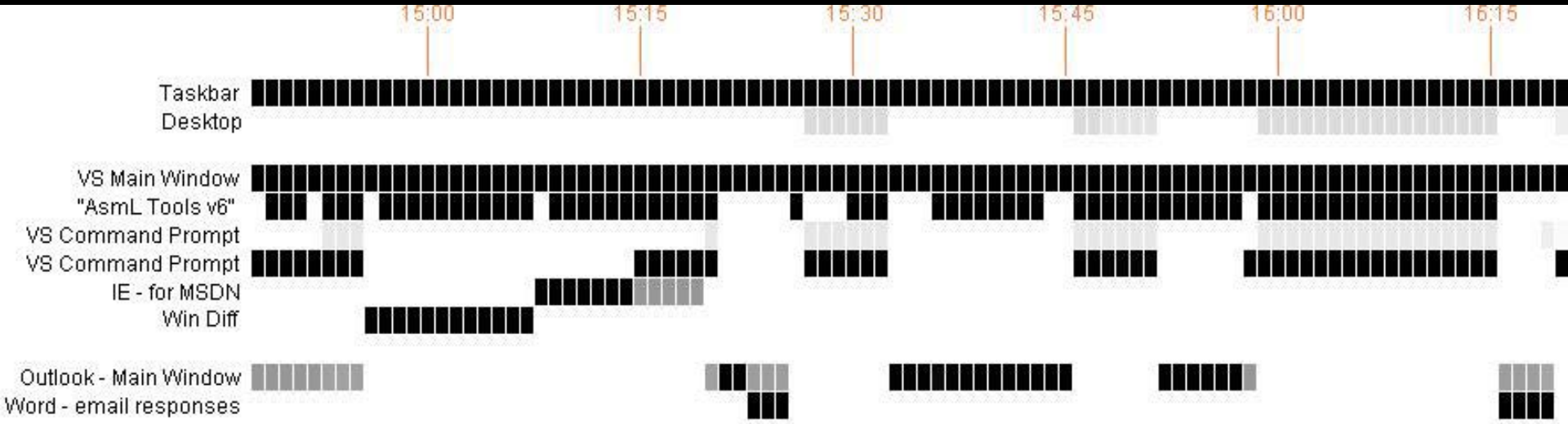
Revisiting Display Space Management

information interfaces

Understanding Current Practice to Inform Next-Generation Design


15:00
15:15
15:30
15:45
16:00
16:15
Taskbar
Desktop
VS Main Window
"AsmL Tools v6"
VS Command Prompt
VS Command Prompt
IE - for MSDN
Win Diff
Outlook - Main Window
Word - email responses

Designs	Studies
SCWM (2000)	Card *et al.* (1984)
CIWM (1993)	Gaylin (1986)
Rotating Windows (2001)	(!!!)
Non-overlap Drag (2000)	Grudin (2001)
QuickSpace (2003)	Ringel (2003)
	Czerwinski *et al.* (2003)

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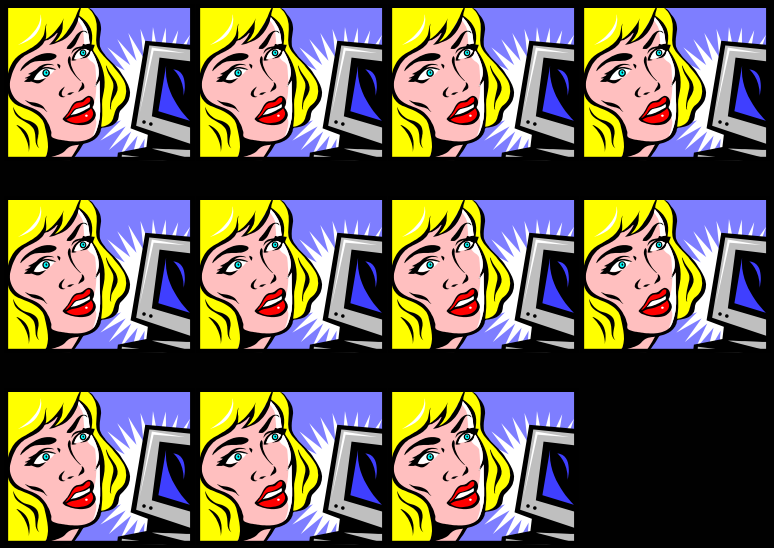
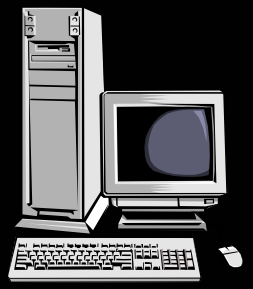
	Mynatt (1999)



Method

Structured, recorded interviews
Captured screen contents
20 participants (11 Female)

Machines



12

3

3

2

Window Managers

13 (7 + 6)

3

3 (2 + 1)

3 (2 + 1)

