

Helping the User by Helping the Developer: The Role of Guidelines in a Multimedia Context

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Andrew, a computer system designed for use on campuses and in businesses around the country, was developed by the Information Technology Center (a joint endeavor between Carnegie Mellon University and IBM Corporation). The Andrew Toolkit provides tools for building applications within the system using multimedia insets, software packages which have been designed for the display and modification of various types of information. Insets which currently exist in Andrew include text, raster, table, animation, hyperlink, and calendar; other insets employing sound and video are under development.

Our objective in creating this set of guidelines was to describe and resolve user interface issues for inset development. The questions, "What happens, and why, within particular insets?" and "Are these behaviors consistent across insets?" guided our efforts. Our intent was to make multimedia insets within Andrew easier to use, as well as to encourage continued discussion of user interface policies for multimedia.

"How do I know where an inset begins and ends?"

"If I type, will the characters be entered in the table or text portion of the document?"

The screenshot shows a graphical user interface with several windows. The top window is a console window with a clock and system status. Below it is a typescript window showing a list of articles. To the right is a directory window containing a table of contacts and their photos.

1	2	3
Name	Address	Photo
2 Dan Boyarski	Room 221 Information Technology Center Carnegie Mellon University 4910 Forbes Avenue Pittsburgh, PA 15213-3890 dan@andrew.cmu.edu	
3 Pink Flamingo	Room 242 Information Technology Center Carnegie Mellon University 4910 Forbes Avenue Pittsburgh, PA 15213-3890 flamingo@andrew.cmu.edu	
4 Christina Haas	Room 221 Information Technology Center Carnegie Mellon University 4910 Forbes Avenue Pittsburgh, PA 15213-3890 ch@andrew.cmu.edu	

"How do I know if I can modify this document?"

"Is this a simple picture, or can I make the flamingo dance?"

"Will it all fit if I make the table smaller? Will I still be able to recognize the raster images?"

"How do I see if there is an entry for Maria Wadlow?"

"How would I add more rasters to the document?"

User Interface Design Principles

- **Consistency:**

Actions and objects should behave similarly across contexts. This consistency is crucial in creating a system which appears to users as a consolidated, working whole and enable users to transfer skills and concepts between applications.

"I like the way a click of the left button (of the mouse) makes a selection. It makes it easier to get up to speed on new programs I haven't seen before."

—Sophomore engineering major

- **Predictability:**

Consistency leads to a predictable system, a system in which users can anticipate computer behavior. We considered predictability to be vital in establishing a sense of trust, so that users feel comfortable using the system. Surprising behavior might be considered entertaining in a game, but it is frustrating and annoying in a tool.

"Somehow the table (inset) always comes up in the size, shape, and location that I expected it to. I don't even have to think about it — it just works."

—Graduate student writing her dissertation on-line

- **User locus-of-control:**

Priority was given to features which put certain kinds of decisions in the hands of the user. We believe that users are more comfortable and productive if they feel that they are in control.

"I like to arrange a document — and rearrange it — depending on the audience I'm addressing. For each document, I'm able to specify how much visual stuff there is at the beginning."

—Teacher and developer of educational software

- **Visual appeal:**

What the user sees is paramount, since much computer-human communication takes place in the visual realm. Visual appeal makes computer systems accessible and inviting.

"I get swept up in programs that are inviting — you know, attractive, clean. Time just flies — and work seems like play."

—English professor

- **Direct Manipulation:**

Users should have the sense that they are dealing directly with "real" objects, objects which — although they are two-dimensional on a computer screen — behave as objects in the users' prior experience might.

"Users should be able to feel that the actions they see on-line are really happening — that they can trust what they see and what they do."

—Developer working on the Andrew project

Applying Guidelines

Question: "If I type, will the characters be entered in the table or text portion of the document?"

Principles Employed:

- Locus-of-control
- Visual appeal
- Direct manipulation

Guideline: In order to do any work with an inset beyond displaying it, that inset must give some visual indication that it is currently accepting input. The inset which is accepting input is distinguished by: a border around the perimeter of the inset, menus appropriate to that inset and, in some cases, a cursor change.

