciplines and the behavioural sciences. Rapid prototyping and envisionment.
- III) **A design process:** requirements analysis, activity design, information design, interaction design, prototyping, evaluation
- IV) **Interactive technologies and techniques:** Hardware, software, systems, and techniques.
- V) **Understanding users, observation, and evaluation:** Interviews and questionnaires, observing users, testing users.
- VI) **Interactive media and modalities:** Typography, layout, colour, speech input/output, natural language interfaces, non-speech audio, video, and multimedia.
- VII) **The extended interface:** training, documentation, error handling, and help; ergonomics and the physical environment; interfaces for special needs.
- VIII) **Research frontiers:** global networking, ubiquitous computing, mobile computing.

This term all students will work in multidisciplinary 4-5 people teams on a semester-long course project to carry out the user-centred, iterative design of prototypes of computational tools or systems appropriate to the needs of senior citizens.

OBJECTIVES

1. To introduce the student to key issues in interactive media design and user interface design.
2. To introduce the student to some of the literature of these fields.
3. To stress the importance of good user interface design, acquaint the student with basic principles whereby this may be accomplished, and give the student experience in trying to carry this out.
4. To give the student concrete experience in:
 - a. Conceiving of and designing novel computational media and their interfaces
 - b. Thinking deeply about user needs
 - c. Thinking critically about user interfaces
 - d. Building effective prototypes of new computational media
 - e. Working in multidisciplinary design teams
 - f. Writing clear, understandable English descriptions of systems, interfaces, issues
 - g. Verbalizing, articulating, and discussing concepts and issues.
5. To prepare the student for further courses in related areas, such as CSC428, and for real-world software, systems, new media, and user interface design.

TEXTS

Mary Beth **Rossen** and Jack **Carroll** (2002). *Usability Engineering: Scenario-Based Development of Human-Computer Interaction (R&C)*, Morgan Kaufmann Publishers, available at bookstore for \$78.50, electronic version available at <http://www.books24x7.com/marc.asp?isbn=1558607129>

Ronald **Baecker** (2002). *CSC318 Lecture Notes* (To be posted to class website by Tuesdays 6 p.m.)

Daniel **Wigdor** (2002). *Building a Usability Prototype in Visual Basic, Dreamweaver, and Flash*, University of Toronto (on website)

Course readings package (RP), with excerpts from:

Ronald **Baecker**, Jonathan **Grudin**, William **Buxton**, and Saul **Greenberg** (1995). *Readings in Human-Computer Interaction: Towards the Year 2000*. Morgan Kaufmann. (**BGBG**)

Terry **Winograd** (Ed.) (1996). *Bringing Design to Software*. Addison-Wesley.

Alistair K. **Edwards** (Ed.) (1995). *Extraordinary Human-Computer Interaction: Interfaces for Users with Disabilities*. Cambridge University Press.

Joan **Greenbaum** and Morten **Kyng** (Ed.) (1991). *Design at Work: Cooperative Design of Computer Systems*. Lawrence Erlbaum Associates. (**GK**)

Thomas K. **Landauer** (1995). *The Trouble with Computers: Usefulness, Usability, and Productivity*. MIT Press.

Jennifer **Preece**, Yvonne **Rogers**, and Helen **Sharp** (2002). *Interaction Design: Beyond Human-Computer Interaction*. John Wiley & Sons. (**PRS**)

Edward **Tufte** (1983). *The Visual Display of Quantitative Information*. Graphics Press.

The Readings Package may be purchased at Canadian Scholar's Press Inc. (CSPI), 180 Bloor St. West, Suite 1202, 416-929-2774. This is on Bloor St. just West of Avenue Road and across from the ROM. The hours (Sept 9 - 20) are Mon-Thurs 9am - 7pm, Fri 9am-5pm, and Sat 12-4. The price is \$40.95.

BGBG, Winograd, Landauer, and Tufte are on reserve at the Engineering Library. Edwards and GK are on reserve at the Gerstein library. R&C and PRS are being "rush ordered" by the Engineering Library.

