

GUI's and Keyboards

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User Interface Goal

- Convey and gather information from user
- Support a set of standard actions and outputs
- Graphical User Interfaces have been well studied and used
 - Must understand them before generalizing
 - Pervasive computing uses many types of user interfaces
- A web page is an example of a GUI
 - Why is there a need for anything else?
 - Because of historical and efficiency reasons
 - Want more direct and richer variety of interface

User Interface Goal II

“As interfaces become easier to use, they become harder to create” [Meyers 1994]

- Do you agree?
 - KISS: Keep It Simple
 - It takes a lot of hard work to make things look simple
- What user interfaces do you like?
 - iPod, Tivo, ...
- Microsoft Windows 2000 have dynamic pulldown menus
 - Does anyone like them? why not?



KISS: Keep it simple

- Goal is for user to not think about how to do something; it should be automatic:
 - If there is a choice, then one must think
 - movie theaters offer very limited choice of candy
 - supermarkets offer huge variety of soft drinks -- what is difference?
 - Save file via menu, keyboard, icon, rightclick, ...
 - One mouse button simpler than three
 - Pay a lot of money for large screen, why waste it on rarely used menu bar



KISS: Keep it simple

- People do not think about repetitive actions
 - “Do you really want to delete file?”
 - after third time, people usually click OK without thinking
- Lots of research on design principles
 - and it is often ignored :(



Manipulation

- Indirect Manipulation
 - E.g. program places graphic objects on screen
 - Nothing is “clickable”
 - Today it feels awkward to use keys on mobile phone to manipulate objects on screen.
 - Everything used to be that way.
- Direct Manipulation of Objects
 - User directly manipulates Graphical Objects with mouse or keyboard
 - “Tangible User Interface” of the future, users will manipulate physical objects with their hands

Widgets

- For lack of natural term, GUI objects are **Widgets**
- Everything in a GUI is a widget
- Widget is picture displayed on screen that is under control of the GUI.
- Widgets are hierarchical: they contain other widgets.
Examples are:
 - Window frame, radio button, scroll bar, menu, ..
- GUI's support certain types of pictures
 - others types must be converted

Big Idea: Abstraction

- “Any problem in computer programming can be solved by adding a level of abstraction”
- “Performance can be improved in programs by removing a level of abstraction”
- Indirection used to support abstraction

Non-widgets

- A GUI is a level of abstraction between user and program, hence it affects performance
- Graphical Computer Games demand high performance for realistic animations
 - They directly manipulate the screen, mouse, keyboard
- Audio not part of GUI
 - Duh. OK, but not part of window system either
 - Could do it by assigning a “channel” to each application and have user select the channel as in a radio



Mice

- Mouse is clicked inside of window or widget
 - e.g.: controls standard widgets: drag a slider, twist a dial, scroll up or down -- all ways to enter a number
- Major innovation: mouse cursor changes sprite as moves between widgets
 - Real world analogy: frog looks different on a lilly pad and in the pond, car looks same in drive- & park- way
- Mouse is part of GUI, but not multiple mice
 - New need arising from wireless mouse and from pda or cell phone as “mouse”
 - Perhaps we need different sprites per user?

Mice II

- Mouse actions:
 - Click is two actions: “button down” and “button up”
 - Movement is relative: “delta x, delta y” events
 - Drag: move while button is down
 - Wheel: “Button D” or “Button U” events
- One button mouse easier to handle
- Multiple button mouse requires training
 - people have been successfully trained already
- Mouse acceleration big success.
 - Are there other applications of acceleration?



Touch Screens

- Not exactly the same as a mouse
- Click: no button down or button up
 - dwell: leave finger in same location
 - double click hard to hit same pixel twice in a row
- Movement: absolute, no consistent origin
 - top left, or bottom right can be (0,0)
- Drag: very difficult, need “modal” command
 - modes are considered harmful, e.g. shift lock is bad
- Wheel: perhaps use some gesture?
- Not easy to simply replace mouse with touch



Keyboards

- It seems simple, precise, and nothing new
- One hand typing --
 - my idea: double keypress -- means mirror key
 - “aa” means “;:” “ss” means “ll” & “gg” means “hh”
 - I needed it when I sat with a baby in my lap
 - there exist other one hand keyboards:
 - twiddler (chording keyboard)
 - half keyboard
 - Telephone pad keyboard: 1-2, 2-3, 1-4, 1-4-2-5, 2-5
- Keyboard entry not exact
 - on-screen keyboard
 - a “G” could be an “f”, “t”, “h”, or “b”
 - Cellphone keyboard
 - a “G” could be a “4” or “H” or “l”

Dasher

- go to www.inference.phy.cam.ac.uk/dasher



Expressive Typing

- Writing with a pen on paper does more than express words:
 - it is a picture & conveys non-verbal expression
- Use the intercharacter typing speed to vary either the font or the inter-character spacing or vertical alignment

GUI Programming

- Embed in code
 - Java AWT, Python TCL,TK
 - Very hard to code, debug, maintain and modify
- Use GUI builder, e.g. Visual Basic
 - rapid prototype
 - reliable
 - consistency across applications
 - easier to implement “help” and “undo”
 - easier to port

Glade (for linux, x-windows)

- Three layers:
 - user application, user GUI, window system
 - we care about first two, glade deals with GUI
- Application separate from GUI
 - Interface is via “callbacks”
 - Each widget has a set of standard interfaces
- see <http://glade.gnome.org/index.html>