Roles

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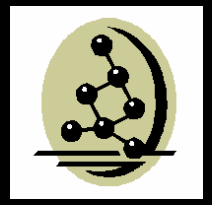
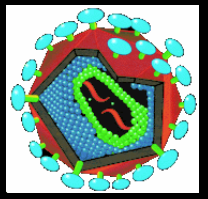
	1	5	
	1	2	
	2	2	
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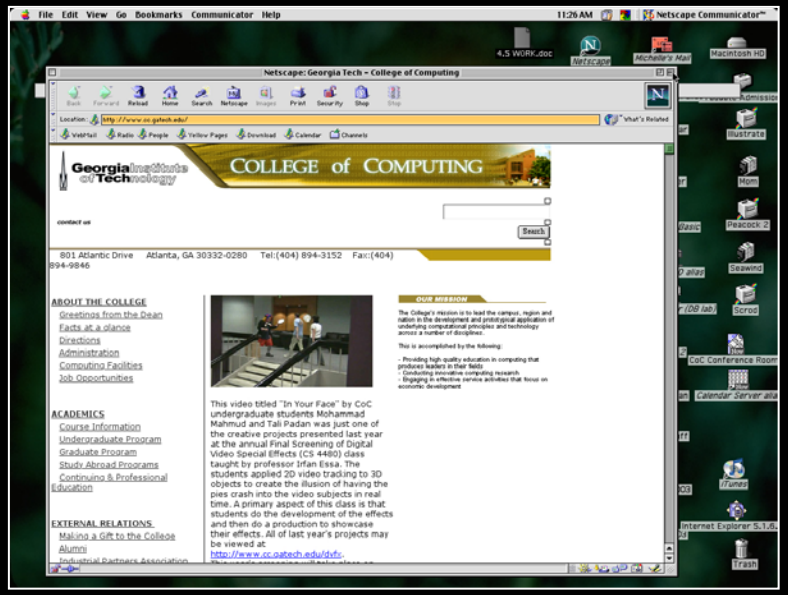
File Edit View Go Bookmarks Communicator Help
Netscape: Georgia Tech - College of Computing
Georgia Institute of Technology
COLLEGE of COMPUTING
ABOUT THE COLLEGE
Greetings from the Dean
Facts at a glance
Directions
Administration
Computing Facilities
Job Opportunities
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Undergraduate Program
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OUR MISSION
This video titled "In Your Face" by CoC undergraduate students Mohammad Mahmud and Tali Padan was just one of the creative projects presented last year at the annual Final Screening of Digital Video Special Effects (CS 4480) class taught by professor Irfan Essa. The students applied 2D video tracking to 3D objects to create the illusion of having the pies crash into the video subjects in real time. A primary aspect of this class is that students do the development of the effects and then do a production to showcase their effects. All of last year's projects may be viewed at
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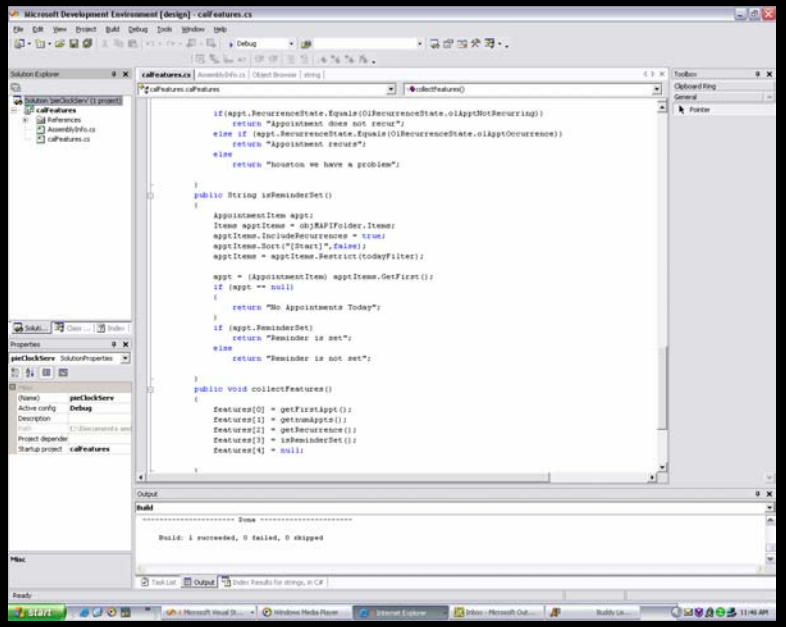
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calFeatures.cs
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public void collectFeatures()
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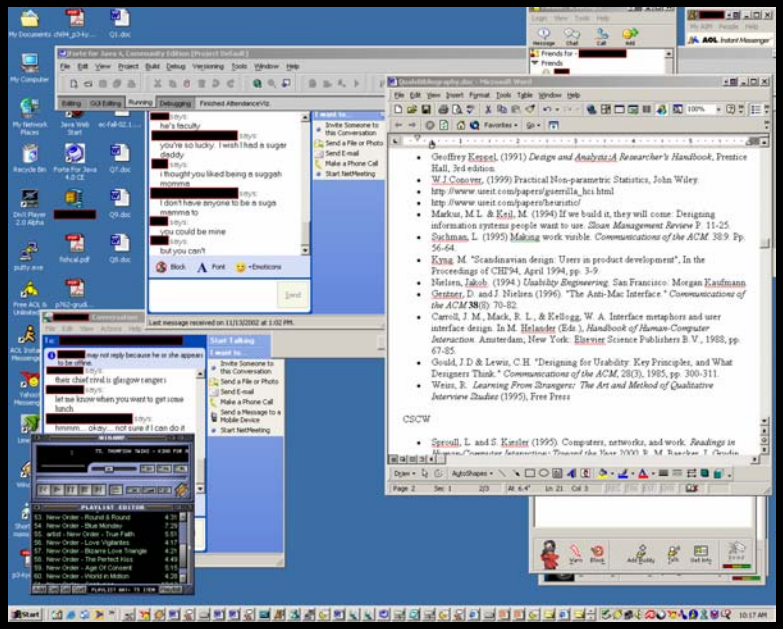
Geoffrey Keppel, (1991) Design and Analysis: A Researcher's Handbook, Prentice Hall, 3rd edition.
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http://www.uoit.com/papers/heuristic/
Markus, M.L. & Keil, M. (1994) If we build it, they will come: Designing information systems people want to use. Sloan Management Review P. 11-25.
Suchman, L. (1995) Making work visible. Communications of the ACM. 38:9. Pp. 56-64
Kyng, M. "Scandinavian design: Users in product development", In the Proceedings of CHI'94, April 1994, pp. 3-9.
Nielsen, Jakob. (1994.) Usability Engineering. San Francisco: Morgan Kaufmann
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Carroll, J. M., Mack, R. L., & Kellogg, W. A. Interface metaphors and user interface design. In M. Helander (Eds.), Handbook of Human-Computer Interaction. Amsterdam, New York: Elsevier Science Publishers B. V., 1988, pp. 67-85.
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Weiss, R. Learning From Strangers: The Art and Method of Qualitative Interview Studies (1995), Free Press
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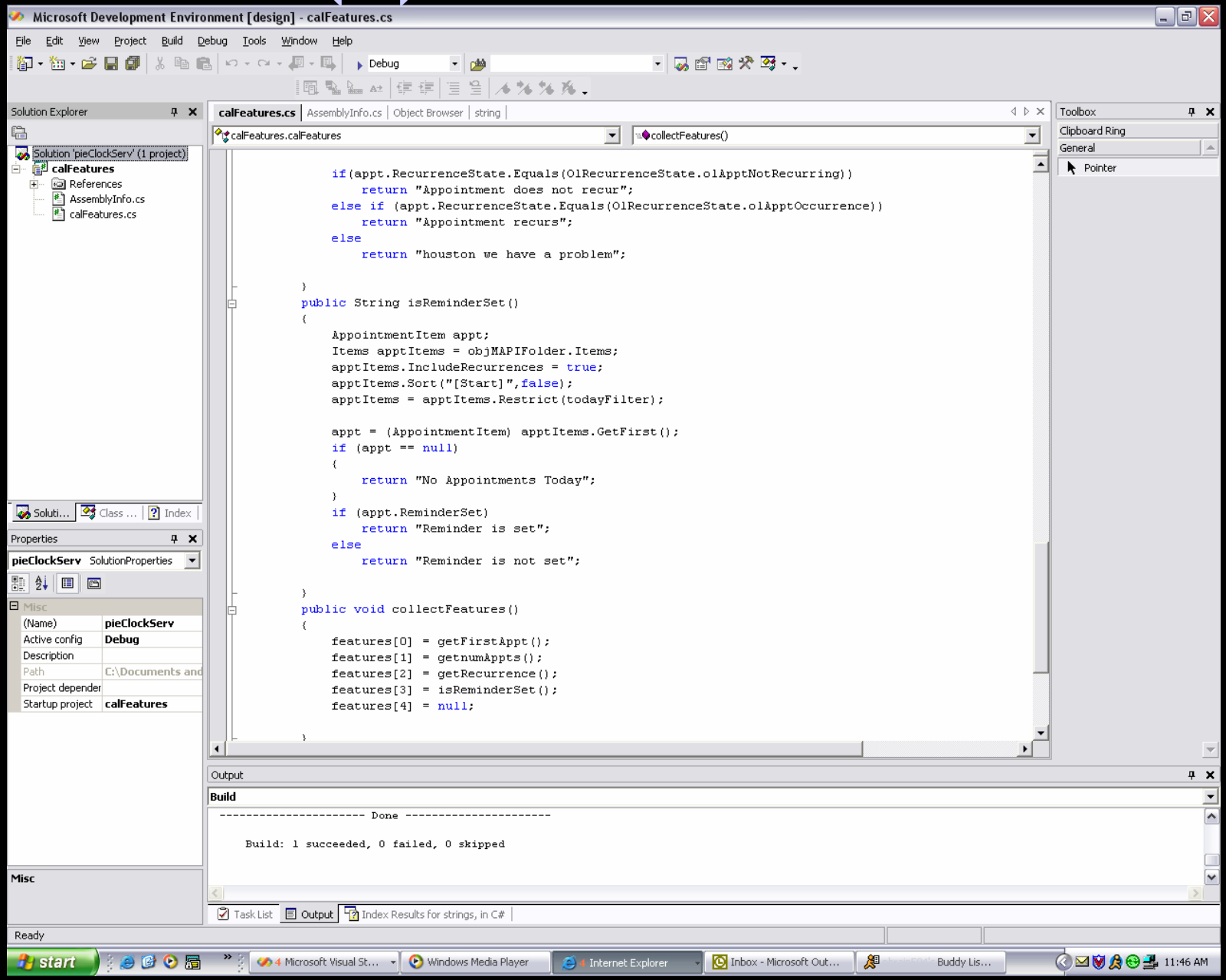
Sproull, L. and S. Kiesler (1995) Computers, networks, and work. Readings in

