DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF TORONTO

CSC 318S

THE DESIGN OF INTERACTIVE COMPUTATIONAL MEDIA

Winter-Spring Term, 1997-98 (VERSION 0 — 5 January 1998)

LECTURES: Mondays, Wednesdays, 1:00-2:00 P.M., SS2117

TUTORIALS: Fridays, 1:00-2:00 P.M., SS2117, SS2102, SS2106, LM158

LECTURER: Ronald Baecker, Professor of Computer Science,
Electrical and Computer Engineering, and Management
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Office hour: Mondays, 2:00-2:30, or by appointment

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FACILITIES SUPP'T: Neil Enns, ennsnr@dgp

COURSE DESCRIPTION

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

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 graphic design, industrial design, and the behavioural sciences. Rapid prototyping and envisionment.
III) Interactive technologies and techniques: Hardware, software, systems, and techniques.
IV) Observation and evaluation: User testing.
V) Interactive media and modalities: Typography, layout, colour, non-speech audio, video, and multimedia.
VI) The extended interface: training, documentation, error handling, and help; ergonomics and the physical environment; interfaces for special needs.
VII) Research frontiers: speech input/output and natural language interfaces; 3D interfaces.

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 the elderly.

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

Ronald **Baecker** (1998). *CSC318 Lecture Notes*. (To be posted to class WWW site, ideally at least 1.5 hours before each class.)

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. ACM Press. Addison-Wesley.

ADDITIONAL REQUIRED READING... EXCERPTS FROM.....

Brenda **Laurel** (Ed.) (1990). *The Art of Human-Computer Interface Design.* Addison-Wesley.

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

ADDITIONAL READING FOR HELP WITH ASSIGNMENTS

Literature on Macromedia Director TBA

NOTE ON READINGS

Copies of all books, readings, and lecture notes will be on reserve in the Computer Science and SigSam libraries.

WEB SITE

www.dgp.toronto.edu/people/RMB/318S98.html

COURSE CALENDAR

Monday LECTURE	Wednesday LECTURE	Friday TUTORIAL
Jan. 5 Introduction to the course, and to interactive computational media	Jan. 7 Intro. to design + the design problem; brainstorming and creativity	Jan. 9 Individual brainstorming
Jan. 12 Senior citizens and their needs (Remmel)	Jan. 14 Group processes, team building, and team management (Blume)	Jan. 15 Individual idea presentation; group formation assistance
Jan. 19 User-centred design; iterative design	Jan. 21 Learning from design	Jan. 23 Presentations of team ideas
Jan. 26 Design methodologies and design principles	Jan. 28 Understanding users and user needs	Jan. 30 Presentations of "A Day in the Life" Scenarios
Feb. 2 Multidisciplinary design, envisionment, and prototyping	Feb. 4 Metaphors and mental models	Feb. 6 More scenarios; interface prototyping; intro to Director
Feb. 9 Interactive systems technology	Feb. 11 Interaction techniques and dialogue styles 1	Feb. 13 More on Director
READING WEEK	READING WEEK	READING WEEK
Feb. 23 Interaction techniques and dialogue styles 2	Feb. 25 Interaction via animation, video, hypertext, and multimedia	Feb. 27 Student presentations and discussion
Mar. 2 Interaction via speech and non-speech audio	Mar. 4 NO CLASS	Mar. 6 Student presentations and discussion
Mar. 9 System and interface observation and evaluation	Mar. 11 Usability testing	Mar. 13 Student presentations and discussion
Mar. 16 Graphic design, typography, and colour	Mar. 18 Data display and visualization	Mar. 20 Student presentations and discussion
Mar. 23 Industrial design (Treadwell)	Mar. 25 The extended interface — training, documentation, help	Mar. 27 Student presentations and discussion
Mar. 30 The extended interface — ergonomics and the physical environment	Apr. 1 The extended interface — computing for special needs (TBA)	Apr. 3 Student presentations and discussion
Apr. 6 Research frontiers — Speech and natural language interfaces	Apr. 8 Research frontiers — Interfaces for 3D spatial design and visualization (Danahy)	Apr. 10 Final presentation of best projects

LECTURE TOPICS, GUEST LECTURERS, AND ASSIGNED READINGS
READINGS SHOULD BE DONE BY DATE LISTED BELOW!!!!!

