

# chapter 5

## interaction design basics

# interaction design basics

## ►design:

- ▶ what it is, interventions, goals, constraints

## ►the design process

- ▶ what happens when

## ►users

- ▶ who they are, what they are like ...

## ►scenarios

- ▶ rich stories of design

## ►navigation

- ▶ finding your way around a system

## ►iteration and prototypes

- ▶ never get it right first time!

# interactions and interventions

design interactions not just interfaces

not just the immediate interaction

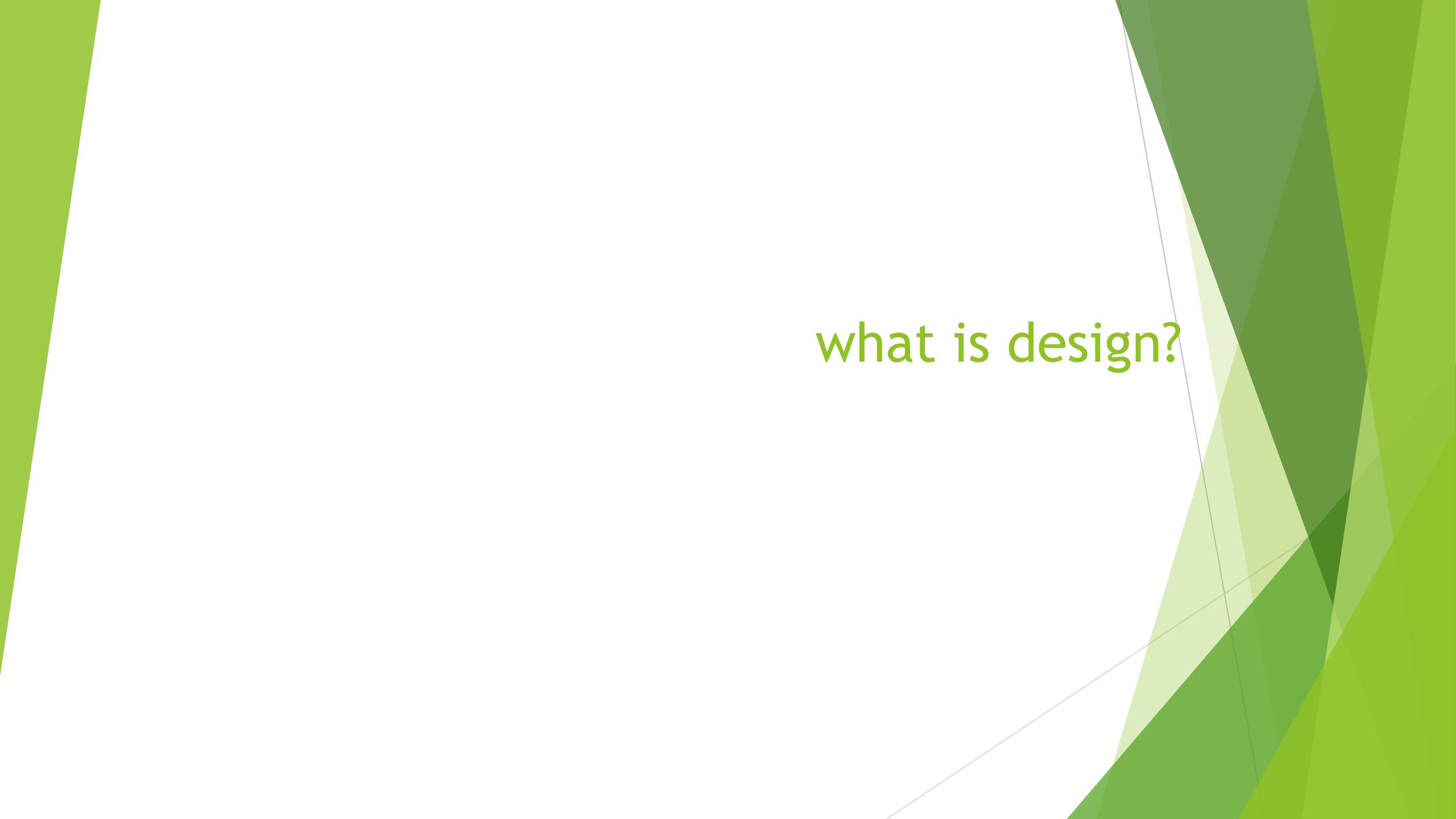
e.g. stapler in office - technology changes interaction style

- ▶ manual: write, print, staple, write, print, staple, ...
- ▶ electric: write, print, write, print, ..., staple

designing interventions not just artefacts

not just the system, but also ...

- ▶ documentation, manuals, tutorials
- ▶ what we say and do as well as what we make



what is design?

# what is design?

achieving goals within constraints

- ▶ goals - purpose
  - ▶ who is it for, why do they want it
- ▶ constraints
  - ▶ materials, platforms
- ▶ trade-offs

# golden rule of design

understand your materials

# for Human-Computer Interaction

## understand your materials

- ▶ understand computers
  - ▶ limitations, capacities, tools, platforms
- ▶ understand people
  - ▶ psychological, social aspects
  - ▶ human error
- ▶ and their interaction ...