Maximizers (5)



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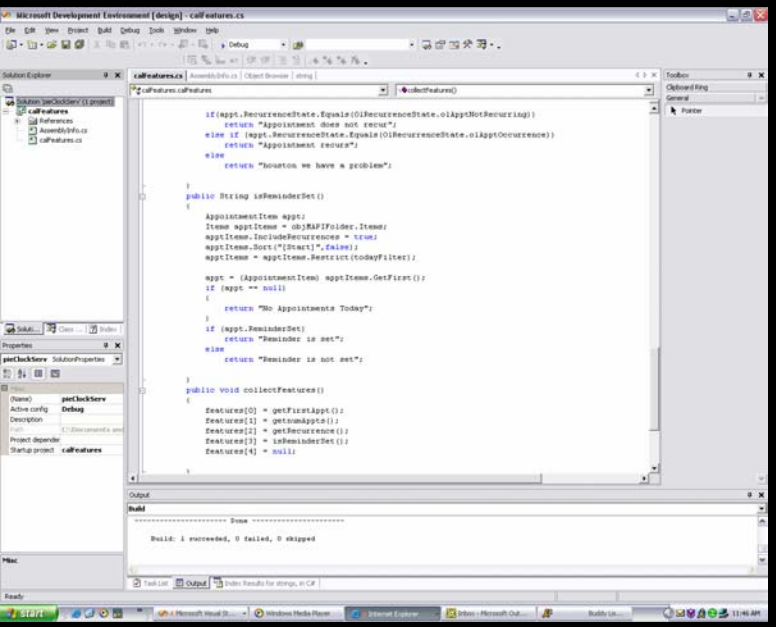
Acroba...
emacs...
images
17
Insert ...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calFeatures.cs
Solution Explorer
Properties
Output
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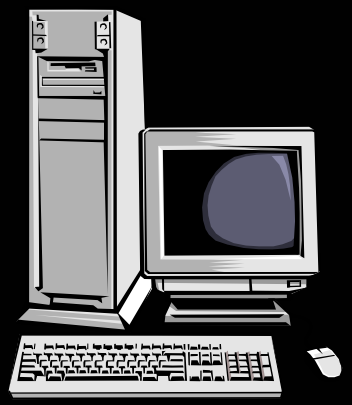
Ready



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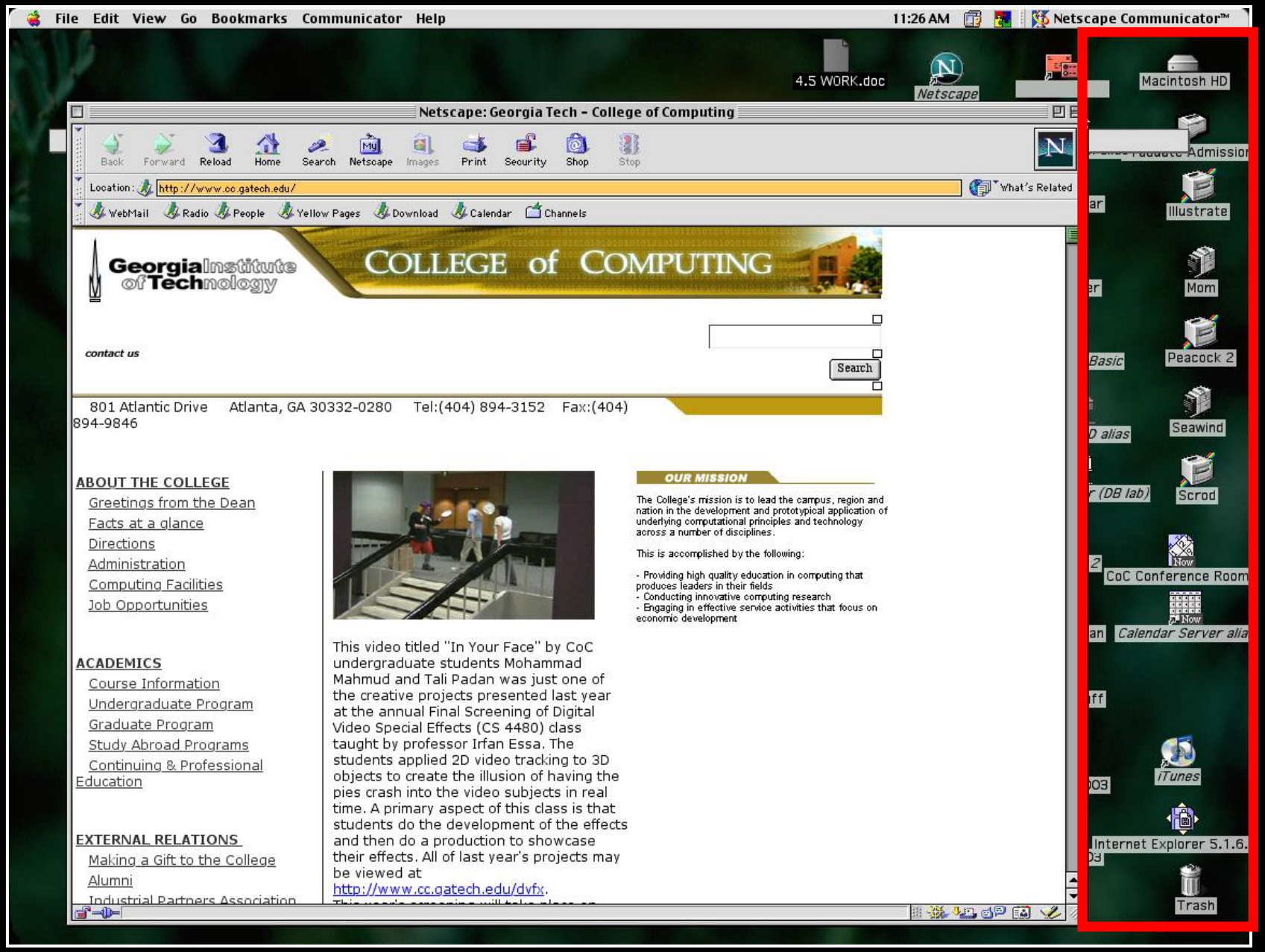