COURSE CALENDAR

<i>LECTURE, Wed. 4-6</i>	<i>TUTORIAL, Thurs. 4-5</i>	<i>Assignments Handed out</i>	<i>Assignments Due back in</i>	<i>Readings DUE BEFORE NEXT CLASS</i>
Sep. 11 Introduction to 318 and to interactive computational media. The elderly: characteristics, needs, use and uses of computing.	Sep. 12 (JOINT) Introduction to Ass. 1; individual brainstorming	Ass. 1		R&C, Ch. 1 RP #1-#2 Edwards (optional)
Sep. 18 Design, the design problem, and creativity and brainstorming Group processes, team building, team management	Sep. 19 (JOINT) Discussion of Ass. 1 and individual ideas; introduction to Ass. 2; group formation assistance	Ass. 2	Ass. 1 due on Sep. 17	R&C, Ch. 2 RP #3
Sep. 25 Understanding users and user needs. Requirements analysis	Sep. 26 Discussion of Ass. 2 and team ideas; introduction to Ass. 3	Ass. 3	Ass. 2 due on Sep. 24	RP #4-#8
Oct. 2 Learning from design User-centred, iterative design	Oct. 3 (JOINT) TA presentation on surveys and interviews	Ass. 7		R&C, Ch. 3 RP #9-#12
Oct. 9 Design methodologies and principles Activity design; metaphors and mental models	Oct. 10 (JOINT) TA presentation on scenarios and claims analysis			R&C, Ch. 4 RP #13-#14
Oct. 16 Information design; graphic design and typography; data display and visualization	Oct. 17 Introduction to Ass. 4; student presentations of current practice ... "Problem Scenarios"	Ass. 4	Ass. 3 due on Oct. 17	R&C, Ch. 5 RP #15
Oct. 23 Interaction design; interaction techniques; speech and sound I/O	Oct. 24 Return and discussion of Ass. 3; student presentations of "Activity Design Scenarios" in process			R&C, Ch. 6 RP #16
Oct. 30 Multidisciplinary design, envisionment, and prototyping; prototyping tools	Oct. 31 (JOINT) Introduction to Ass. 5; TA presentation on prototyping tools	Ass. 5	Ass. 4 due on Oct. 31	R&C, Ch. 7
Nov. 6 System and interface evaluation	Nov. 7 Return and discussion of Ass. 4; student presentations of prototypes in process			R&C, App. RP #17
Nov. 13 System and interface evaluation	Nov. 14 (JOINT) Introduction to Ass. 6; TA presentation on usefulness and usability evaluation	Ass. 6		RP #18
Nov. 20 Human abilities: perceptual, cognitive, motor	Nov. 21 Return and discussion of Ass. 5; student presentations of prototypes	Ass. 5 due on Nov. 18		R&C, Ch. 8 (omit 292-300) RP #19
Nov. 27 Course evaluation and discussion; guest lecture on usability in the real world	Nov. 28 Student presentations of usefulness and usability evaluations			R&C, Ch. 9 (omit 329-338) R&C, Ch. 10
Dec. 4 Research frontiers: the extended interface and user support, global networking, collaborative systems, ubiquitous computing	Dec. 5 (JOINT) Q&A about the entire course with Prof. Baecker		Ass. 6 due on Dec. 6	

LECTURE TOPICS AND ASSIGNED READINGS

READINGS SHOULD BE DONE IN THE WEEK ASSIGNED, BECAUSE THE LECTURES WILL ASSUME THIS HAS BEEN DONE. IT ALSO PREVENTS FALLING BEHIND.

Sept. 11→18

[R&C] Chapter 1, Scenario-Based Usability Engineering, 1-35

[RP#1, BGBG] G. Salomon, A Case Study in Interface Design: The CHI'89 Information Kiosk, 23-34
Salomon's "storytelling prototype" corresponds to Rosson & Carroll's Activity Design Scenario, and her "functional prototype" corresponds to Rosson & Carroll's Interaction Scenario prototype

[RP#2, Edwards] A. Newell, Extra-ordinary Human-Computer Interaction, 3-15

Why designing for special needs is challenging, exciting, and beneficial for the advance of HCI

[Edwards] Computers and People with Disabilities, 19-41 (**RECOMMENDED**)

Includes guidelines for the design of computers to enable their use by people with disabilities

Sept. 18→25

[R&C] Chapter 2, Analyzing Requirements, 37-78

[RP#3, PRS] Chapter 13, Asking Users and Experts (part), 389-407

Interviews and questionnaires

Sept. 25→Oct. 2

[RP#4, BGBG] Chapter 2, Design and Evaluation (part), 73-80 (top of 1st column)

Approaches to the design of interactive systems

[RP#5, BGBG] C. Lewis and J. Rieman, Getting to Know Users and their Tasks, 122-127