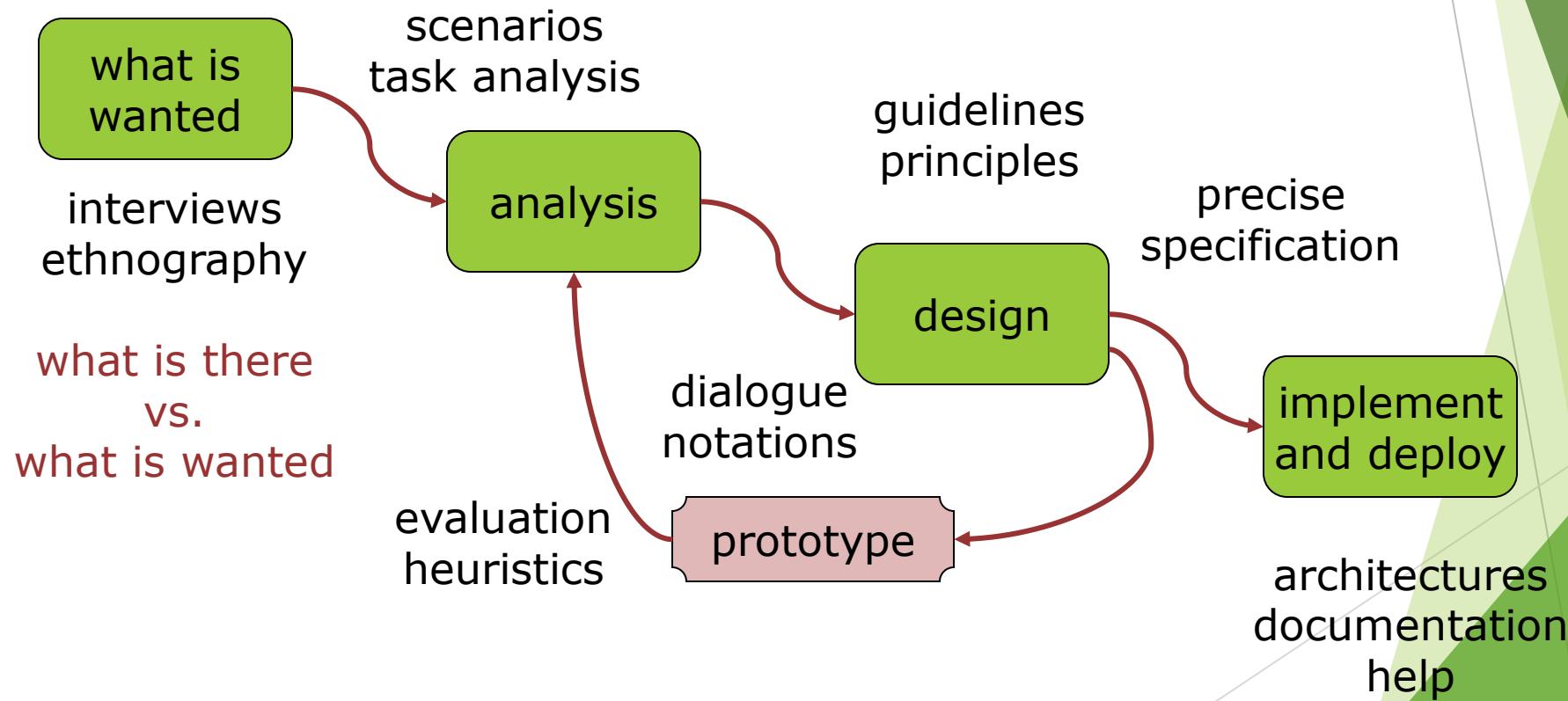
# To err is human

- ▶ accident reports ..
  - ▶ aircrash, industrial accident, hospital mistake
  - ▶ enquiry ... blames ... ‘human error’
- ▶ but ...
  - ▶ concrete lintel breaks because too much weight
  - ▶ blame ‘lintel error’ ?
    - ... no - design error
    - we know how concrete behaves under stress
- ▶ human ‘error’ is normal
  - ▶ we know how users behave under stress
  - ▶ so design for it!
- ▶ treat the user at least as well as physical materials!

Central message ...

the user

# The process of design



# Steps ...

- ▶ requirements
  - ▶ what is there and what is wanted ...
- ▶ analysis
  - ▶ ordering and understanding
- ▶ design
  - ▶ what to do and how to decide
- ▶ iteration and prototyping
  - ▶ getting it right ... and finding what is really needed!
- ▶ implementation and deployment
  - ▶ making it and getting it out there

# ... but how can I do it all ! !

- ▶ limited time ⇒ design trade-off
- ▶ usability?
  - ▶ finding problems and fixing them?
  - ▶ deciding what to fix?
- ▶ a perfect system is badly designed
  - ▶ too good ⇒ too much effort in design

## user focus

know your user  
personae  
cultural probes

# know your user

- ▶ who are they?
- ▶ probably not like you!
- ▶ talk to them
- ▶ watch them
- ▶ use your imagination

# persona

- ▶ description of an ‘example’ user
  - ▶ **not necessarily a real person**
- ▶ use as surrogate user
  - ▶ **what would Betty think**
- ▶ details matter
  - ▶ **makes her ‘real’**

# cultural probes

- ▶ direct observation
  - ▶ sometimes hard
    - ▶ in the home
    - ▶ psychiatric patients, ...
- ▶ probe packs
  - ▶ items to prompt responses
    - ▶ e.g. glass to listen at wall, camera, postcard
  - ▶ given to people to open in their own environment
    - they record what is meaningful *to them*
- ▶ used to ...
  - ▶ inform interviews, prompt ideas, enculture designers



The background features a series of overlapping, semi-transparent green triangles of varying shades, creating a dynamic and layered effect.

scenarios

stories for design  
use and reuse

# scenarios

- ▶ stories for design
  - ▶ communicate with others
  - ▶ validate other models
  - ▶ understand dynamics
- ▶ linearity
  - ▶ time is linear - our lives are linear
  - ▶ but don't show alternatives

# scenarios ...

- ▶ what will users want to do?
- ▶ step-by-step walkthrough
  - ▶ what can they see (sketches, screen shots)
  - ▶ what do they do (keyboard, mouse etc.)
  - ▶ what are they thinking?
- ▶ use and reuse throughout design

# also play act ...

- ▶ mock up device
- ▶ pretend you are doing it
- ▶ internet-connected swiss army knife ...



use toothpick as stylus 



but where is that thumb?