Wed. Jan. 7   Introduction to design + the design project; brainstorming and creativity
[BGBG] Case Study A, The Iterative Design of an Information Kiosk, 23-24
[BGBG] G. Salomon, A Case Study in Interface Design: The CHI'89 Information Kiosk, 25-34
[Winograd] T. Winograd. Introduction, xiii-xxv
[Winograd] Ch. 1, M. Kapor, A Software Design Manifesto, 1-9
[Winograd] T. Winograd and P. Tabor, Software Design and Architecture, 10-16

Fri. Jan. 9   Discussion of assignment 1, individual brainstorming
[BGBG] S.J. Mountford, Tools and Techniques for Creative Design, 128-141

Mon. Jan. 12   Senior citizens and their needs
Guest lecture by Ann Remmel, Education Organization Development, Baycrest Centre
Readings TBA

Wed. Jan. 14   Group processes, team building, and team management
Guest lecture by Lil Blume, Consultant and lecturer on interpersonal communications
Readings TBA

Fri., Jan. 16   Discussion of Assignment 2, idea and proposal presentation
*   Brainstorming, group process discussion, assistance with group formation*

Mon., Jan. 19   User-centred design; iterative design
[BGBG] J.D. Gould, How to Design Usable Systems, 93-116
[Winograd] T. Winograd, The Apple Computer Interface Design Project, 185-189

Wed., Jan. 21   Learning from design
[BGBG] D. Norman, The Psychopathology of Everyday Things, 1-33
[Winograd] Ch. 9, D. Schon and J. Bennett, Reflective Conversation with Materials, 171-184
[Winograd] Ch. 11, S. Gal, Footholds for Design, 215-227

Fri., Jan. 23   Introduction to Assignment 3, concept development; idea presentations

Mon., Jan. 26   Design methodologies; design principles
[BGBG] Chapter 2, Design and Evaluation (part), 73-80 (top of 1st column)
[Winograd] T. Winograd, Macintosh Human Interface Guidelines, 81-85
[Winograd] Ch. 6, P. Denning and P. Dargan, Action-Centered Design, 105-119
[Winograd] P. Denning and T. Winograd, Business-Process Mapping, 121-127

Wed., Jan. 28   Understanding users and their needs; involving users in design
[BGBG] C. Lewis and J. Rieman, Chapter 2, Getting to Know Users and their Tasks, 122-127
[Winograd] Ch. 13, L. DeYoung, Organizational Support for Software Design, 253-267
[Winograd] L. DeYoung and T. Winograd, Quicken, 268-271
[Winograd] Ch. 14, S. Kuhn, Design for People at Work, 273-289
[Winograd] S. Kuhn and T. Winograd, Participatory Design, 290-294

Fri., Jan. 30   Discussion of Assignment 2; presentations of "A Day in the Life" scenarios

Mon., Feb. 2   Interdisciplinary design, envisionment, and prototyping
[BGBG] L. Vertelney, Using Video to Prototype User Interfaces, 142-146
[Laurel] S. Kim, Interdisciplinary Collaboration, 31–45
[Winograd] Ch. 10, M. Schrage, Cultures of Prototyping, 191-205
[Winograd] T. Winograd, HyperCard, Director, and Visual Basic, 206-213

Wed., Feb. 4   Metaphors and mental models
[BGBG] T. Erickson, Working with Interface Metaphors, 147-151
[Winograd] Ch. 2, D. Liddle, Design of the Conceptual Model, 17-31
[Winograd] T. Winograd, The Alto and the Star, 32-36
[Winograd] T. Winograd, The Spreadsheet, 228-231

Fri., Feb. 6   Introduction to Assignment 4, prototyping, and Director as a prototyping medium
                    Presentations of "A Day in the Life" scenarios

Mon., Feb. 9   Interactive systems technology

Wed., Feb. 11   Interaction techniques and dialogue styles 1
[BGBG] B. Shneiderman, A Taxonomy ... of Interaction Styles, 401-410
[BGBG] A. Marcus, A Comparison of Graphical User Interfaces, 457-468

Fri., Feb. 13   More on Director; Discussion of assignment 3

Feb. 16-20   READING WEEK

Mon., Feb. 23   Interaction techniques and dialogue styles 2
[BGBG] Chapter 7, Touch, Gesture, and Marking, 1-17
[BGBG] E. Bier, et al., A Taxonomy of See-Through Tools, 517-523
[Laurel] G. Kurtenbach & E. Hulteen, Gestures in Human-Computer Communication, 309-317