Task-centred user interface design

[RP#6, Landauer] The Trouble with Computers, 139-140, 141-144, 239-247

Usefulness, usability, and example of user-centred design

[RP#7, BGBG] D. Norman, The Psychopathology of Everyday Things, 5-21

Affordances, conceptual models, visibility, mapping, feedback

[RP#8, GK] Introduction: Situated Design, 1-16 (skip 10-14)

Design paying attention to the workplace, including participatory design

Oct. 2→Oct. 9

[R&C] Chapter 3, Activity Design, 79-108

[RP#9, BGBG] T. Erickson, Working with Interface Metaphors, 147-151

Choosing and evaluating metaphors

[RP#10, Winograd] T. Winograd, Kid Pix, 58-61

Functionality as user experience

[RP#11, Winograd] T. Winograd, The Spreadsheet, 228-231

The power of an effective representation

[RP#12, Winograd] L. DeYoung and T. Winograd, Quicken, 268-271

The power of a familiar metaphor

Oct. 9→Oct. 16

[R&C] Chapter 4, Information Design, 109-157

[RP#13, BGBG] A. Marcus, Principles for Effective Visual Communication for GUI Design, 425-441
Principles abstracted from a successful information design practice
[RP#14, Tufte] Visual Display, Ch. 1, 13-15, 28-31, 46 (last par.)-51; Ch. 2, 53-9; Ch. 4, 91-5
Visual wisdom from the master of information visualization

Oct. 16→Oct. 23

[R&C] Chapter 5, Interaction Design, 159-195

[RP#15, BGBG] Chapter 8, Speech, Language, and Audition, 525-537
Includes speech synthesis, speech recognition, multimodal interaction, and non-speech audio

Oct. 23→Oct. 30

[R&C] Chapter 6, Prototyping, 197-225

[Wigdor] Prototyping Tools

[RP#16, Winograd] Ch. 10, M. Schrage, Cultures of Prototyping, 191-205
Prototyping in the real world, especially in industrial design

Oct. 30→Nov. 6

[R&C] Chapter 7, Usability Evaluation, 227-271

Nov. 6→Nov. 13

[R&C] Appendix: Inferential Statistics, 363-372

[RP#17, BGBG] Chapter 2, Design and Evaluation (part), 80-91
Approaches to evaluating interactive systems

Nov. 13→Nov. 20

[RP#18, PRS] Chapter 3, Understanding Users, 73-104
An overview of cognition as applied to interaction design

Nov. 20→Nov. 27

[R&C] Chapter 8, User Documentation, 273-292, 300-302

[RP#19, BGBG] J. Carroll & R. Mack, Learning to Use a Word Processor: By Doing, ..., 698-717
Learning software by doing, by thinking, and by knowing

Nov. 27→Dec. 4

[R&C] Chapter 9, Emerging Paradigms for User Interaction, 303-329, 338-340
[R&C] Chapter 10, Usability Engineering in Practice, 341-362

THE PROJECT

The job of each project team is to conceive, design, prototype, and evaluate a novel approach to this design problem. Further details appear in the handouts for the following set of assignments.

ASSIGNMENTS, DUE DATES, AND METHODS OF EVALUATION

Assignment 1

Handed out: Wed., September 11
Due back in: **Tues., September 17, 6 p.m. !!! (via course newsgroup only)**
Description: Brainstorming ideas for term project

Assignment 2

Handed out: Wed., September 18
Due back in: **Tues., September 24, 6 p.m. !!! (via course newsgroup only)**
Description: One page proposal for term project; list of team members

Assignment 3

Handed out: Wed., September 25
Due back in: Thurs., October 17, **4 p.m. (paper)**
Description: Requirements analysis for computational media design project

Assignment 4

Handed out: Wed., October 9
Due back in: Thurs., October 31. **4 p.m. (paper)**
Description: Activity design and information design for computational media design project

Assignment 5

Handed out: Wed., October 23
Due back in: Mon., November 18. **4 p.m. (paper)**
Description: Interaction design for computational media design project
Design and prototyping of interactive computer system

Assignment 6

Handed out: Wed, November 13
Due back in: Fri., December 6, **4 p.m. (paper)**
Description: Usefulness and usability evaluation of prototype system
Review and analysis of design project and design experience

Assignment 7 (part of class participation)

