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


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:

The Readings Package may be purchased at Canadian Scholar’s Press Inc. (CSP), 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

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

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
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

[RP#9, BGBG] T. Erickson, Working with Interface Metaphors, 147-151
Choosing and evaluating metaphors
Functionality as user experience
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
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

[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

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 | Description: 3 min. oral presentation + 3 min. Q&A period on one key issue in one assignment |
GRADING

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo taken</td>
<td>1%</td>
<td>individual grade (0% or 1%)</td>
</tr>
<tr>
<td>Assignment 1</td>
<td>1%</td>
<td>individual grade (0% or 1%, not marked)</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>2%</td>
<td>group grade</td>
</tr>
<tr>
<td>Assignment 3</td>
<td>12%</td>
<td>group grade</td>
</tr>
<tr>
<td>Assignment 4</td>
<td>12%</td>
<td>group grade</td>
</tr>
<tr>
<td>Assignment 5</td>
<td>12%</td>
<td>group grade</td>
</tr>
<tr>
<td>Assignment 6</td>
<td>12%</td>
<td>group grade</td>
</tr>
<tr>
<td>Assignment 7</td>
<td>5%</td>
<td>individual grade</td>
</tr>
<tr>
<td>Class participation</td>
<td>8%</td>
<td>individual grade (includes project work, class participation)</td>
</tr>
<tr>
<td>FINAL EXAM</td>
<td>35%</td>
<td>individual grade</td>
</tr>
</tbody>
</table>

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#, 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.