Introduction:

• Positive feelings associated with good user interfaces:
  المشاعر الإيجابية المرتبطة بواجهات المستخدم الجيدة
  ▪ Mastery of the interface
    إتقان الواجهة
  ▪ Competence in performing tasks
    الكفاءة في أداء المهام
  ▪ Ease in learning the system originally and in assimilating advanced features
    سهولة في تعلم النظام أصلاً وفي استيعاب المميزات المتقدمة
  ▪ Confidence in the capacity to retain mastery over time
    الثقة في القدرة على الاحتفاظ بالاتقان أكثر من مرة
  ▪ Enjoyment in using the system
    تمتلك باستخدام النظام
  ▪ Eagerness to show the system off to novices
    حرص على إظهار النظام للمبتدئين
  ▪ Desire to explore more powerful aspects of the system
    الرغبة في استكشاف جوانب أكثر قوة للنظام

Examples of Direct-Manipulation Systems

Command line vs. display editors and word processors

• Training times with display editors are much less than line editors
  أوقات التدريب مع محررين العرض أقل بكثير من محررين الأسطر
• Line editors are generally more flexible and powerful
  خط المحررين بشكل عام هم أكثر مرونة وقوى

The advances of WYSIWYG word processors: التقدم لمعالجات النصوص

1. Display a full page of text
2. Display of the document in the form that it will appear when the final printing is done
3. Show cursor action
4. Control cursor motion through physically obvious and intuitively natural means
5. Use of labeled icon for actions
6. Display of the results of an action immediately

P a g e  B y  H u d a  A l B a s h e e r
7. Provide rapid response and display  

8. Offer easily reversible actions

Examples of Direct-Manipulation Systems: WYSIWYG word processing

Technologies that derive from the word processor:

A. Integration
B. Desktop publication software
C. Slide-presentation software
D. Hypermedia environments
E. Improved macro facilities
F. Spell checker and thesaurus
G. Grammar checkers

The VisiCalc spreadsheet and its descendants

- VisiCalc users delighted in watching the program propagate changes across the screen.
  - من سعداء المشاهدة البرنامج ونشر التغييرات عبر الشاشة

- In some cases, spatial representations provide a better model of reality
  - وفي بعض الحالات، توفر التمثيلات المكانية أفضل نموذج للواقع

Successful spatial data-management systems depend on choosing appropriate:

- Icons
- Graphical representations
- Natural and comprehensible data layouts

- نظم إدارة البيانات المكانية الناجحة تعتمد على اختيار المناسب
Video games

1. Nintendo Wii, Sony PlayStation, and Microsoft Xbox
2. Field of action is visual and compelling
3. Commands are physical actions whose results are immediately shown on the screen
4. No syntax to remember
5. Most games continuously display a score
6. Direct manipulation in SimCity
7. Second Life virtual world
8. Spore
9. Myst well received
10. DOOM and Quake controversial

Computer-aided design

1. Computer-aided design (CAD) use direct manipulation
2. Manipulate the object of interest
3. Generate alternatives easily
4. Explain the impact
5. Problem solving by analogy to the real-world

Office automation

1. Xerox Star was a pioneer with sophisticated formatting
2. Apple Lisa System
3. Rapid and continuous graphical interaction
4. Microsoft Windows is a descendant

Direct-Manipulation interfaces are being used in a wide range of applications, e.g. management dashboard for a retail store

ضمن منتجات الألعاب الفيديو، هناك العديد من الألعاب التي تركز على التفاعلات الفورية والمعينة، مثل الألعاب التي تستخدم الاتجاهات الفورية مثل الألعاب المبنية على التحزينات، والتي تسمح لللاعبين بإصدار الأوامر الفورية التي تظهر نتائجها فوراً على الشاشة. هذه الألعاب تركز على التفاعلات الفورية، والتي تجعل من اللاعبين يشعرون بالتفاعل الفوري مع اللعبة. في هذه الألعاب، الألعاب التي تستخدم التفاعلات الفورية، مثل الألعاب المبنية على التحزينات، تسمح لللاعبين بإصدار الأوامر الفورية التي تظهر نتائجها فوراً على الشاشة. هذه الألعاب تركز على التفاعلات الفورية، والتي تجعل من اللاعبين يشعرون بالتفاعل الفوري مع اللعبة.
Discussion of Direct Manipulation