Wed, Feb. 25   Interaction via animation, video, hypertext, and multimedia
[Laurel], R.M. Baecker & I. Small, Animation at the Interface, 251-267
[BGBG] R.M. Baecker, I. Small, & R. Mander, Bringing Icons to Life, 444-449
[Winograd] T. Winograd, Kid Pix, 58-61
[BGBG] Chapter 13, Hypertext and Multimedia
[Winograd] T. Winograd, Mosaic and the World Wide Web, 100-104

Fri., Feb. 27   Student presentations and discussion

Mon.., Mar. 2   Interaction via speech and non-speech audio
[BGBG] Chapter 8, Speech, Language, and Audition, 1-15
[Laurel] S.J. Mountford & W. Gaver, Talking and Listening to Computers, 319-334
[BGBG] W. Gaver and R. Smith, Auditory Icons in Large Scale Collaborative Environments, 564-569

Wed.., Mar. 4   NO CLASS

Fri., Mar. 6   Introduction to Assignment 5, user testing; Student presentations and discussion

Mon.., Mar. 9   System and interface observation and evaluation
[BGBG] Chapter 2, Design and Evaluation (part), 80-89

Wed.., Mar. 11   Usability testing
[Laurel] K. Gomoll, Some Techniques for Observing Users, 85–90
[BGBG] S. Kennedy, Using Video in the BNR Usability Lab, 92-95

Fri., Mar. 13   Student presentations and discussion; discussion of assignment 4

Mon., Mar. 16   Graphic design, typography, and colour
[BGBG] Chapter 6, Vision, Graphic Design, and Visual Display, 411-419
[BGBG] A. Marcus, Principles of Effective Visual Communication for GUI Design, 425-441
[BGBG] G. Murch, Colour Graphics — Blessing or Ballyhoo (part), 442-443
[Winograd] Ch. 3, G. Crampton Smith and P. Tabor, The Role of the Artist-Designer, 37-57

Wed., Mar. 18   Data display and visualization
[Tufte] Ch. 1, 13–20 (2nd par.); 28–31; 46 (last par.)–51; Ch. 2, 53–9; Ch. 4, 91-5; Ch. 5, 107-21 (skim)

Fri., Mar. 20   Intro to Assignment 6, further iterative design; student presentations and discussion

Mon., Mar. 23   Industrial design
[Winograd] Ch. 8, D. Kelley and B. Hartfield, The Designer's Stance, 151-164
[Winograd] B. Hart field and T. Winograd, IDEO, 165-170
[Laurel] L. Vertelney & S. Booker, Designing the Whole-Product User Interfaces, 57–63

Wed., Mar. 25   The extended interface: training, documentation, error handling, help systems
[BGBG] Chapter 10, Designing to Fit Human Capabilities
[BGBG] C. Lewis & D. Norman, Designing for Error, 686-697
[BGBG] A. Sellen & A. Nicol, Building User-centred On-line Help, 718-723
[BGBG] J. Carroll & R. Mack, Learning ... a Word Processor: By Doing, By Thinking, ..., 698-717

Fri., Mar. 27   Student presentations and discussion

Mon., Mar. 30   The extended interface: ergonomics and the physical environment
[BGBG] S. Sauter, L. Chapman, & S. Knutson, Improving VDT Work (part), 738-737
[Winograd] Ch. 12, D. Norman, Design as Practiced, 233-247
[Winograd] L. DeYoung and T. Winograd, 248-251

Wed., Apr. 1   The extended interface: computing for special needs
Readings TBA

Fri., Apr. 3   Student presentations and discussion; discussion of Assignment 5

Mon., Apr. 6   Research frontiers: speech and natural language interfaces
[BGBG] G. White, Natural Language Understanding and Speech Recognition, 554-563

Wed., Apr. 8   Research frontiers: interfaces for 3D spatial design and visualization
[BGBG], Chapter 14, Cyberspace, 897-906

Fri., Apr. 10   Question and answer, review for final exam

THE PROJECT

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 the elderly. The job of each project team is to conceive, design, prototype, and evaluate a novel approach to this design problem.

