

User Interface Design

Reference:

Chapter 15 User Interface Design, Software Engineering: A Practitioner's Approach, R.S. Pressman & Associates

Outline

- UI design typical errors
- UI Principles
- UI Development Process

Detail Design for Components in the Architecture

- Detail design comes after system architecture design
- For each component we need to identify
 - Input data
 - Function
 - Output data
- Detail design relates to
 - Design User Interfaces for each component at the Client side or View component in MVC architectural pattern
 - Design data structure and algorithm for each component
 - Design database at the database server side

User Interfaces Design

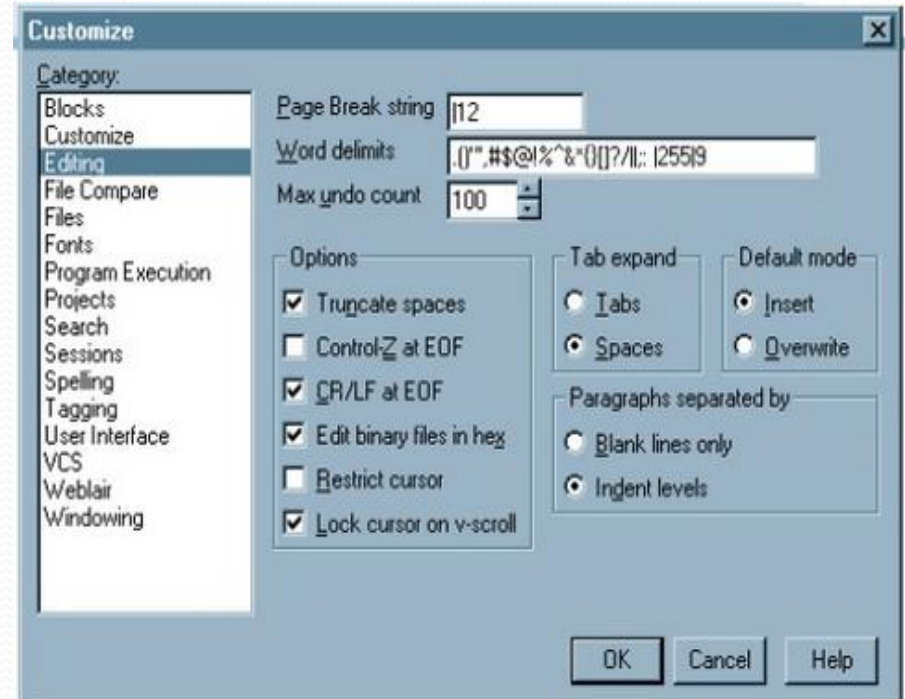
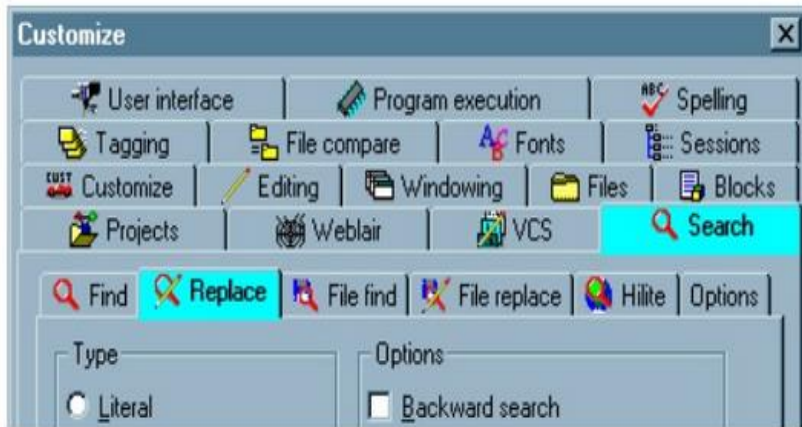
- System users often judge a system by its interface rather than its functionality
- A poorly designed interface can cause a user to make errors
- Poor user interfaces can cause software systems be never used

User Interface Example



Good or Bad UI?

User Interface Example



Which one is better ?