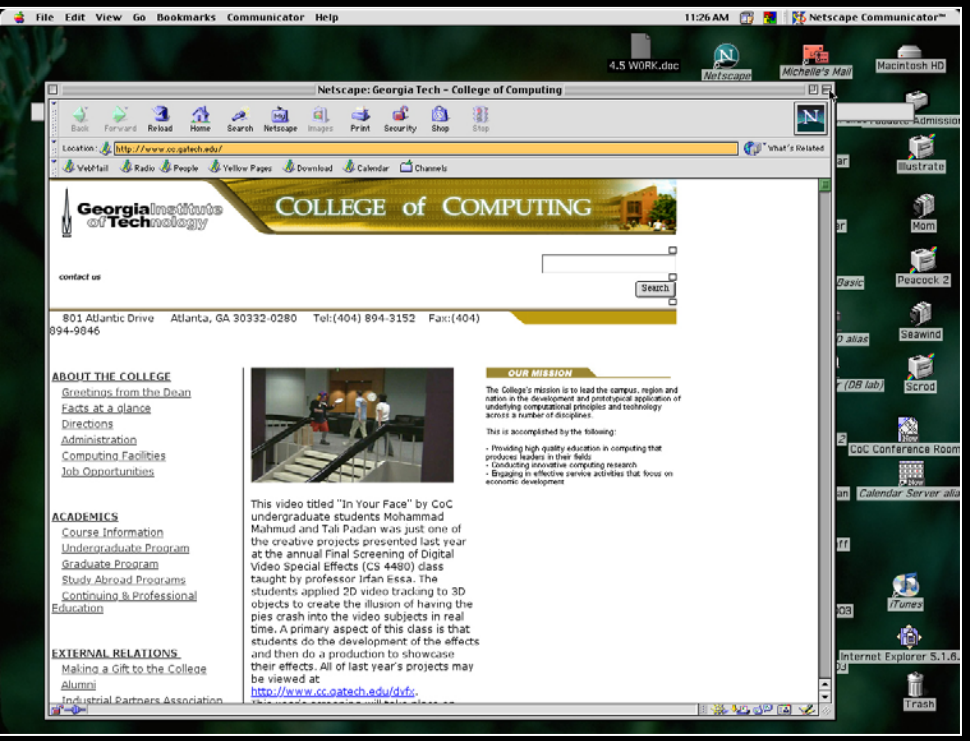
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11:26 AM
Netscape Communicator
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Netscape
Michelle's Mail
Macintosh HD
Netscape: Georgia Tech - College of Computing
Back Forward Reload Home Search Netscape Images Print Security Shop Stop
Location: http://www.cc.gatech.edu/
What's Related
Webmail Radio People Yellow Pages Download Calendar Channels
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801 Atlantic Drive Atlanta, GA 30332-0280 Tel:(404) 894-3152 Fax:(404) 894-9846
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This is accomplished by the following:
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- Conducting innovative computing research
- Engaging in effective service activities that focus on economic development
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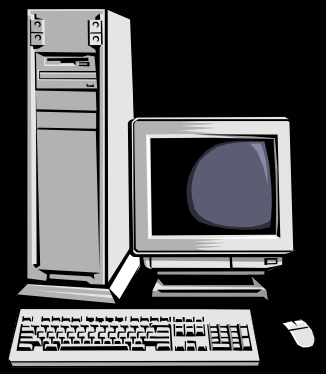
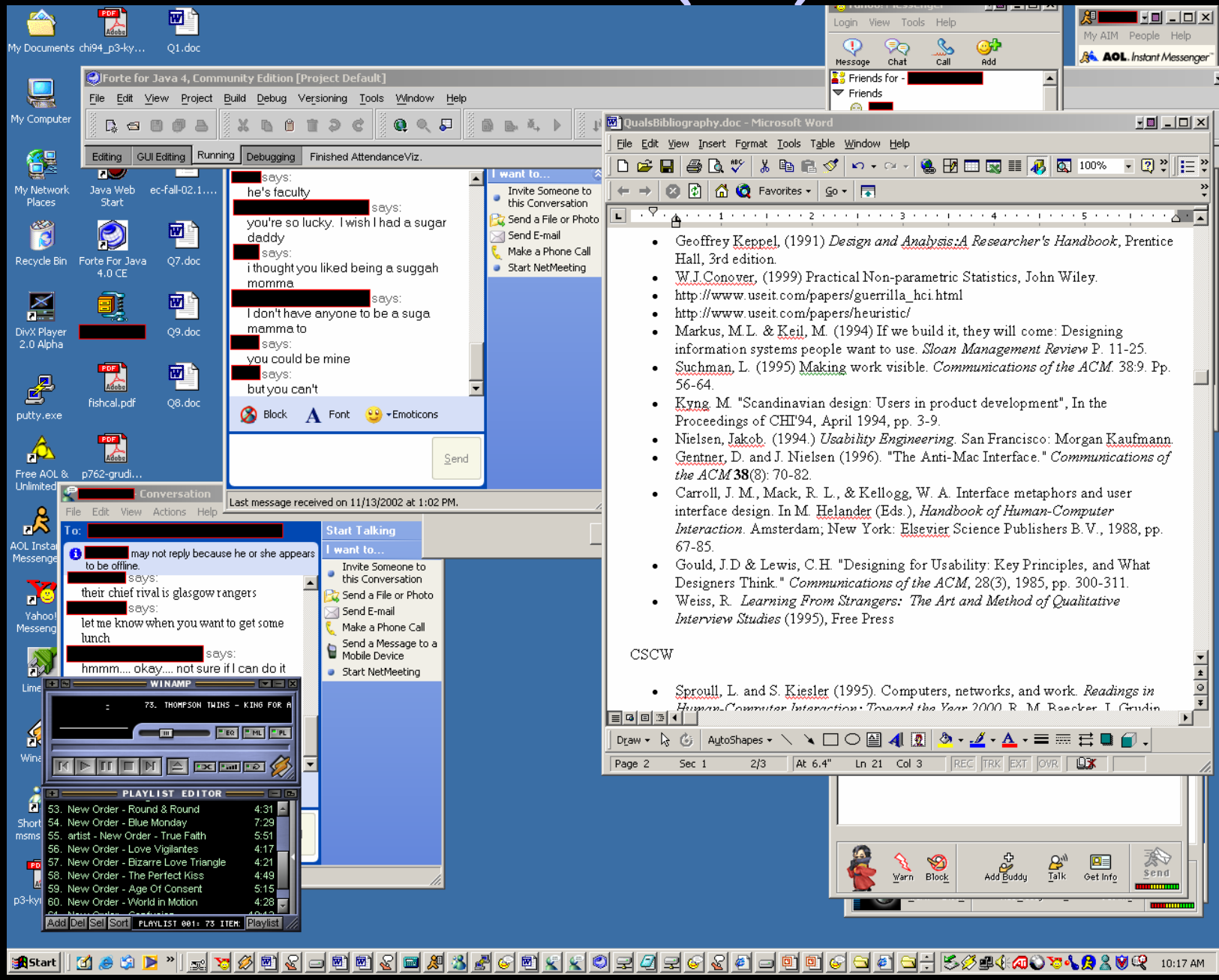
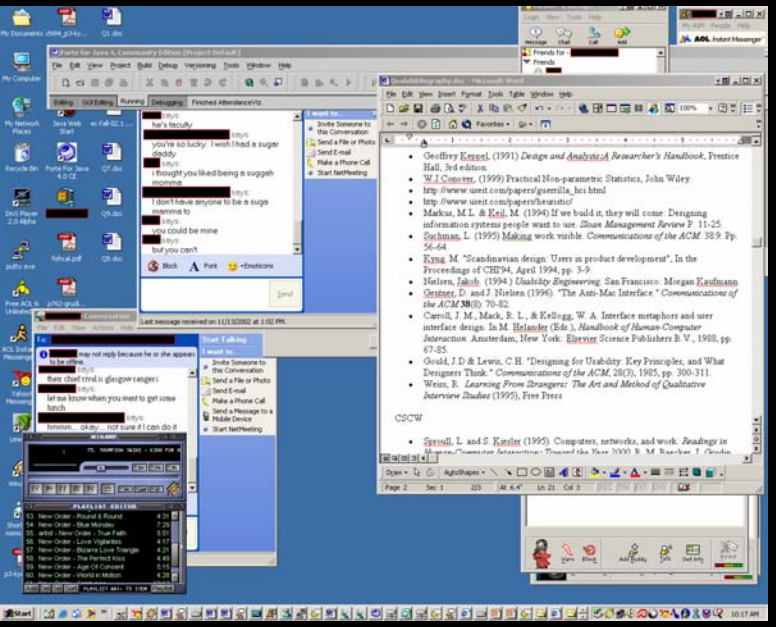
Admissions
Illustrate
Mom
Peacock 2
Seawind
Scrod
CoC Conference Room
Calendar Server alias
iTunes
Internet Explorer 5.1.6
Trash