Problems with direct manipulation

- Spatial or visual representations can be too spread out
- High-level flowcharts and database schema can become confusing
- Designs may force valuable information off of the screen
- Users must learn the graphical representations
- The visual representation may be misleading
- Typing commands with the keyboard may be faster

Principles of Direct Manipulation

1. Continuous representations of the objects and actions of interest with meaningful visual metaphors.
2. Physical actions or presses of labeled buttons, instead of complex syntax.
3. Rapid, incremental, reversible actions whose effects on the objects of interest are visible immediately.

Interface-Building Tools

Visual Thinking and Icons

- The visual nature of computers can challenge the first generation of hackers.
- The naturalistic nature of computers allows for direct manipulation.
- An icon is an image, picture, or symbol representing a concept.
**Icon-specific guidelines**

1. Represent the object or action in a familiar manner

2. Limit the number of different icons

3. Make icons stand out from the background

4. Consider three-dimensional icons

5. Ensure a selected icon is visible from unselected icons

6. Design the movement animation

7. Add detailed information

8. Explore combinations of icons to create new objects or actions

**3D Interfaces**

1. “Pure” 3D interfaces have strong utility in some contexts, e.g., medical, product design. In other situations, more constrained interaction may actually be preferable to simplify interactions.

2. “Enhanced” interfaces, better than reality, can help reduce the limitations of the real-world, e.g., providing simultaneous views.

3. Avatars in multiplayer 3-D worlds

4. First person games

**Features for effective 3D**

- Use occlusion, shadows, perspective, and other 3D techniques carefully.
- Minimize the number of navigation steps for users to accomplish their tasks.
- Avoid unnecessary visual clutter, distraction, contrast shifts, and reflections.
- Simplify user movement.
- Prevent errors.
- Simplify object movement.
- Organize groups of items in aligned structures to allow rapid visual search.
Guidelines for inclusion of enhanced 3D features:

1. Provide overviews so users can see the big picture.

يدعى نصائح لعرض أنظار العامة حيث يمكن للمستخدمين رؤية الصورة الكبيرة.

2. Allow teleoperation.

إذا حذر للمستخدمين出国留学.

3. Offer X-ray vision so users can see into or beyond objects.

توفر الأشعة السينية توفر المستخدمين مشاهدة داخل والخارج الكائنات.

4. Provide history keeping.

توفير حفظ التاريخ.

5. Permit rich user actions on objects.

تمكين الإجراءات غنية بالكائنات للمستخدم.

6. Enable remote collaboration.

إمكاني التعاون البعيد.

7. Give users control over explanatory text and let users select for details on demand.

منح المستخدمين السيطرة على نص تفسيري وحدد المستخدمين السماح لمزيد من التفاصيل عن الطلب.

8. Offer tools to select, mark, and measure.

توفر الأدوات للتحديد والعلامات والقياس.

Guidelines for inclusion of enhanced 3D features (cont.):

المبادئ التوجيهية لإدراج ميزات ثلاثية الأبعاد (المحسنة) (المحسنة):

1. Implement dynamic queries to rapidly filter out unneeded items.

نفذ استعلامات ديناميكية بسرعة تصفية العناصر غير المرغوب فيها.

2. Support semantic zooming and movement.

دعم التنقل والزوم التكبير.

3. Enable landmarks to show themselves even at a distance.

تمكين المعالم لأظهار أنفسهم حتى على المسافة.

4. Allow multiple coordinated views.

سماعا لوجهات نظر منسقة متعددة.

5. Develop novel 3D icons to represent concepts that are more recognizable and memorable.

تطوير رواية الثري دي لتمثيل المفاهيم الأكثر تميزا.