# ... explore the depths

- ▶ explore interaction
  - ▶ what happens when
- ▶ explore cognition
  - ▶ what are the users thinking
- ▶ explore architecture
  - ▶ what is happening inside

# use scenarios to ..

- ▶ communicate with others
  - ▶ designers, clients, users
- ▶ validate other models
  - ▶ ‘play’ it against other models
- ▶ express dynamics
  - ▶ screenshots - appearance
  - ▶ scenario - behaviour

# linearity

Scenarios - one linear path through system

Pros:

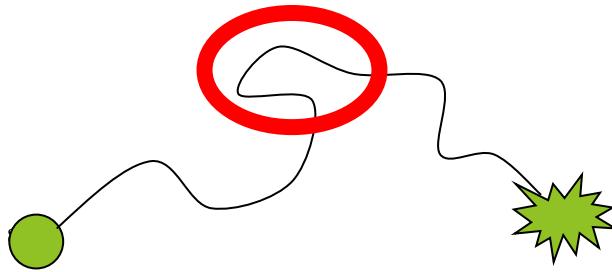
- ▶ life and time are linear
- ▶ easy to understand (stories and narrative are natural)
- ▶ concrete (errors less likely)

Cons:

- ▶ no choice, no branches, no special conditions
- ▶ miss the unintended

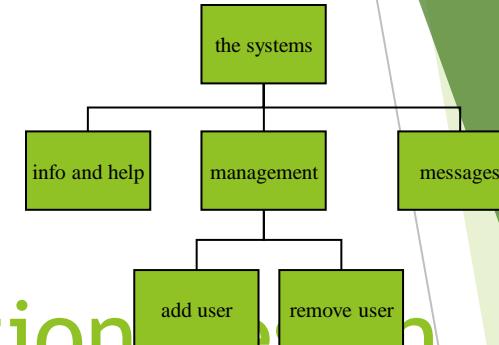
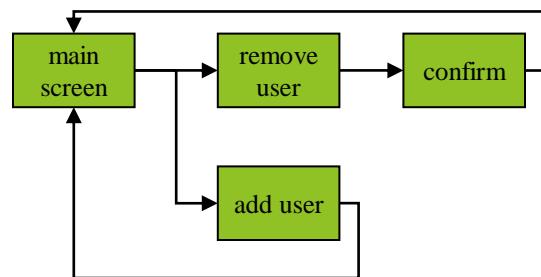
▶ So:

- ▶ use several scenarios
- ▶ use several methods



## navigation design

local structure - single screen  
global structure - whole site



# levels

- ▶ widget choice
  - ▶ menus, buttons etc.
- ▶ screen design
- ▶ application navigation design
- ▶ environment
  - ▶ other apps, O/S

# the web ...

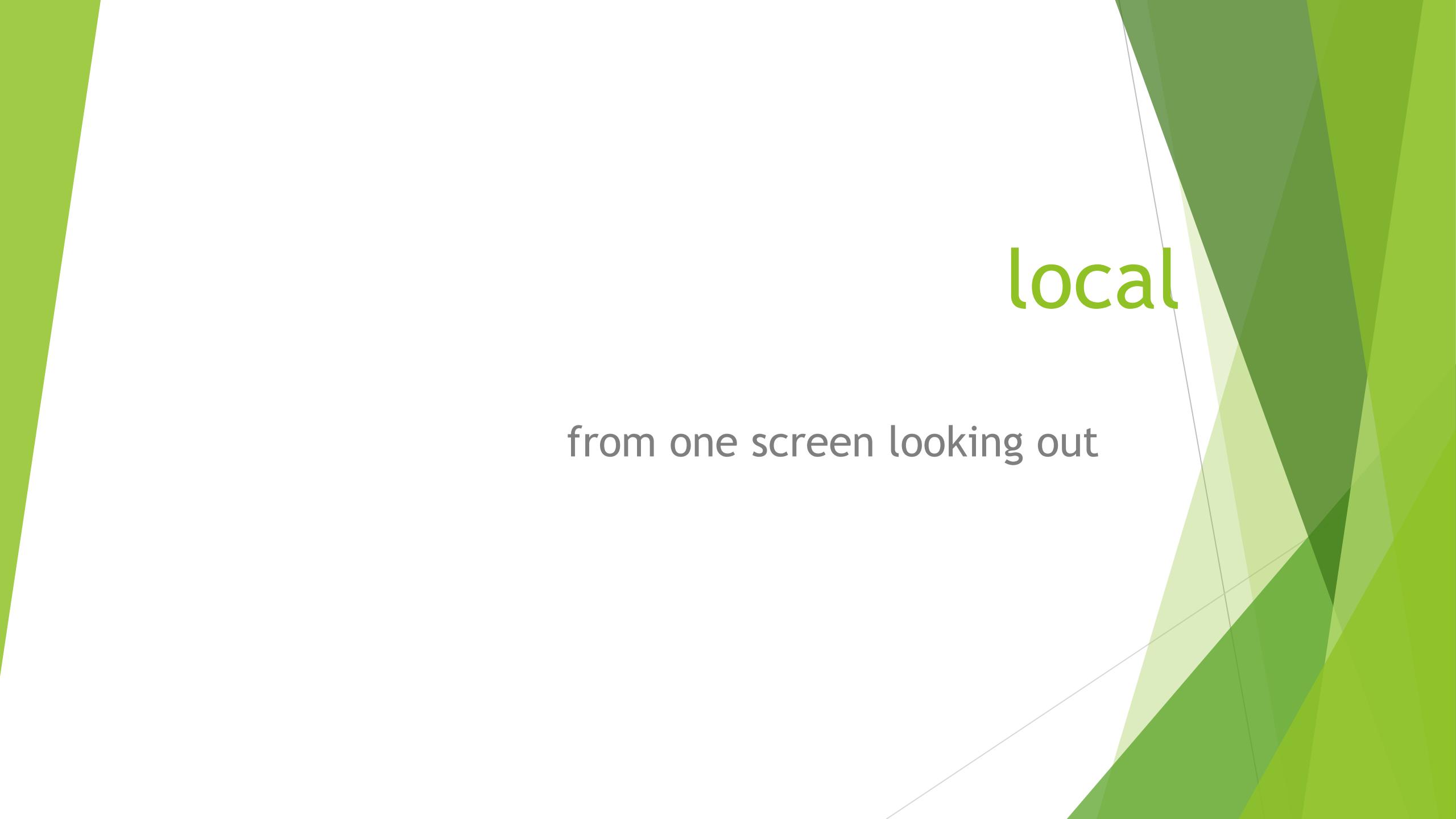
- ▶ **widget choice**
  - ▶ **screen design**
  - ▶ **navigation design**
  - ▶ **environment**
- 
- **elements and tags**
    - <a href="...">
  - **page design**
  - **site structure**
  - **the web, browser, external links**