Careful Coordinators (10)





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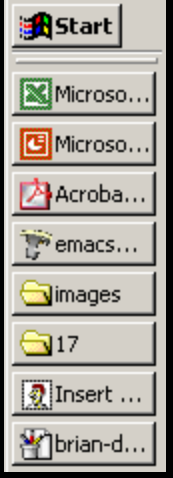
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17
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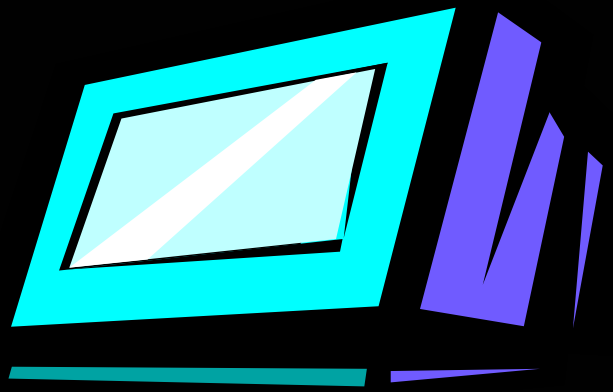
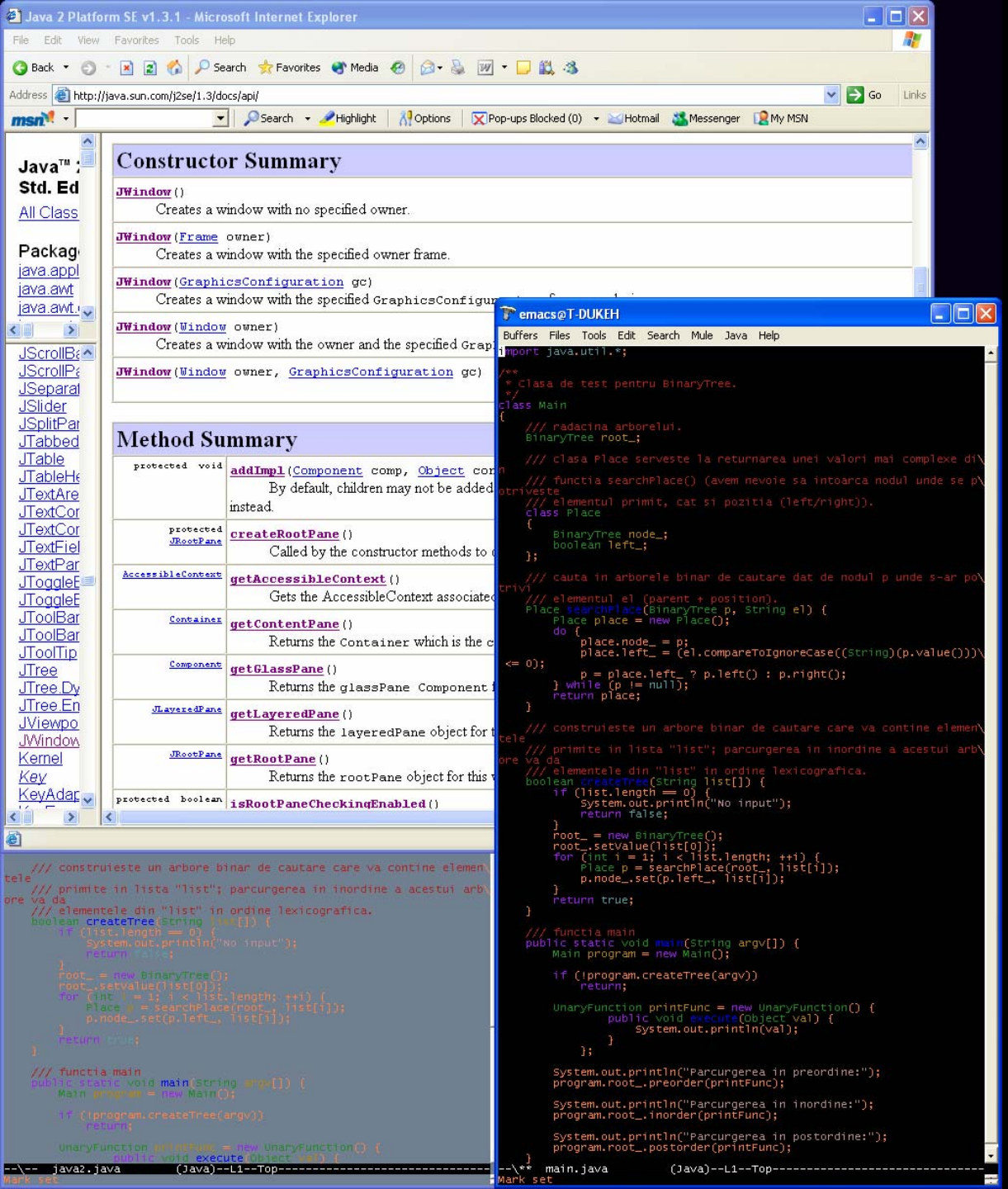