Teleportation

اثنين من الوالدين:。

1. direct manipulation in personal computers and process control in complex environments.

التلاعب المباشر في أجهزة الكمبيوتر الشخصية وعملية التحكم في بيئات معقدة.

2. Physical operation is remote.

تشغيل الفعلي البعيد.

Complicating factors in the architecture of remote environments:

العوامل المعقدة في البنية البعيدة:

- Time delays
- Transmission delays
- Operation delays
- Incomplete feedback
- Feedback from multiple sources
- Unanticipated interferences
Virtual and Augmented Reality

- Virtual reality breaks the physical limitations of space and allow users to act as though they were somewhere else.
- Augmented reality shows the real world with an overlay of additional interaction.
- Situational awareness shows information about the real world that surrounds you by tracking your movements in a computer model.
- Augmented reality is an important variant.
- Enables users to see the real world with an overlay of additional interaction.

Successful virtual environments depend on the smooth integration of:

Q: List the technologies on which successful virtual environments depend?

1. Visual Display
2. Head position sensing
3. Hand-position sensing
4. Force feedback
5. Sound input and output
6. Other sensations
7. Cooperative and competitive virtual reality

Impact of this technology in our everyday lives

تأثر هذه التكنولوجيا في حياتنا اليومية
Chapter 5 Questions and Answers

1. Define direct manipulation. Give four benefits of direct manipulation over command line interfaces. Also list four problems of direct manipulation.

**Definition:** Interface design with visual representation of the world of action, immediate visibility of the objects and actions of interest; rapid, reversible, incremental actions; and replacement of typed commands by a pointing action on the object of interest. Dragging a file to a trash can is an example. Analogical reasoning is tapped.

**Benefits over commands:**
1. Control/display compatibility
2. Less syntax reduces error rates
3. Errors are more preventable
4. Faster learning and higher retention
5. Encourages exploration

**Problems:**
6. Increased system resources, possibly
7. Some actions may be cumbersome
8. Macro techniques are often weak
9. History and other tracing may be difficult
10. Visually impaired users may have more difficulty

What are the three principles of direct manipulation?

- Continuous representations of the objects and actions of interest with meaningful visual metaphors
- Physical actions or presses of labeled buttons, instead of complex syntax.
- Rapid, incremental, reversible actions whose effects on the objects of interest are visible immediately.

2. What are the guidelines for effective use of icons?

- Represent the object or action in a familiar and recognizable manner.
- Limit the number of different icons.
- Make the icon stand out from its background.
- Carefully consider three-dimensional icons; they are eye-catching but also can be distracting.
- Ensure that a single selected icon is clearly visible when surrounded by unselected icons.
- Make each icon distinctive from every other icon.
- Ensure the harmoniousness of each icon as a member of a family of icons.
- Design the movement animation: when dragging an icon, the user might move the whole icon, just a frame, possibly a grayed-out or transparent version, or a black box.
- Add detailed information, such as shading to show the size of a file (larger shadow indicates larger file), thickness to show the breadth of a directory folder (thicker means more files inside), color to show the age of a document (older might be yellower or grayer), or animation to show
Compare command language interfaces to direct manipulation interfaces with respect to compactness, speed of performance and learnability?

**Compactness:** command lines take up less screen real estate

**Speed of performance:** one could argue negligible in today’s modern computers, however, some display refreshes of maps, etc. do take some delay due to internet broadband capacity (i.e. download time)

**Learnability:** Direct manipulation clearly the winner here, as it maps to a visual paradigm, e.g. the airline map displays in the previous question.

Name two ways you could update the above interface to support the principles of direct manipulation. Draw a sketch of your redesign.