# physical devices

- ▶ **widget choice**
- ▶ **screen design**
- ▶ **navigation design**
- ▶ **environment**
- **controls**
  - buttons, knobs, dials
- **physical layout**
- **modes of device**
- **the real world**

# think about structure

- ▶ within a screen
  - ▶ later ...
- ▶ local
  - ▶ looking from this screen out
- ▶ global
  - ▶ structure of site, movement between screens
- ▶ wider still
  - ▶ relationship with other applications

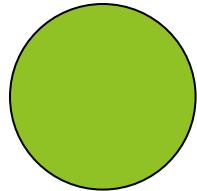


local

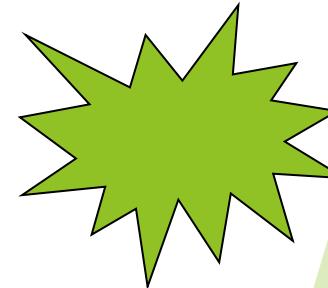
from one screen looking out

# goal seeking

start

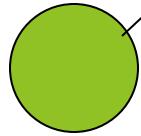


goal

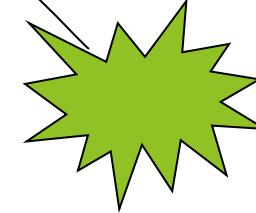


