DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF TORONTO

CSC428F/2514F

HUMAN-COMPUTER INTERACTION

Lecture 14

USER INTERFACE STYLE GUIDELINES AND THE DEVELOPMENT PROCESS

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14.1 Model-based interface generation

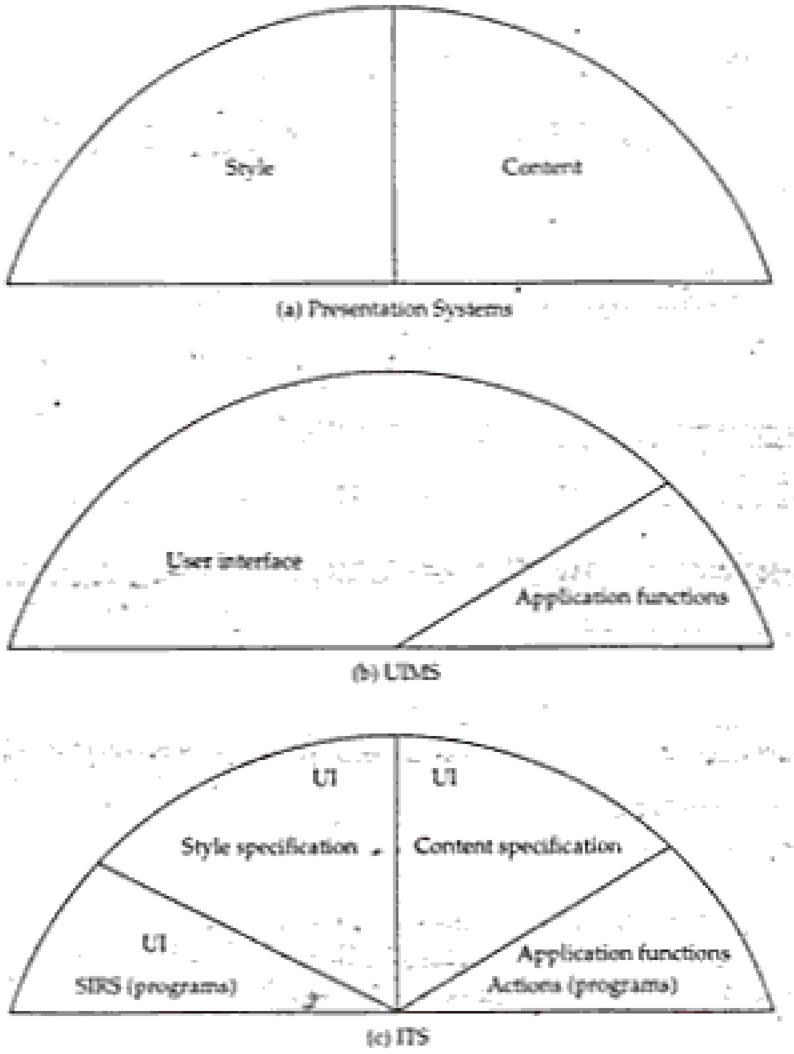
Usually called User Interface Management Systems
    High-level specification of interfaces
    Separation of application and interface code
    Often employ special-purpose languages (13.6)
    Some pioneering work done at Toronto (Buxton et al.)

Example: ITS from IBM Yorktown Hights (Wiecha et al., 1990
    in BGBG; other papers cited in 14.10)

14.2 ITS

Separation of interface and application (a la UIMS)
Separation of content and style (a la presentation system)
Schematic diagram (Figure 14.1)

Fig. 14.1 Schematic relationship of various development tools
(from Gould, et al., in Rudisill, et al.,1996, p. 178)



Schematic relationship of various development tools.

Action layer

Actions read and write data without concern for dialog control (i.e., sequencing and timing)

Communication between application and interface through passing values stored in *data tables*

External control, control resides with dialog manager

Actions written in C

Dialog layer (see Figures 14.2, 14.3)

Dialog includes the content of logical *frames* and the control flow among them

Dialog content specified in terms of *sessions*, *frames*, *lists*, *forms*, *choices*, *info*

Dialog *attributes* control actions executed, values set, messages displayed

Style rule layer

Style rules compose style programs (widgets) into interaction techniques

Control both presentation and interaction

Goals are both *consistency* and *identity*

Rules have *conditions* part and *results* part

Default attribute values, which can be overridden

Style rules can themselves generate dialog, e.g., default help and quit buttons

Example style rule (Fig. 14.4)