3 key findings - NMs and CCs

invisibility of information

desktop empty space

windows as reminders



user focus

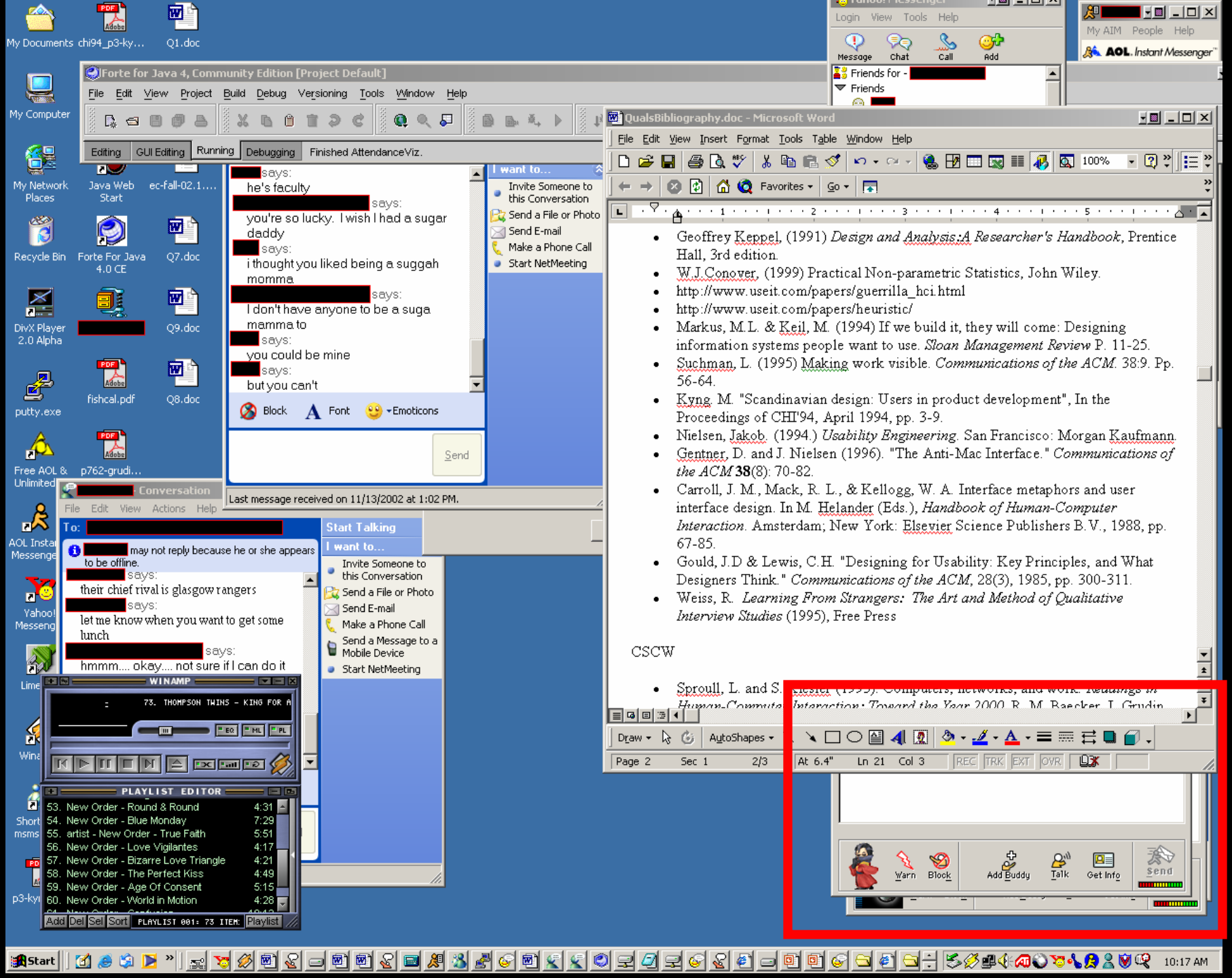
versus

input focus

invisibility

is as important as

visibility


My Documents
chi94_p3-ky...
Q1.doc
My Computer
My Network Places
Java Web Start
ec-fall-02.1....
Recycle Bin
Forte For Java 4.0 CE
Q7.doc
DivX Player 2.0 Alpha
Q9.doc
putty.exe
fishcal.pdf
Q8.doc
Free AOL & Unlimited
p762-grudi...
Forte for Java 4, Community Edition [Project Default]
File Edit View Project Build Debug Versioning Tools Window Help
Editing GUI Editing Running Debugging Finished AttendanceViz.
says:
he's faculty
says:
you're so lucky. I wish I had a sugar daddy
says:
i thought you liked being a suggah momma
says:
I don't have anyone to be a suga mamma to
says:
you could be mine
says:
but you can't
Block Font Emoticons
Send
I want to...
Invite Someone to this Conversation
Send a File or Photo
Send E-mail
Make a Phone Call
Start NetMeeting
Last message received on 11/13/2002 at 1:02 PM.
Conversation
File Edit View Actions Help
To:
may not reply because he or she appears to be offline.
says:
their chief rival is glasgow rangers
says:
let me know when you want to get some lunch
says:
hmmm.... okay.... not sure if I can do it
Start Talking
I want to...
Invite Someone to this Conversation
Send a File or Photo
Send E-mail
Make a Phone Call
Send a Message to a Mobile Device
Start NetMeeting
WINAMP
73. THOMPSON TWINS - KING FOR A
PLAYLIST EDITOR
53. New Order - Round & Round 4:31
54. New Order - Blue Monday 7:29
55. artist - New Order - True Faith 5:51
56. New Order - Love Vigilantes 4:17
57. New Order - Bizarre Love Triangle 4:21
58. New Order - The Perfect Kiss 4:49
59. New Order - Age Of Consent 5:15
60. New Order - World in Motion 4:28
Add Del Sel Sort PLAYLIST 001: 73 ITEM: Playlist
Login View Tools Help
Message Chat Call Add
Friends for -
Friends
My AIM People Help
AOL Instant Messenger
QualsBibliography.doc - Microsoft Word
File Edit View Insert Format Tools Table Window Help
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Geoffrey Keppel, (1991) Design and Analysis:A Researcher's Handbook, Prentice Hall, 3rd edition.
W.J.Conover, (1999) Practical Non-parametric Statistics, John Wiley.
http://www.useit.com/papers/guerrilla_hci.html
http://www.useit.com/papers/heuristic/
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Nielsen, Jakob. (1994.) Usability Engineering. San Francisco: Morgan Kaufmann.
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Weiss, R. Learning From Strangers: The Art and Method of Qualitative Interview Studies (1995), Free Press
CSCW
Sproull, L. and S.
Draw AutoShapes
Page 2 Sec 1 2/3
At 6.4" Ln 21 Col 3 REC TRK EXT OVR
Warn Block Add Buddy Talk Get Info Send
Start
10:17 AM

management styles and correlations to system types. Findings indicate the many facets of space management and can help designers and evaluators build for emerging display and interaction technologies.

Author Keywords
interview, window management, space management, multiple monitors, multiple desktops

ACM Classification Keywords
H.5.2 User Interfaces: Evaluation/Methodology, GUI, Windowing Systems

INTRODUCTION

The personal computer (PC) has undergone dramatic changes over the past 25 years. The huge gains in processor speed and physical memory and the popularity of the Internet have allowed people to use computers in an astonishing variety of ways. Throughout this period, the desktop, and its related window system, have changed very little. Many organizations and individuals have built a variety of window managers and interaction techniques to help users allocate space to windows and information, but few have been formally evaluated. Furthermore, because of a very small number of studies of the actual practices of

meaning that smaller displays will still be used as we move forward. This situation creates an interesting challenge for emerging space mangers: the ability to effectively manage a large display space while still being relevant to the small display areas that have dominated interaction. Having a thorough understanding of space management practices will also help the transition to fledgling input technologies such as voice recognition, eye-gaze tracking, and even brain-based communication, all of which have the potential to become everyday interaction methods.