# goal seeking

start

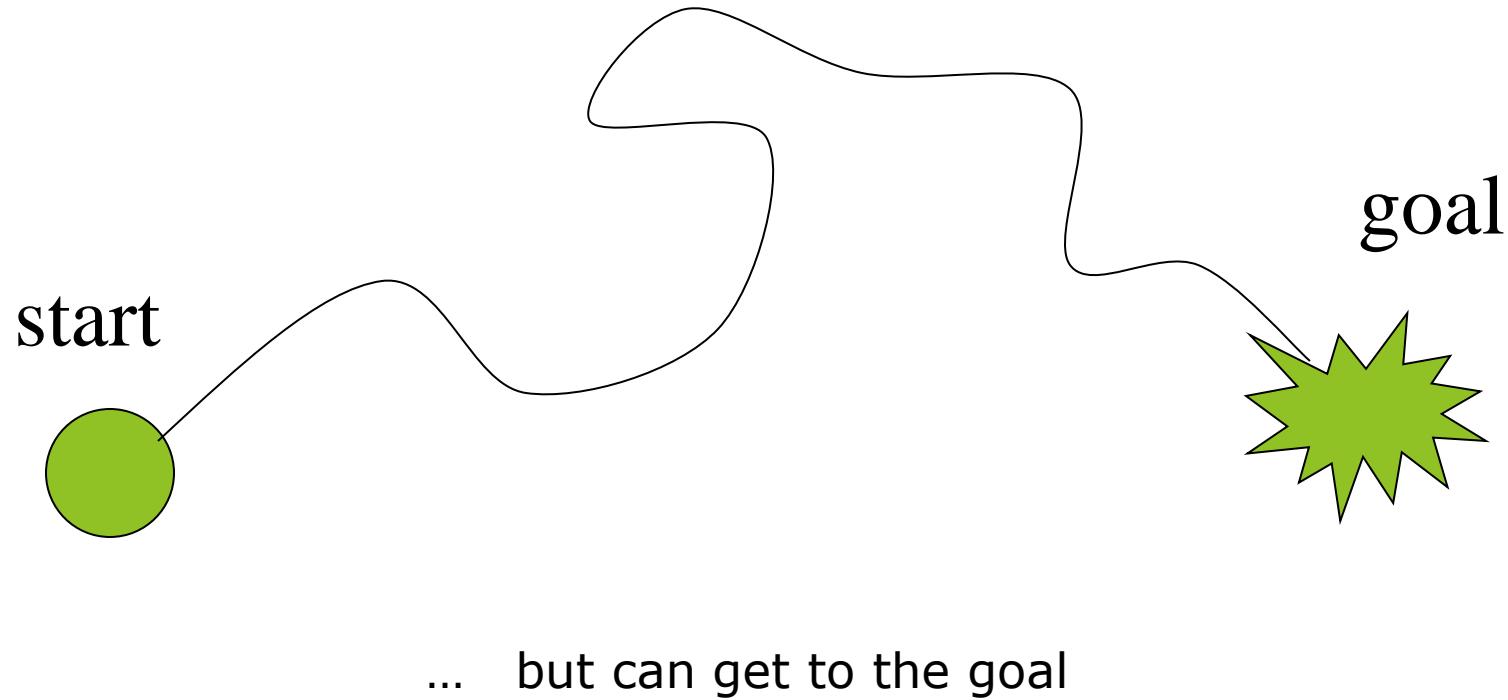


goal

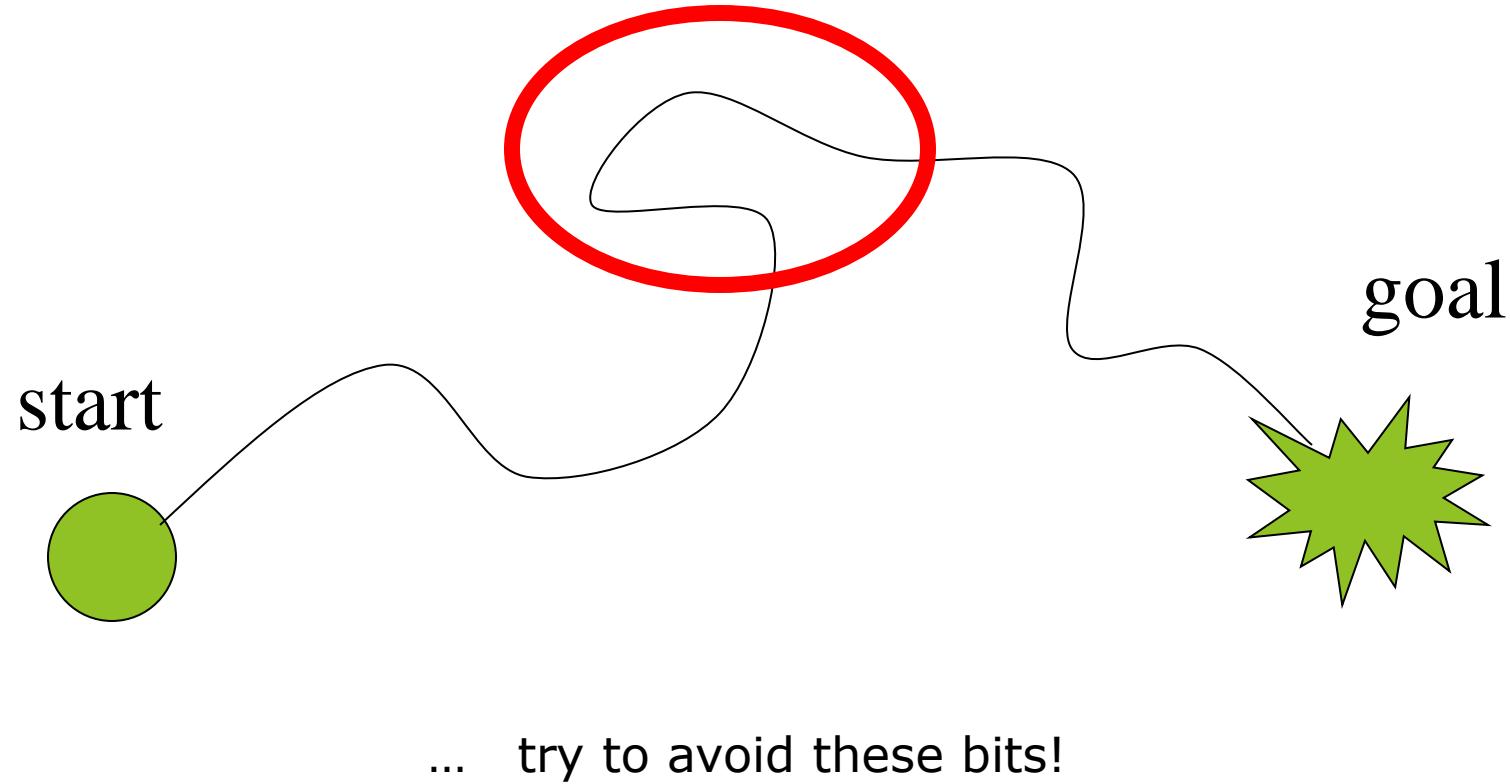


progress with local knowledge only ...

# goal seeking



# goal seeking



# four golden rules

- ▶ knowing where you are
- ▶ knowing what you can do
- ▶ knowing where you are going
  - ▶ or what will happen
- ▶ knowing where you've been
  - ▶ or what you've done

# where you are - breadcrumbs

shows path through web site hierarchy  
top level category      sub-category

## web site

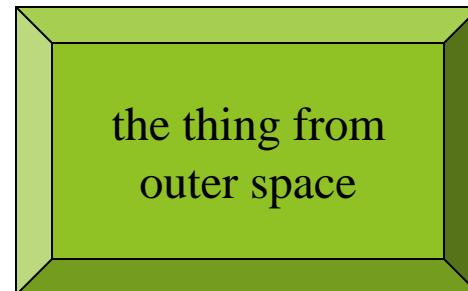
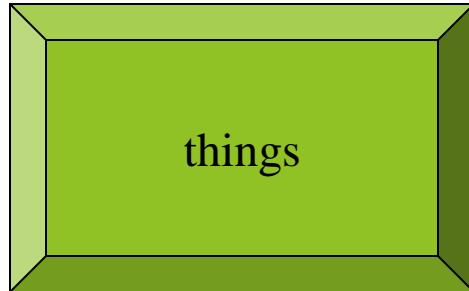
[meandeviation.com](http://meandeviation.com) > statistics tutorial > notes > 7 errors