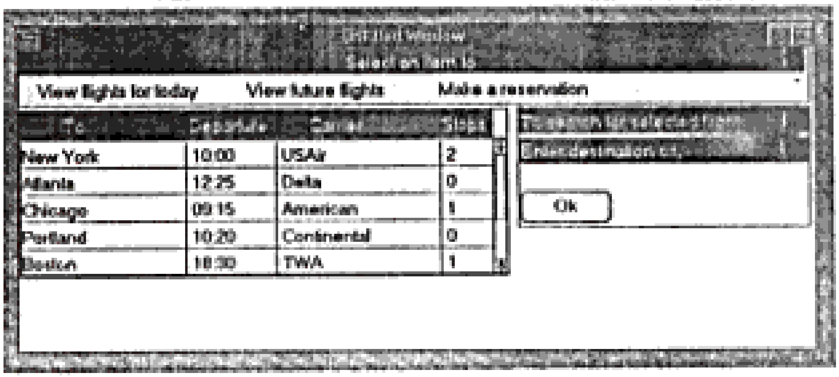
Style program layer

Examples are widgets for text formatting, tree layout, row and column table layout, circular menus, etc.

Importance of space negotiation among style programs that determine screen layout

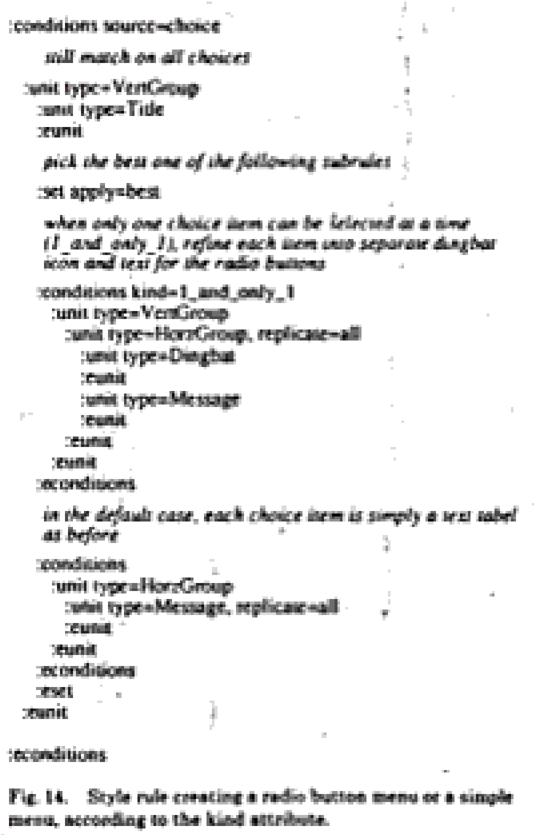
Fig. 14.2 Frame for viewing and selecting flights in example airline reservation kiosk (from Wiecha, et al., 1990, p. 215; BGBG, p. 378)

Fig. 14.3 Flight list and controls for selecting particular flights in the example airline reservation kiosk (from Wiecha, et al., 1990, p. 215; BGBG, p. 378)



To	Departure	Carrier	Stops
New York	10:00	USAir	2
Atlanta	12:25	Delta	0
Chicago	09:15	American	1
Portland	10:20	Continental	0
Boston	18:30	TWA	1

Fig. 14.4 Style rule creating a simple menu with title (from Wiecha, et al., 1990, p. 218; BGBG, p. 380)



```
:conditions source=choice

    still match on all choices

  :unit type=VertGroup
    :unit type=Title
    :eunit

    pick the best one of the following subrules

    :set apply=best

    when only one choice item can be selected at a time
    (1_and_only_1), refine each item into separate dingbat
    icon and text for the radio buttons

    :conditions kind=1_and_only_1
      :unit type=VertGroup
        :unit type=HorzGroup, replicate=all
          :unit type=Dingbat
          :eunit
          :unit type=Message
          :eunit
        :eunit
      :eunit
    :econditions

    in the default case, each choice item is simply a text label
    as before

    :conditions
      :unit type=HorzGroup
        :unit type=Message, replicate=all
        :eunit
      :eunit
    :econditions
    :eset
  :eunit

:econditions
```

Fig. 14. Style rule creating a radio button menu or a simple menu, according to the kind attribute.

14.3 ITS interface components and work roles

Recall multidisciplinary nature of the design of interactive systems and their interfaces

Actions	Application programmer
Dialog	Application (content) expert
Style rules	Style expert, e.g., graphic designer
Style programs	Style programmer

14.4 The Success of ITS

History: The IBM Olympic Messaging System (see BB, 1987)