Interface Design Errors

- Typical Design Errors
 - Lack of consistency
 - Too much memorization
 - No guidance / help
 - No context sensitivity
 - Poor response
 - Unfriendly

Before designing

- Need to take into account:
 - Who the users are: trained professionals, technician, manufacturing workers, etc
 - What activities are being carried out: tasks and subtasks
 - What problem domain objects are manipulated
 - Where the interaction is taking place (the environment)
: can they save the work in the middle of the process ?
- Need to optimize the interactions users have with the interfaces
 - So that they match the users' activities and needs

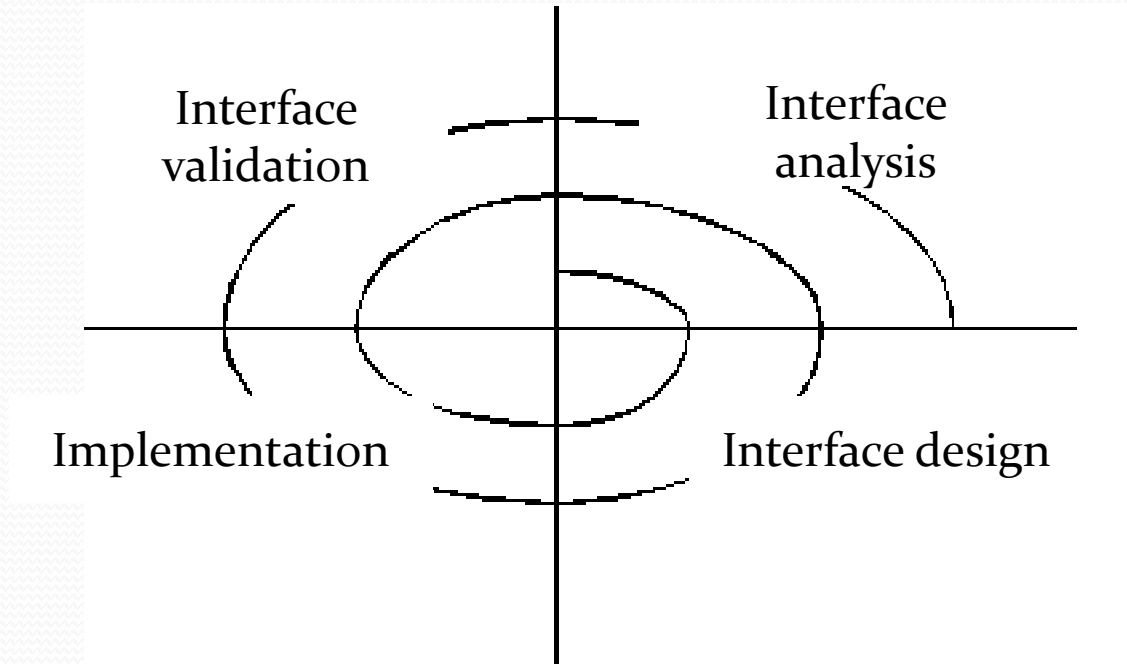
UI Principles

- User familiarity/User friendly
 - The interface should be based on user-oriented terms and concepts rather than computer concepts. Good habit. E.g. Read and input data from left to right
- Consistency
 - The system should display an appropriate level of consistency. Maintain consistency of UI across modules, across a family of applications. Same design rules over multiple interfaces. E.g. Commands and menus should have the same format.

UI Principles (contd.)

- User guidance
 - Some user guidance such as help systems, on-line manuals, etc. should be supplied
- Reduce the user's memory load
 - Reduce demand on short term memory , e.g. visual cues to recall past actions rather than having to recall them
 - Establish meaningful defaults
- Recoverability (forgiveness)
 - The system should provide some resilience to user errors and allow the user to recover from errors. This might include an undo facility, confirmation of destructive actions, 'soft' deletes, etc.

User Interface Development Process



Interface Analysis

- Interface analysis means understanding
 - the people (end-users) who will interact with the system through the interface;
 - the tasks that end-users must perform to do their work,
 - the content that is presented as part of the interface,
 - the environment in which these tasks will be conducted.