1	2	3	4	5
Subjects/Scores	October	January	April	Average
2 A	88	89	92	89.67
3 B	60	72	76	69.33
4 C	43	54	56	51
5 D	90	83	94	91
6 Average	70.25	76	79.5	75.25

Subjects/Scores	October	January	April	Average
A	88	89	92	89.67
B	60	72	76	69.33
C	43	54	56	51
D	90	89	94	91
Average	70.25	76	79.5	75.25

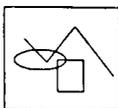
A table inset with and without input focus

Question: "How do I know where an inset begins and ends?"

- Consistency
- Direct manipulation
- Predictability
- Visual Appeal

Guideline: An inset's border should visually indicate to users that the inset may contain more information than they see and that they can scroll the inset. This border should be significantly distinct from the borders which surround dialog boxes, selected insets, and insets whose entire contents have been selected.

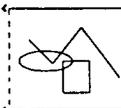
If we are trying to define a graphical scrolling mechanism, the most difficulty comes from representing the meaning.



has been addressed unsuccessfully by mouse makers for some time now. This

A

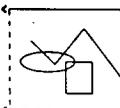
If we are trying to define a graphical scrolling mechanism, the most difficulty comes from representing the meaning.



has been addressed unsuccessfully by mouse makers for some time now. This

B

If we are trying to define a graphical scrolling mechanism, the most difficulty comes from representing the meaning.



has been addressed unsuccessfully by mouse makers for some time now. This

C

Border A: Default with input focus
Border B: Cropped on left with input focus
Border C: Cropped on left and bottom with input focus

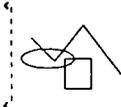
If we are trying to define a graphical scrolling mechanism, the most difficulty comes from representing the meaning.



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D

If we are trying to define a graphical scrolling mechanism, the most difficulty comes from representing the meaning.



has been addressed unsuccessfully by mouse makers for some time now. This

E

If we are trying to define a graphical scrolling mechanism, the most difficulty comes from representing the meaning.



has been addressed unsuccessfully by mouse makers for some time now. This

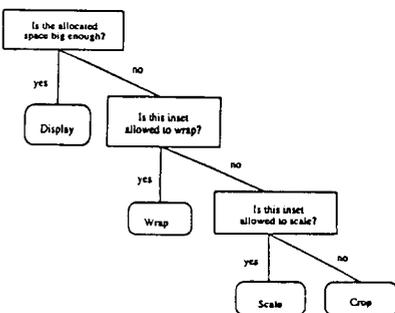
F

Border D: Default without input focus
Border E: Cropped on left without input focus
Border F: Cropped on left and bottom without input focus

Question: "Will it all fit if I make the table smaller? Will I still be able to recognize the raster images?"

- Consistency
- Predictability

Guideline: If, for some reason, the surrounding inset does not allocate sufficient space, then the inset must manipulate its representation of the data to fit within the space that has been allocated. All insets must be able to redisplay their contents in the event that they are given insufficient space.



A decision tree to assist developers in understanding how space allocation for insets should work

Maria G. Wadlow

Maria Wadlow manages the Human Factors Design Group and the Documentation Group at the Information Technology Center at Carnegie Mellon University. Maria is interested in understanding the role of computers in creation and design processes, specifically in the areas of information navigation, knowledge representation, communication, and individualized learning.

Christina Haas

Christina Haas is a Consultant for Interface Design at the Information Technology Center at Carnegie Mellon. She received a PhD in Rhetoric in 1987 and is interested in how computer technology impacts upon, and can be used to support, processes of communication: writing, reading, and managing information. She recently spent a year in Japan studying written, oral, and computer communication in Japanese companies.

Dan Boyarski

Dan Boyarski is a member of the Information Technology Center's Human Factors Design Group, as well as Associate Professor and Head of Graphic Design at Carnegie Mellon. Dan has been concentrating on the visual aspects of human-computer interaction in his work with Andrew, IBM, and Fitch RichardsonSmith.

Paul G. Crumley

Paul Crumley is a system designer at the Information Technology Center at Carnegie Mellon. He received his B.S. in Electrical Engineering from Carnegie Mellon in 1983. Paul takes a holistic approach to system design and includes human factors as a component in the system.