Software design & architecture

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Design issue

Before going on to discuss the process of interaction design, I discuss some general design issues that have to be considered. Essentially, the designer of a user interaction with a computer is faced with two key questions:

1. How should the user interact with the computer system?
2. How should information from the computer system be presented to the user?

A coherent user interface must integrate user interaction and information presentation. This can be difficult because the designer has to find a compromise between the most appropriate styles of interaction and presentation for the application, the background and experience of the system users, and the equipment that is available.

User interaction

User interaction means issuing commands and associated data to the computer system. On early computers, the only way to do this was through a command-line interface and a special-purpose language was used to communicate with the machine. However, this was geared to expert users and, a number of approaches have now evolved that are easier to use. Shneiderman (Shneiderman, 1998) has classified these forms of interaction into five primary styles:

1. Direct manipulation The user interacts directly with objects on the screen. Direct manipulation usually involves a pointing device (a mouse, a stylus, a trackball or, on touch screens, a finger) that indicates the object to be manipulated and the action, which specifies what should be done with that object. For example, to delete a file, you may click on an icon representing that file and drag it to a trashcan icon.
2. Menu selection The user selects a command from a list of possibilities (a menu). The user may also select another screen object by direct manipulation and the command operates on that object. In this approach, to delete a file, you would select the file icon then select the delete command.
3. Form fill-in The user fills in the fields of a form. Some fields may have associated menus and the form may have action 'buttons' that, when pressed, cause some action to be initiated. You would not normally use this approach to implement the interface to

operations such as file deletion. Doing so would involve filling in the name of the file on the form then 'pressing' a delete button.

4. Command language The user issues a special command and associated parameters to instruct the system what to do. To delete a file, you would type a delete command with the filename as a parameter.

5. Natural language The user issues a command in natural language. This is usually a front end to a command language; the natural language is parsed and translated to system commands. To delete a file, you might type 'delete the file named xxx'.

Each of these styles of interaction has advantages and disadvantages and is best suited to a particular type of application and user (Shneiderman, 1998). Figure 29.2 shows the main advantages and disadvantages of these styles and suggests types of application where they might be used. Of course, these interaction styles may be mixed, with several styles used in the same application. For example, Microsoft Windows supports direct manipulation of the iconic representation of files and directories, menu-based

Interaction style	Main advantages	Main disadvantages	Application examples
Direct manipulation	Fast and intuitive interaction Easy to learn	May be hard to implement Only suitable where there is a visual metaphor for tasks and objects	Video games CAD systems
Menu selection	Avoids user error Little typing required	Slow for experienced users Can become complex if many menu options	Most general-purpose systems
Form fill-in	Simple data entry Easy to learn Checkable	Takes up a lot of screen space Causes problems where user options do not match the form fields	Stock control Personal loan processing
Command language	Powerful and flexible	Hard to learn Poor error management	Operating systems Command and control systems
Natural language	Accessible to casual users Easily extended	Requires more typing Natural language understanding systems are unreliable	Information retrieval systems