In this paper we present results from a study of 20 users of various window managers and display configurations. After discussing related work, the details of the study, and some definitions, we give a classification of our participants' management styles. The majority of this paper examines the general management principles discovered in the interviews, with implications for design and evaluation shown for each principle. Finally, we suggest directions for future work in space management.

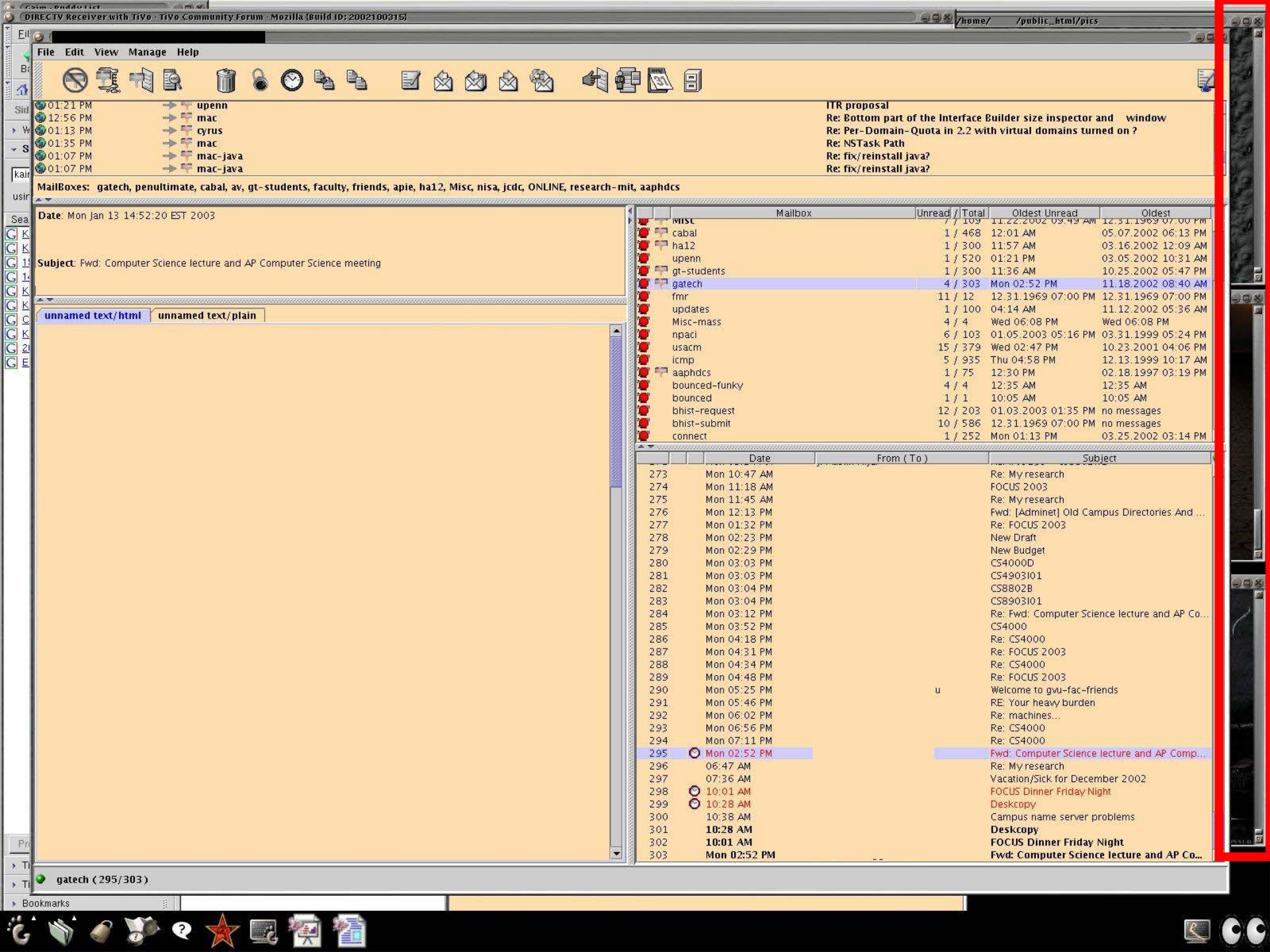
RELATED WORK

The idea of understanding and evaluating window management practices is certainly not new; Gaylin [6] *and* Bly and Rosenberg [3] are examples of each, respectively. Beyond these works from 1986 however, recent work tends to focus on particular types of displays, not general practices. Grudin studies multiple-monitor users [7] and Ringel compares them to multiple-desktop users [14]. Mynatt [12] *and* Perry and O'Hara [13] use interviews and

Page 1 Sec 1 1/8 At Ln Col REC TRK EXT OVR

- Introduction
  - Don't forget to outline paper
- Related Work
  - Studies – Bly, Gaylin, Czerwinski
  - Large Display Interaction – Guimbretiere
  - Window Managers
    - Real World
    - Specific Evaluations

Page 1 Sec 1 1/1 At 2.9" Ln 11 Col 32 REC TRK EXT OVR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01:21 PM upenn ITR proposal
12:56 PM mac Re: Bottom part of the Interface Builder size inspector and window
01:13 PM cyrus Re: Per-Domain-Quota in 2.2 with virtual domains turned on ?
01:35 PM mac Re: NSTask Path
01:07 PM mac-java Re: fix/reinstall java?
01:07 PM mac-java Re: fix/reinstall java?
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unnamed text/plain
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upenn 1 / 520 01:21 PM 03.05.2002 10:31 AM
gt-students 1 / 300 11:36 AM 10.25.2002 05:47 PM
gatech 4 / 303 Mon 02:52 PM 11.18.2002 08:40 AM
fmr 11 / 12 12.31.1969 07:00 PM 12.31.1969 07:00 PM
updates 1 / 100 04:14 AM 11.12.2002 05:36 AM
Misc-mass 4 / 4 Wed 06:08 PM Wed 06:08 PM
npaci 6 / 103 01.05.2003 05:16 PM 03.31.1999 05:24 PM
usacm 15 / 379 Wed 02:47 PM 10.23.2001 04:06 PM
icmp 5 / 935 Thu 04:58 PM 12.13.1999 10:17 AM
aaphdcs 1 / 75 12:30 PM 02.18.1997 03:19 PM
bounced-funky 4 / 4 12:35 AM 12:35 AM
bounced 1 / 1 10:05 AM 10:05 AM
bhist-request 12 / 203 01.03.2003 01:35 PM no messages
bhist-submit 10 / 586 12.31.1969 07:00 PM no messages
connect 1 / 252 Mon 01:13 PM 03.25.2002 03:14 PM
Date From (To) Subject
273 Mon 10:47 AM Re: My research
274 Mon 11:18 AM FOCUS 2003
275 Mon 11:45 AM Re: My research
276 Mon 12:13 PM Fwd: [Adminet] Old Campus Directories And ...
277 Mon 01:32 PM Re: FOCUS 2003
278 Mon 02:23 PM New Draft
279 Mon 02:29 PM New Budget
280 Mon 03:03 PM CS4000D
281 Mon 03:03 PM CS4903I01
282 Mon 03:04 PM CS8802B
283 Mon 03:04 PM CS8903I01
284 Mon 03:12 PM Re: Fwd: Computer Science lecture and AP Co...
285 Mon 03:52 PM CS4000
286 Mon 04:18 PM Re: CS4000
287 Mon 04:31 PM Re: FOCUS 2003
288 Mon 04:34 PM Re: CS4000
289 Mon 04:48 PM Re: FOCUS 2003
290 Mon 05:25 PM u Welcome to gwu-fac-friends
291 Mon 05:46 PM RE: Your heavy burden
292 Mon 06:02 PM Re: machines...
293 Mon 06:56 PM Re: CS4000
294 Mon 07:11 PM Re: CS4000
295 Mon 02:52 PM Fwd: Computer Science lecture and AP Comp...
296 06:47 AM Re: My research
297 07:36 AM Vacation/Sick for December 2002
298 10:01 AM FOCUS Dinner Friday Night
299 10:28 AM Deskcopy
300 10:38 AM Campus name server problems
301 10:28 AM Deskcopy
302 10:01 AM FOCUS Dinner Friday Night
303 Mon 02:52 PM Fwd: Computer Science lecture and AP Co...
gatech (295/303)
Bookmarks