## 7 common errors

live links  
to higher  
levels



# beware the big button trap

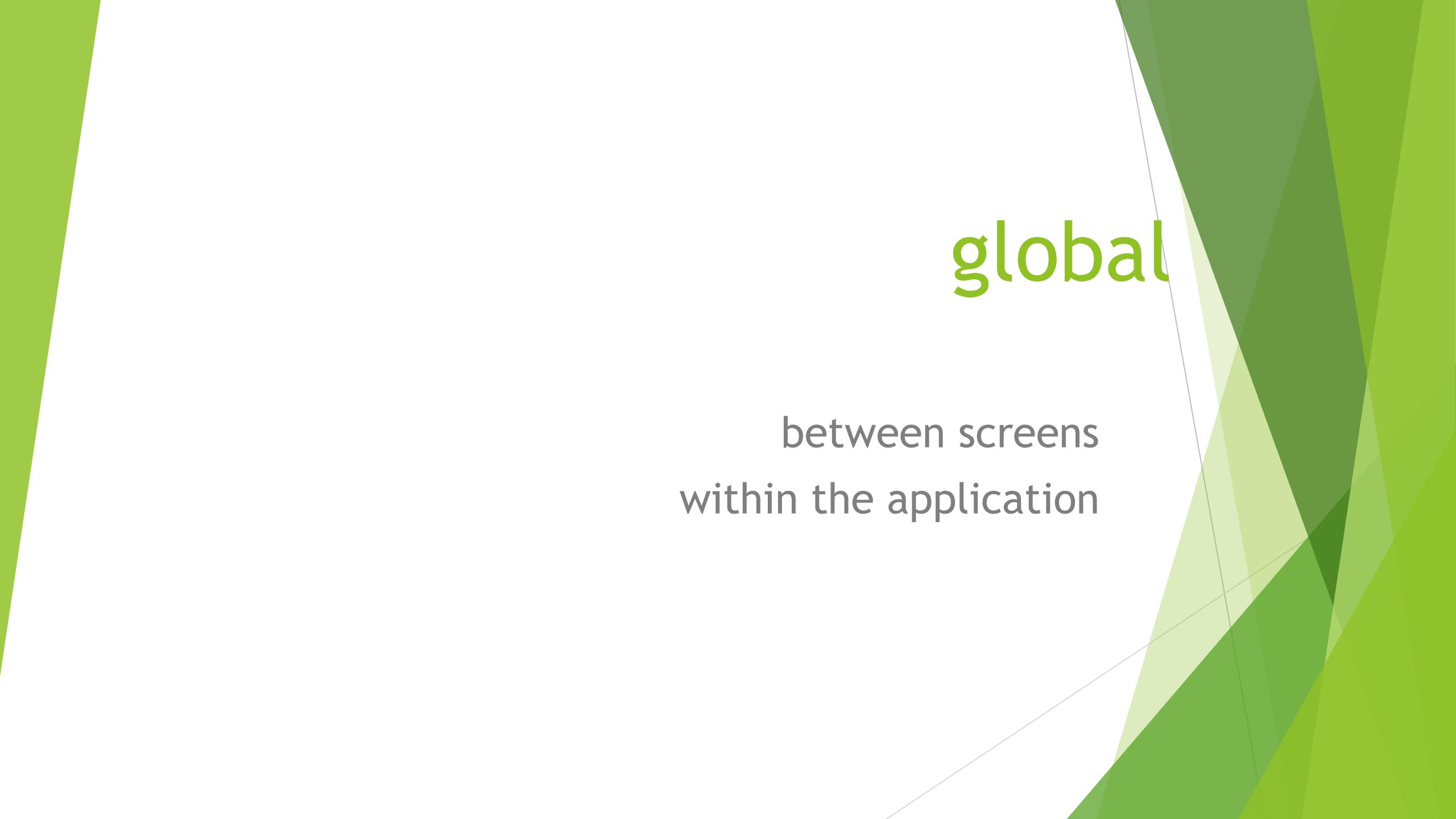


- ▶ where do they go?
  - ▶ lots of room for extra text!

# modes

- ▶ lock to prevent accidental use ...
  - ▶ remove lock - 'c' + 'yes' to confirm
  - ▶ frequent practiced action
- ▶ if lock forgotten
  - ▶ in pocket 'yes' gets pressed
  - ▶ goes to phone book
  - ▶ in phone book ...
    - 'c' - delete entry
    - 'yes' - confirm
    - ... oops !