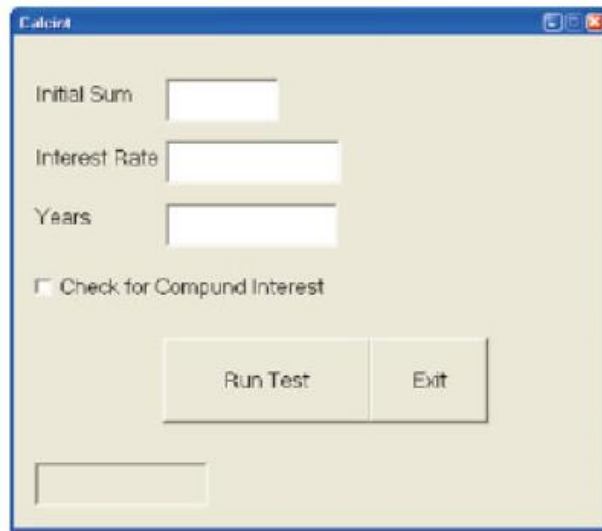
Interface Design Steps

- Using information developed during interface analysis define interface objects (GUI components) and actions
- Define events (user actions) that will cause the state of the user interface to change. Model this behavior.
- Depict each interface state as it will actually look to the end-user.
- Indicate how the user interprets the state of the system from information provided through the interface.

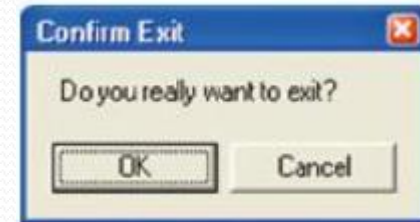
GUI components

- Personal application GUI
 - Content design
 - Primary window
 - Second window: can be dialog box, message box, tab folder, drop-down list
 - Forms, Menubar, Toolbar, Scroll bar, Status bar, Textbox, Row browser, Tree browser, Checkbox, Radio button, Command button, etc.
- Web GUI
 - Content design
 - Similar components as Personal application GUI plus Links
 - Navigation design: take into account the logic in navigation, so the users don't feel lost in the “hyperspace” of web pages.

Example – Components and States of Calculate Interest Interface



Calculate Interest window



Exit window

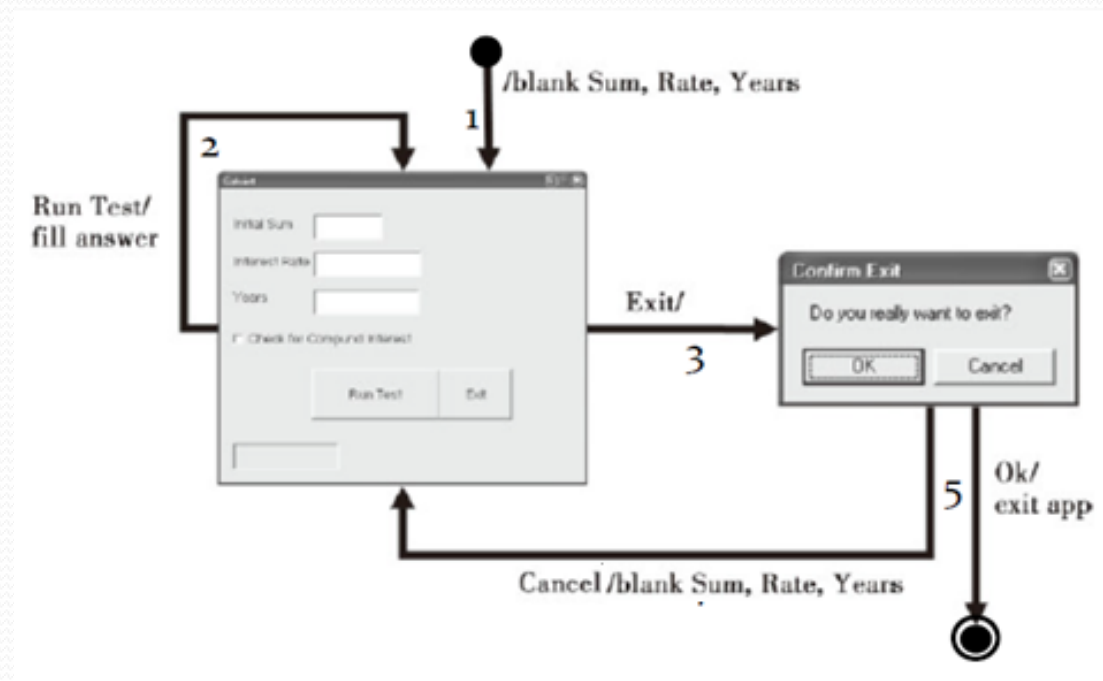
GUI components:

Text box: Initial Sum, Interest Rate, Year, Output

Check box: Compound Interest

Command button: Run Test, Exit

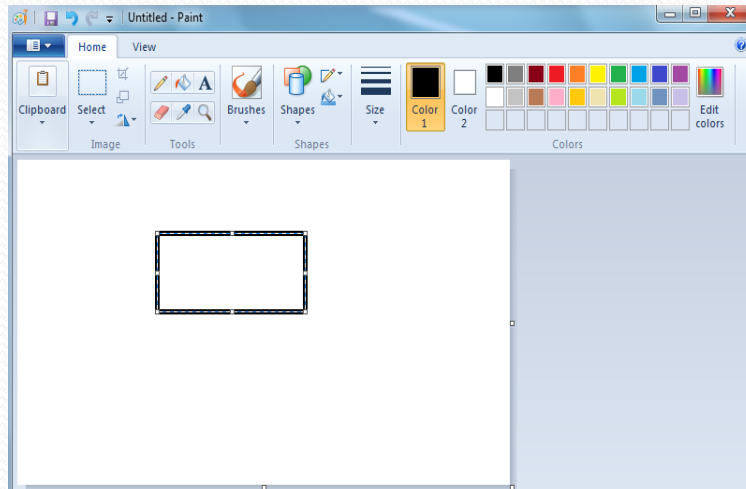
UI State diagram



User-System Interaction

- Two problems must be addressed in interactive systems design
 - How should information from the user be provided to the computer system?
 - How should information from the computer system be presented to the user?

Interaction Styles



Direct manipulation



Menu selection



Menu selection

Interaction Styles

Personal Details

Title* -- Please select --

First Name*

Surname*

House Number / Name Enter your house name or number
This should be the address where your car is kept over night.

Address line 1*

Address line 2

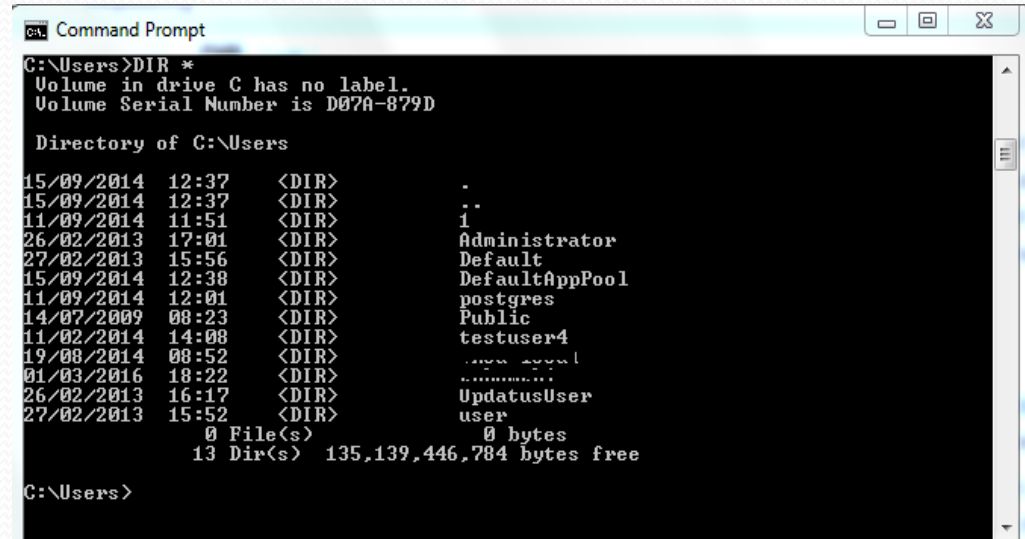
County / City / City Area -- Please select --

City / Town / Townland -- Please select --

Click to verify **Confirm postal address**

We need to match your postal address to the official Post Office listing. Please fill in your address and click on the Confirm postal address button.