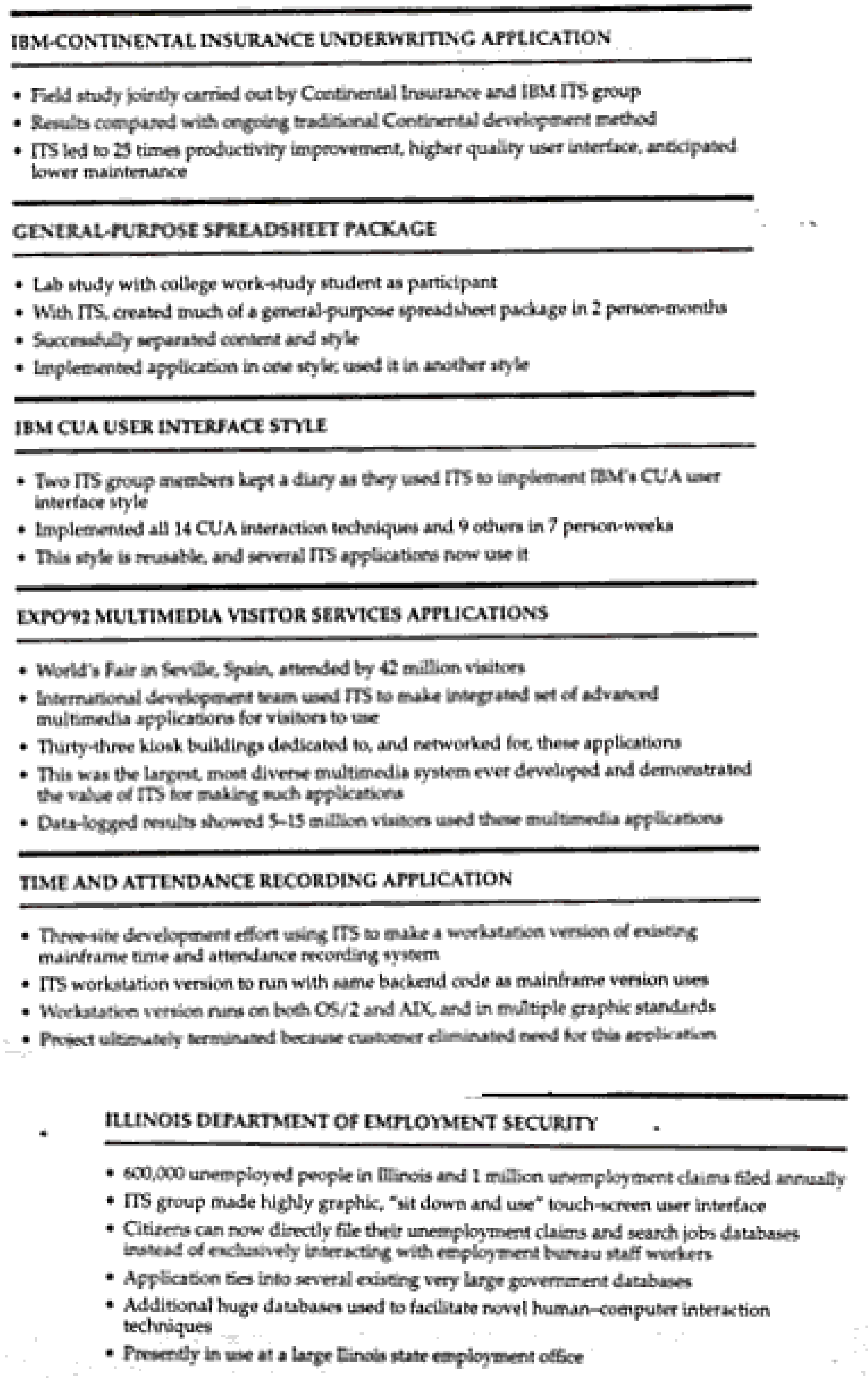
The Expo 92 Visitor Information System (Seville, Spain)
    Information and services for 20 million visitors
    Maps and directions for navigation
    Up-to-minute event schedules
    Background information on countries and organizations

System requirements
    Multi-lingual
    Operable with little or no training by people with little or no computer experience
    Must be attractive
    Must operate with multiple kinds of media: high-quality text, graphics, images

ITS Expo 92 Video

Other applications evaluated (Fig. 14.5) according to 4 criteria
    Time to complete an application
    Comments of developers
    Quality of the work
        (informal judgments of developers and users)
    Quality of the work regarding subsequent maintenance
        (informal judgments of managers and developers)

Fig. 14.5 Case studies of developers using UTS (from Gould, et al., in Rudisill, et al.,1996, pp. 182-3)



IBM-CONTINENTAL INSURANCE UNDERWRITING APPLICATION

- Field study jointly carried out by Continental Insurance and IBM ITS group
- Results compared with ongoing traditional Continental development method
- ITS led to 25 times productivity improvement, higher quality user interface, anticipated lower maintenance

GENERAL-PURPOSE SPREADSHEET PACKAGE

- Lab study with college work-study student as participant
- With ITS, created much of a general-purpose spreadsheet package in 2 person-months
- Successfully separated content and style
- Implemented application in one style; used it in another style