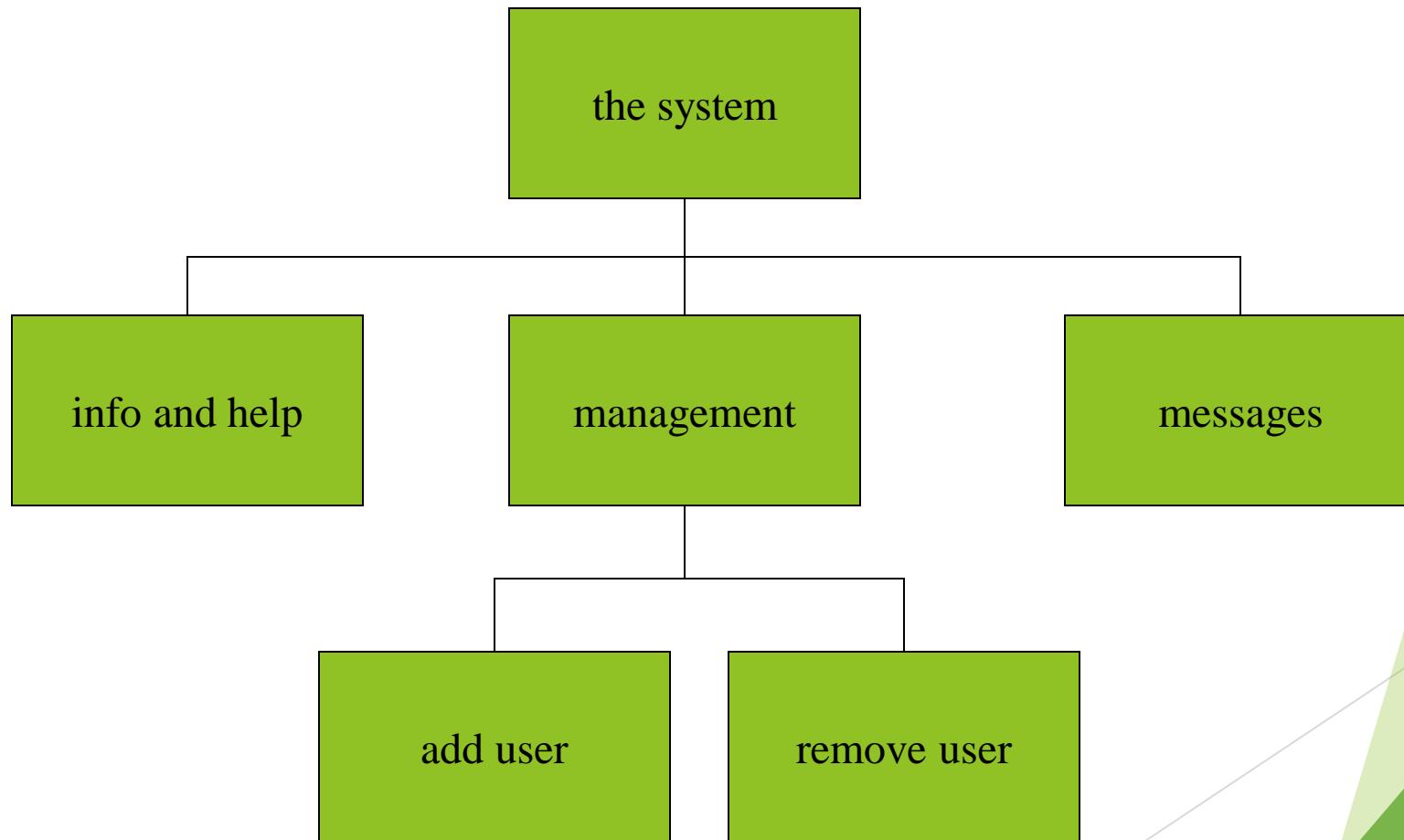




global

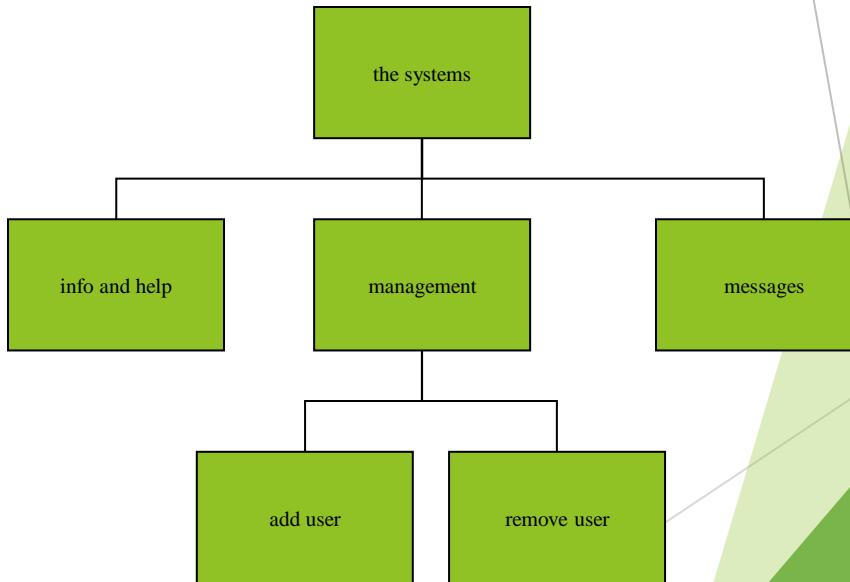
between screens  
within the application

# hierarchical diagrams



# hierarchical diagrams ctd.

- ▶ parts of application
  - ▶ screens or groups of screens
- ▶ typically functional separation



# navigating hierarchies

- ▶ deep is difficult!
- ▶ misuse of Miller's  $7 \pm 2$ 
  - ▶ short term memory, not menu size
- ▶ optimal?
  - ▶ many items on each screen
  - ▶ but structured within screen

see /e3/online/menu-breadth/

# think about dialogue

what does it mean in UI design?

Minister: do you *name* take this woman ...

Man: I do

Minister: do you *name* take this man ...

Woman: I do

Minister: I now pronounce you man and wife

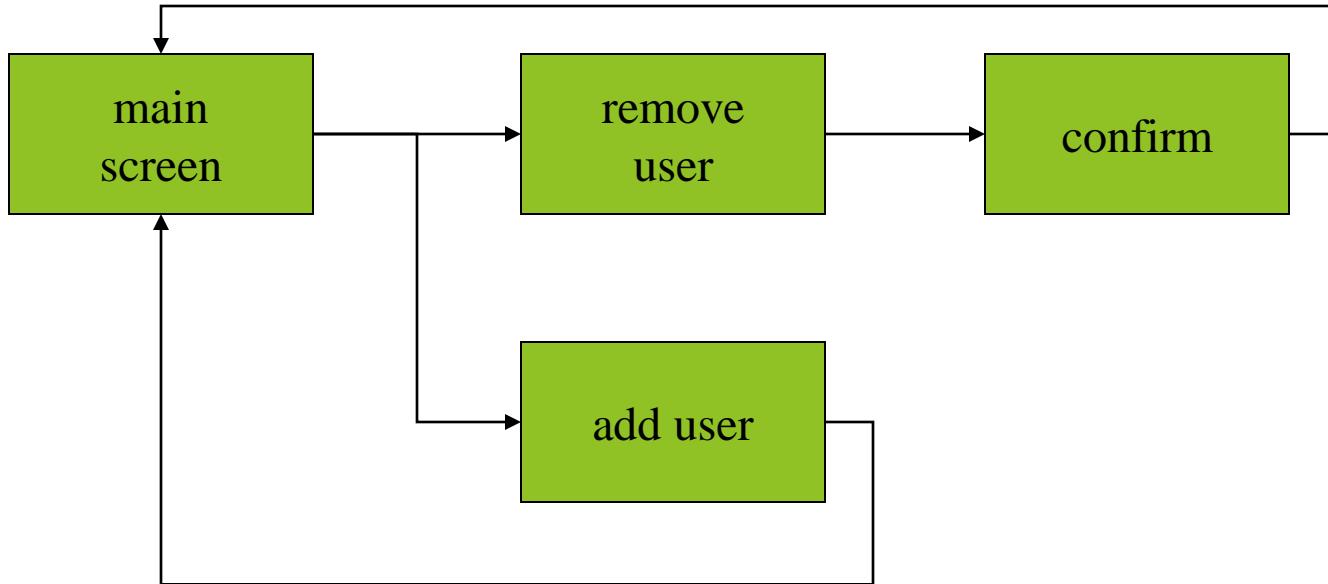
# think about dialogue

what does it mean in UI design?