- Larger buttons to match ‘finger’ interaction device
- Drag and drop medication names from a pop-up list
- Touch calendar dates on a pop-up, full-month calendar rather than pull-down calendar menu options
- Keyboard pop-up to enter your name
- More consistent field size and length (see examples in Chapter 6 regarding Form Fill-in).
- Also, make overall interface more modern (this one appears in a style guide matching Windows XP or 2000)

**Chapter Five Multiple Choice Questions**

1. Which of the following is not a characteristic of direct manipulation interfaces?
   a. Visibility of the objects and actions of interest.
   b. **Menu selection and form fill-in.**
   c. Rapid, reversible, incremental actions.
   d. Replacement of typed commands by a pointing action on the object of interest.

2. Augmented reality is ________________.
   a. The same thing as virtual reality
   b. A type of dashboard displaying a large volume of information at one time.
   c. **An innovation in which users see the real world with an overlay of additional information.**
   d. The use of haptic interaction skills to manipulate objects and convert the physical form to a digital form.

3. Drawbacks of direct manipulation include all of the following except _____________.
   a. Designs may consume valuable screen space.
   b. Users must learn the meanings of visual representations.
   c. Visual representation may be misleading
   d. **The gulf of execution is increased**

4. Remote environments are complicated by ________________.
   a. The gulf of execution, the gulf of evaluation, and time delays.
   b. **Time delays, incomplete feedback, and unanticipated interferences.**
c. Supervisory control, lack of multiple coordinated views, and time delays
d. Lack of precision, supervisory control, time delays, and gulf of execution.

5. All of the following are good guidelines for use of icons except ________________.
   a. Represent the object or action in a familiar and recognizable manner.
   b. Carefully consider three-dimensional icons; they are eye-catching but also can be distracting.
   c. Limit the number of different icons.
   d. Make the icon blend in with its background.

6. Successful virtual environments will depend on smooth integration of what technologies?
   a. Visual display
   b. Head-position and hand position sensing
   c. Force feedback and haptics
   d. All of the above

7. The advantages of WYSIWYG word processors include all of the following except __________.
   a. Users see a partial page of text.
   b. The document is seen as it will appear when printed.
   c. Cursor action is visible and cursor motion is natural.
   d. Immediate display of the results of an action

8. Relative flow dragging allows a user to ______________.
   a. Move through a video by dragging an object of interest along its visual trajectory.
   b. See a large volume of information at one time and to directly manipulate it
   c. Be in an immersive environment that blocks out the world.
   d. Avoid complex commands that might be needed only during a once-a-year emergency.

9. A successful direct-manipulation interface must present ________________.
   a. A complex series of user choices.
   b. An appropriate representation or model of reality.
   c. The option for users to enter a long string of commands.
   d. Mixed metaphors so that users don’t become bored.

10. Which of the following is not a beneficial attribute of well-designed systems that use direct manipulation?
    a. Novices can learn basic functionality quickly
    b. Experts can work rapidly to carry out a wide range of tasks
    c. Knowledgeable intermittent users can retain operational concepts.
    d. User actions are permanent and cannot easily be undone

11. ______________ is the name for the condition that exists when a remotely controlled device
    transmits its current position, but does it so slowly that it does not indicate its exact current position.
    a. Incomplete feedback
    b. Transmission delay
    c. Insufficient feedback
    d. Feedback delay
12. One solution to the problems of the architecture of remote environments is ____________.
   a. Discourage the use of remote environments for critical tasks.
   b. Make explicit the network delays and breakdowns as part of the system.
   c. Add animation that allows users to see what happens if they move their input device.
   d. Better user training

13. For virtual environments to be successful, displays must ________________.
   a. Approach real time in presenting images to the users.
   b. Use low resolution when objects are not moving
   c. Be head-mounted
   d. Be boom-mounted

14. Allowing surgeons to look at a patient while they see an overlay of an x-ray is an example of _____.
   a. Virtual reality
   b. Visual Display
   c. Augmented Reality
   d. Force Feedback

15. Users have a strong sense of causality when _____________.
   a. Interface objects and actions are complex.
   b. Users can select actions rapidly by pointing or gesturing.
   c. Display feedback is delayed.
   d. Inputs produce random results