IBM CUA USER INTERFACE STYLE

- Two ITS group members kept a diary as they used ITS to implement IBM's CUA user interface style
- Implemented all 14 CUA interaction techniques and 9 others in 7 person-weeks
- This style is reusable, and several ITS applications now use it

EXPO'92 MULTIMEDIA VISITOR SERVICES APPLICATIONS

- World's Fair in Seville, Spain, attended by 42 million visitors
- International development team used ITS to make integrated set of advanced multimedia applications for visitors to use
- Thirty-three kiosk buildings dedicated to, and networked for, these applications
- This was the largest, most diverse multimedia system ever developed and demonstrated the value of ITS for making such applications
- Data-logged results showed 5–15 million visitors used these multimedia applications

TIME AND ATTENDANCE RECORDING APPLICATION

- Three-site development effort using ITS to make a workstation version of existing mainframe time and attendance recording system
- ITS workstation version to run with same backend code as mainframe version uses
- Workstation version runs on both OS/2 and AIX, and in multiple graphic standards
- Project ultimately terminated because customer eliminated need for this application

ILLINOIS DEPARTMENT OF EMPLOYMENT SECURITY

- 600,000 unemployed people in Illinois and 1 million unemployment claims filed annually
- ITS group made highly graphic, "sit down and use" touch-screen user interface
- Citizens can now directly file their unemployment claims and search jobs databases instead of exclusively interacting with employment bureau staff workers
- Application ties into several existing very large government databases
- Additional huge databases used to facilitate novel human–computer interaction techniques
- Presently in use at a large Illinois state employment office

14.5 Interface principles and guidelines

Collections of statements which advise the designer on how to proceed

Example (Hansen, 1971)
Know thy user
Minimize memorization
Optimize operations
Engineer for errors

Rubinstein and Hersh (1984)
1. Designers make myths; users make conceptual models
2. Separate design from implementation
3. Describe before you leap
.....
93. Videotape real users

Smith and Mosier: 679 (!!?) guidelines (1984)

Tog On Interface (Bruce “Tog” Tognazzini, Addison-Wesley, 1992) presents 196 (?) guidelines in the context of answers to specific questions about user interface design for the Macintosh computer

14.6 The uses of guidelines

Roles of guidelines
Raising awareness of concepts
Assisting in design choices
Offering strategies for solving design problems
Supporting evaluation — with heuristic evaluation, we were judging interfaces with respect to guidelines

Pros of guidelines

- Stimulate ideas and insights
- Give helpful advice
- Provide good checklists

Cons of guidelines

- Occasionally incorrect
- Usually vague
- Sometimes contradictory (need for tradeoffs)
- Very often not at the appropriate level of specificity
- Often difficult to apply to real design problems

14.7 Style guides

Formalized sets of guidelines for specific set of interfaces, e.g., for the Mac, for Windows 95, for the World Wide Web

Establish a kind of corporate identity for a product line

For example, *Macintosh Human Interface Guidelines* (Apple Computer, Inc., Addison-Wesley, 1992) "...describes the way to create products that optimize the interaction between people and Macintosh computers"

Ch. 1: Human Interface Principles
Ch. 2: General Design Considerations
Ch. 3: Human Interface Design and the Development Process
Ch. 4: Menus
Ch. 5: Windows
Ch. 6: Dialog Boxes
Ch. 7: Controls
Ch. 8: Icons
Ch. 9: Colour
Ch. 10: Behaviours
Ch. 11: Language

14.8 Style guides and software development and use

The role in software development

- Simplifies design decisions
- If supported by a toolkit, e.g., ITS, speeds development

The role in software use

- Facilitates effective, error-free use
- Aids skill transfer and learning of new system

14.9 Development tools: summing up

Models of user interface software development tools

Low-level software, e.g., windowing systems

Mid-level software, e.g., toolkits, GUIs

High-level software, e.g., tools for interactive graphical specification, User Interface Management Systems

The role of guidelines and style guides

14.10 References

Gould, J., Boies, S.. and Lewis, C. (1991). Making Useful, Usable, Productivity-Enhancing Computer Applications. *Communications of the ACM* 34(1), 79-85.

Gould, J., Ukelson, J. and Boies, S. (1993). Improving Application Development Productivity by Using ITS. *International Journal of Man-Machine Studies* 39(1), 113-146.

Gould, J., Ukelson, J. and Boies, S. (1996). Improving User Interfaces and Application Productivity by Using the ITS Application Development Environment. In Rudisill, M., Lewis, C., Polson, P., and McKay, T. (Eds.) (1996), *Human-Computer Interface Design: Success Cases, Emerging Methods, and Real-World Context*. Morgan Kaufmann.