ASSIGNMENTS, DUE DATES, AND METHODS OF EVALUATION

Assignment 1
Handed out: Monday, January 5, 1:10 p.m.
Due back in: Sunday, January 11, **4 p.m. !!! (contributed only to newsgroup**)
Description: Brainstorming ideas for term project

Assignment 2
Handed out: Monday, January 12, 1:10 p.m.
Due back in: Thursday, January 22, **4 p.m. !!! (paper, also contributed to newsgroup**)
Description: One page description of term project; list of team members

Assignment 3
Handed out: Monday, January 19, 1:10 p.m.
Due back in: Friday, February 6, 1:10 p.m. **(paper, also linked/posted to class Web site**)
Description: Concept development for computational media design

Assignment 4
Handed out: Monday, February 2, 1:10 p.m.
Due back in: Friday, March 6. 1:10 p.m. **(paper, also linked/posted to class Web site**)
Description: Design and prototyping of interactive computer system

Assignment 5
Handed out: Monday, March 2, 1:10 p.m.
Due back in: Friday, March 27, 1:10 p.m.   **(paper, also linked/posted to class Web site**)
Description: Usefulness and usability evaluation of prototype system

Assignment 6
Handed out: Monday, March 23, 1:10 p.m.
Due back in: Friday, April 10, 1:10 p.m.   **(paper, also linked/posted to class Web site**)
Description: Further iterative design, prototyping, and evaluation of prototype system

Assignment 7 (part of class participation)
Handed out: Monday, January 12
Due back in: Sign up early for a tutorial date between Jan. 23 and Apr. 3
Description: 3 minute oral presentation of one key issue in one assignment

Assignment 8 (part of class participation)
Handed out: Monday, January 19
Due back in: Friday, March 13
Description: Participation in computer conference; each student must submit **at least** 2 thoughtful contributions

Optional assignment 9 (part of class participation)
Handed out: Monday, March 16
Due back in: Friday, April 10, 1 p.m.
Description: 5 minute presentations of the most promising 8 projects to a review panel
                    consisting of the instructor, the teaching assistants, and 2 to 4 additional local
                    expert designers and individuals knowledgeable about senior citizen needs

GRADING

Assignment 1	2%	individual grade
Assignment 2	2%	group grade
Assignment 3	12%	group grade
Assignment 4	12%	group grade
Assignment 5	12%	group grade
Assignment 6	12%	group grade
Class participation	15% (including Assignments 7-9)	individual grade
FINAL EXAM	33%	individual grade

Late assignments — IMPORTANT NOTE
Up to 7 school days late   **Subtract 7% of grade per day**
More than 7 school days late   **No credit**

Final exam — IMPORTANT NOTE
Independent of your term marks, you must achieve a grade of at least 37.5% on the final exam in
to order to pass the course.

Written work

Assignments 1-6 will include written work.

All written assignments must be typed and submitted on 8.5"X11" paper (and also submitted
electronically to the class newsgroup 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 contain a one paragraph executive summary of the document, and a table of
contents.

Why is this? 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. Your work
must reflect competence in these skills.

**If you need help, please consult a college writing labs. We will distribute
information on how to find your lab.**

FACILITIES

We will use PCs augmented with special I/O hardware, Macromedia Director for prototyping, and multimedia software. Virtual U software will be used for Web-based computer conferencing. Further details will be supplied.

COURSE STAFF

Ronald Baecker is Professor of Computer Science, Electrical and Computer Engineering, and Management at the University of Toronto, and Director of the Knowledge Media Design Institute of the University. 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 is the author or co-author of four books, *Readings in Human-Computer Interaction: A Multidisciplinary Approach*, *Human Factors and Typography for More Readable Programs*, *Readings in Groupware and Computer-Supported Cooperative Work: Facilitating Human-Human Collaboration*, and *Readings in Human-Computer Interaction: Toward the Year 2000*; two published videotapes, *Sorting Out Sorting* and *The Dynamic Image*; and over 100 technical publications and presentations. He has a B.S., M.S., and Ph.D. from MIT.

Diba Bot, a CS graduate of U of T and an alumnus of CSC318, is an interface designer at IBM.

Scott Mackie, a CS graduate of U of T and an alumnus of CSC318, is a Web and multimedia consultant.

Agnes Ouelette, a Landscape Architecture graduate of U of T and an alumnus of CSC318, is a member of the Collaborative Multimedia Research Group.

Jade Rubick, who has bachelor's degrees in Computer Science, Japanese, and Far Eastern Studies from the University of Oregon, is a CS master's student specializing in human-computer interaction.

GUEST LECTURERS

Lillian Blume has taught English and interpersonal communications at Mohawk College and McMaster University, and is a lecturer and consultant specializing in interpersonal communications.

John Danahy is Professor of Landscape Architecture and Director of the Centre for Landscape Research.

Ann Remmel has been Director, Education and Organizational Development, for the Baycrest Home for the Aged, and is just starting a new job at the Bank of Montreal.

Simon Treadwell is an Industrial Designer......