Handed out: Wed., September 25
Due back in: Sign up early for a tutorial date between Oct. 17 and Nov. 28
Description: 3 min. oral presentation + 3 min. Q&A period on one key issue in one assignment

GRADING

Photo taken	1%	individual grade (0% or 1%)
Assignment 1	1%	individual grade (0% or 1%, not marked)
Assignment 2	2%	group grade
Assignment 3	12%	group grade
Assignment 4	12%	group grade
Assignment 5	12%	group grade
Assignment 6	12%	9% group grade; 3% individual grade
Assignment 7	5%	individual grade
Class participation	8%	individual grade (includes project work, class participation)
FINAL EXAM	35%	individual grade

IMPORTANT NOTES ABOUT GRADES

Late assignments up to 8 school days late	Subtract 5% of grade per school day
Late assignments more than 8 school days late	No credit

Independent of your term marks, you must achieve a grade of **at least 35%** on the **final exam** in order to pass the course.

WRITTEN WORK

Your ability to conceive of, design, and implement new computational tools and new user interfaces that truly meet the needs of a class of users depends critically upon your ability to communicate with these users. This requires effective writing and speaking skills. Assignments 3-6 will therefore include substantial written work.

Assignments 3-6 must be typed and submitted on 8.5"X11" paper (and also submitted electronically to the class computer conference or Web site, as noted above.) Structure and organization, spelling, grammar, word usage, and document appearance will count for roughly 20% of your grade on the written work. **If reports are not in satisfactory English prose, they will be returned for rewriting.**

Each submission for Assignments 3-6 must include a title page with a meaningful title, your names, your student ID#s, your tutor's name, the course name and number, and the date. The second page should be a one paragraph executive summary of the document, and a table of contents.

If you need help, please consult your college writing lab.

COURSE PHOTOGRAPHS

During the first two weeks of class, student pictures will be taken by Kelly Rankin in BA1170 during the class break and just after the class. You may also have your picture taken in BA7214 Monday September 16 from 2:30 to 4:00, or Friday September 20 from 1 to 2:30, or (last chance) Monday September 23 from 2:30 to 4:00.

FACILITIES

Students may wish to use their own computer facilities for prototyping as long as you absolutely sure your prototype will be viewable on the Web from any standard Web browser or viewable on a CDF machine.

You may also use the environment provided by the Department in CDF, the Gerstein Science Information Center, CDF-PC Lab, 2nd Floor, 9 King's College Rd, see <http://www.cdf.toronto.edu/cdfpc/faq.html#GS1>

There you will find PCs augmented with special I/O hardware, and software prototyping tools Macromedia Flash, Macromedia Dreamweaver, and Microsoft Visual Basic. Further details are in the document by Wigdor.

COURSE WEB SITE AND LISTSERV

The course web site may be found at <http://www.dgp.utoronto.ca/people/RMB/318/csc318.html>. The course listserv is CSC318-L@LISTSERV.UTORONTO.CA. Subscribe to the listserv by sending a message to listserv@listserv.utoronto.ca. In the body of the text type the command line "subscribe csc318-L <firstname> <lastname>". Don't put any subject in and if you have an automatic signature, it must be removed.

COURSE STAFF

Ronald Baecker is the Bell University Laboratories Chair in Human-Computer Interaction at the University of Toronto. He is also a Professor of Computer Science and the Founder and Chief Scientist of the Knowledge Media Design Institute. He is an active lecturer and consultant to industry on topics including human-computer interaction and user interface design, computer-supported cooperative work and learning, multimedia, and entrepreneurship in the software industry. He has a B.S., M.S., and Ph.D. from MIT.

Gonzalo Ramos is a Ph.D. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. He has a B.Sc. in CS from the University of Buenos Aires, and a M.Sc. in CS from the University of Toronto. He has particular interests in interaction and visualization techniques and in multimedia.

Krista Strickland is a M.Sc. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. She has a B.Sc. in CS from the University of Prince Edward Island. She has a particular interest in distributed systems.

Mike Wu is a M.Sc. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. He has a B.Sc. in CS from the University of British Columbia. He has a particular interest in computer games and computer-supported cooperative work.

Shengdong Zhao will soon be a Ph.D. student in Human-Computer Interaction in the Computer Science Department at the University of Toronto. He has a M.Sc. in Information Management and Systems from the University of California at Berkeley. He has particular interests in database and information retrieval, XML, and digital documents and services.