invisibility of information

past: SCWM, Rotating Windows

future: users will hide information regardless of display configuration

sometimes

empty space

isn’t empty at all

File Edit View Go Bookmarks Communicator Help 11:26 AM Netscape Communicator™

4.5 WORK.doc Netscape Macintosh HD

Netscape: Georgia Tech - College of Computing

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- Continuing & Professional Education

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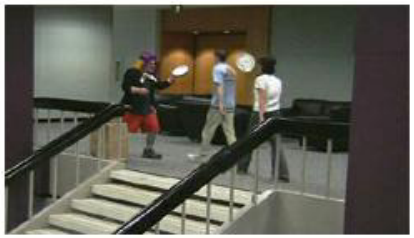
- Industrial Partners Association



This video titled "In Your Face" by CoC undergraduate students Mohammad Mahmud and Tali Padan was just one of the creative projects presented last year at the annual Final Screening of Digital Video Special Effects (CS 4480) class taught by professor Irfan Essa. The students applied 2D video tracking to 3D objects to create the illusion of having the pies crash into the video subjects in real time. A primary aspect of this class is that students do the development of the effects and then do a production to showcase their effects. All of last year's projects may be viewed at http://www.cc.gatech.edu/dvfx.

OUR MISSION

The College's mission is to lead the campus, region and nation in the development and prototypical application of underlying computational principles and technology across a number of disciplines.

This is accomplished by the following:

- Providing high quality education in computing that produces leaders in their fields
- Conducting innovative computing research
- Engaging in effective service activities that focus on economic development

Illustrate Mom Peacock 2 Seawind Scrod CoC Conference Room Calendar Server alia iTunes Internet Explorer 5.1.6. Trash

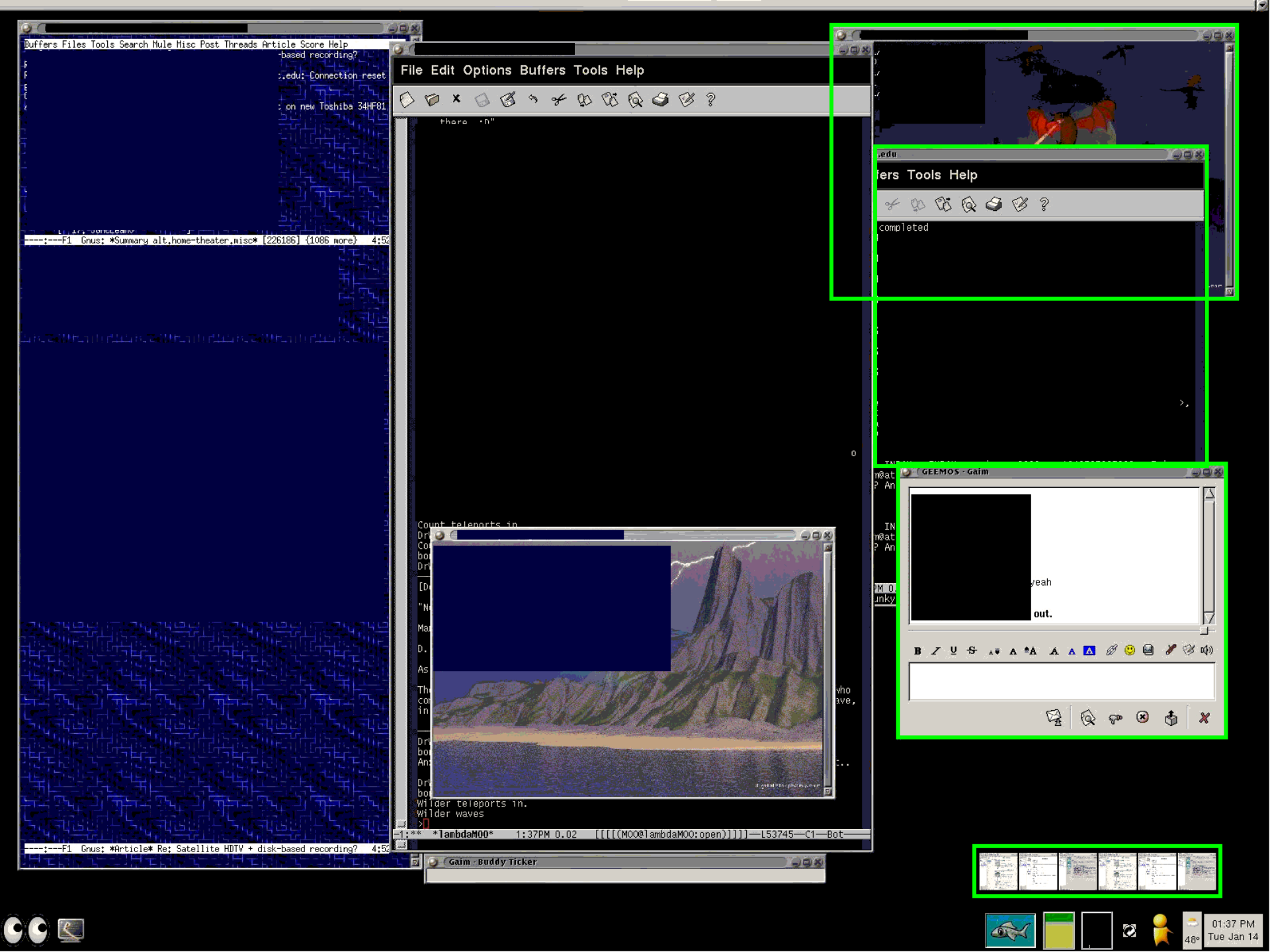
Desktop Empty Space

past: QuickSpace, Non-Ovp. Dragging

future: better use of “empty space” and “icon space” for multimon users

windows acting

as reminders


Buffers Files Tools Search Mule Misc Post Threads Article Score Help
-based recording?
.edu: Connection reset
on new Toshiba 34HF81
----:---F1 Gnus: *Summary alt.home-theater.misc* [226186] {1086 more} 4:52
----:---F1 Gnus: *Article* Re: Satellite HDTV + disk-based recording? 4:52
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Gaim - Buddy Ticker
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Tue Jan 14

Windows as Reminders

past: CIWM

future: more space engenders technique

Future Work

Georgia Institute of Technology
College of Computing

GVU center georgia tech

information interfaces

http://www.gvu.gatech.edu/ii

hutch @ cc.gatech.edu
stasko @ cc.gatech.edu