Form fill-in



```
C:\Users>DIR *
Volume in drive C has no label.
Volume Serial Number is D07A-879D

Directory of C:\Users

15/09/2014 12:37 <DIR>      .
15/09/2014 12:37 <DIR>      ..
11/09/2014 11:51 <DIR>      1
26/02/2013 17:01 <DIR>      Administrator
27/02/2013 15:56 <DIR>      Default
15/09/2014 12:38 <DIR>      DefaultAppPool
11/09/2014 12:01 <DIR>      postgres
14/07/2009 08:23 <DIR>      Public
11/02/2014 14:08 <DIR>      testuser4
19/08/2014 08:52 <DIR>      ..
01/03/2016 18:22 <DIR>      ..
26/02/2013 16:17 <DIR>      UpdatusUser
27/02/2013 15:52 <DIR>      user
0 File(s)      0 bytes
13 Dir(s)      135,139,446,784 bytes free

C:\Users>
```

Command language

Natural language: can be typed or spoken natural language, e.g.
Siri, Information Retrieval-Google

Interaction Styles	Applications Example	Advantages	Disadvantages
Direct manipulation	Video Games CAD (Computer Add Design)	Fast and intuitive interaction Easy to learn	May be hard to implement Only suitable where there is a visual metaphor for tasks and objects
Menu selection	Most general purpose systems	Avoid user errors Little typing required	Slow for experienced users Can become complex if many menu options
Form fill in	Personal loan processing Insurance quote	Simple data entry Easy to learn	Take up a lot of screen space
Command language	Operating System Data base manipulation (SQL-command line)	Powerful and flexible	Hard to learn Poor error management
Natural language	WWW Information retrieval	Accessible to casual users Easily extended	Require more typing Natural language processing systems are unreliable

Information presentation

- Information presentation is concerned with presenting system information to system users
- The information may be presented directly (e.g. text , or number) or may be transformed in some way for presentation (e.g. in some graphical form)

Information presentation factors

- Is the information textual or numeric? Are relative values important?
- Is the user interested in precise information or data relationships?
- How quickly do information values change?
Must the change be indicated immediately?
- Must the user take some actions in response to a change?

Colour displays

- Colour adds an extra dimension to an interface and can help the user understand complex information structures
- Colour can be used to highlight exceptional events
- Use color code consistently
- Don't over-use of colour in the display: keep 2 or 3 colour

Interface Implementation

- Once the interfaces are designed, they are implemented using tools/ prototyping
- Get users feedback for improvement (iterative design approach)

User Interface evaluation

- Some evaluations of a user interface design should be carried out to assess its suitability
- Ideally, an interface should be evaluated against a usability specification

Simple UI evaluation technique

- Questionnaires for user feedback
- Video recording of system use and subsequent tape evaluation.
- Instrumentation of code to collect information about facility use and user errors.
- The provision of a grip button for on-line user feedback.

Usability attributes

Attribute	Description
Learnability	How long does it take a new user to become productive with the system?
Speed of operation	How well does the system response match the user's work practice?
Robustness	How tolerant is the system of user error?
Recoverability	How good is the system at recovering from user errors?
Adaptability	How closely is the system tied to a single model of work?

Key points

- Interface design should be user-centred. An interface should be logical and consistent and help users recover from errors
- Interaction styles include direct manipulation, menu systems, form fill-in, command languages and natural language
- Graphical displays should be used to present trends and approximate values. Digital displays when precision is required
- Colour should be used sparingly and consistently

Key points

- Systems should provide on-line help
- Error messages should be positive rather than negative
- A range of different types of user documents should be provided
- Ideally, a user interface should be evaluated against a usability specification