Minister: do you *name* take this woman ...

- marriage service
  - ▶ general flow, generic - blanks for names
  - ▶ pattern of interaction between people
- computer dialogue
  - ▶ pattern of interaction between users and system
  - ▶ but details differ each time

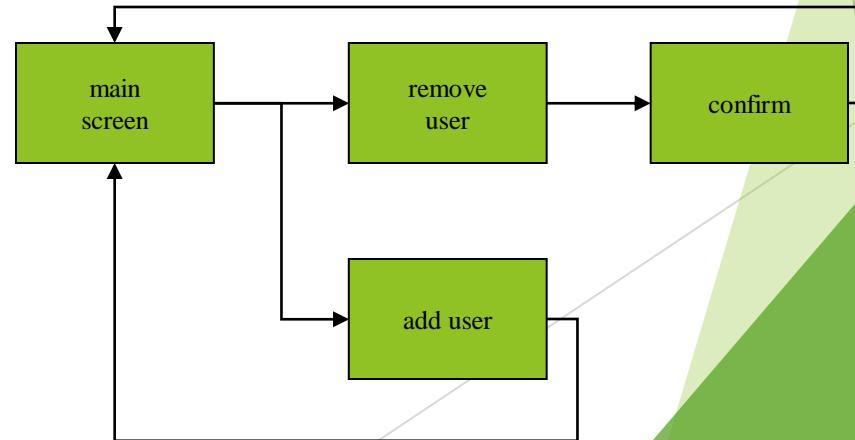
# network diagrams



- ▶ show different paths through system

# network diagrams ctd.

- ▶ what leads to what
- ▶ what happens when
- ▶ including branches
- ▶ more task oriented than hierarchy





# wider still

between applications  
and beyond ...

# wider still ...

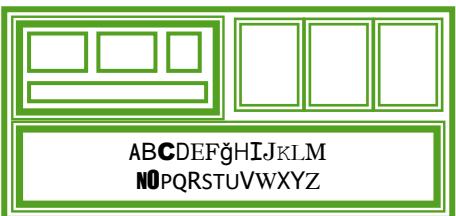
- ▶ style issues:
  - ▶ platform standards, consistency
- ▶ functional issues
  - ▶ cut and paste
- ▶ navigation issues
  - ▶ embedded applications
  - ▶ links to other apps ... the web



Dix , Alan  
Finlay, Janet  
Abowd, Gregory  
Beale, Russell

# screen design and layout

basic principles  
grouping, structure, order  
alignment  
use of white space



# basic principles

## ► ask

- ▶ what is the user doing?

## ► think

- ▶ what information, comparisons, order

## ► design

- ▶ form follows function

# available tools

- ▶ grouping of items
- ▶ order of items
- ▶ decoration - fonts, boxes etc.
- ▶ alignment of items
- ▶ white space between items

# grouping and structure

logically together  $\Rightarrow$  physically together

## Billing details:

Name  
Address: ...  
Credit card no

## Delivery details:

Name  
Address: ...  
Delivery time

## Order details:

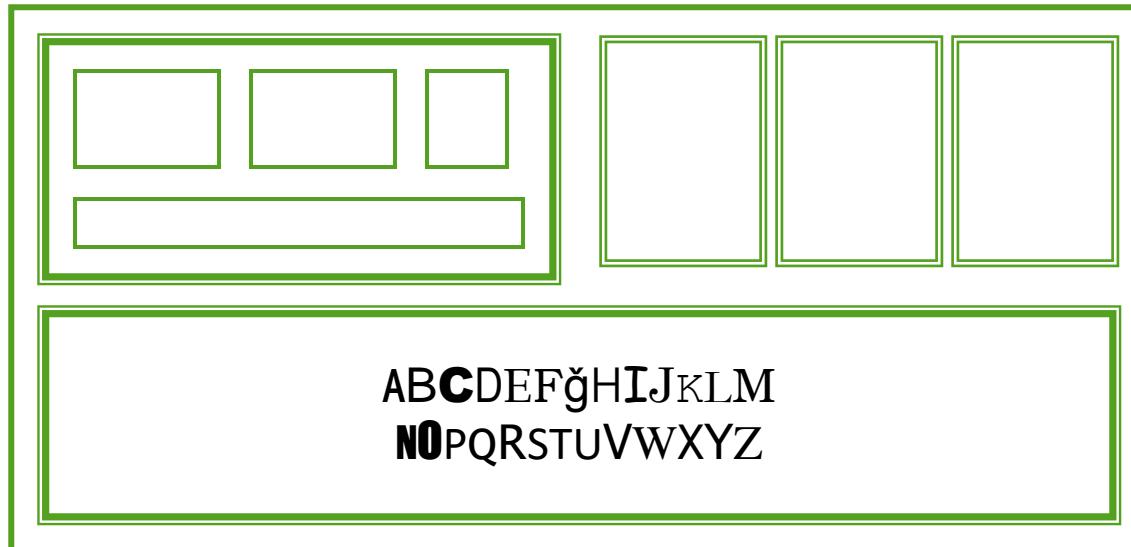
item	size	screws	(boxes)	quantity	cost/item	cost
.....	10	...	...	7	3.71	25.97
.....	...	...	...	...	...	...

# order of groups and items

- ▶ think! - what is natural order
- ▶ should match screen order!
  - ▶ use boxes, space etc.
  - ▶ set up tabbing right!
- ▶ instructions
  - ▶ beware the cake recipie syndrome!  
... mix milk and flour, add the fruit  
after beating them

# decoration

- ▶ use boxes to group logical items
- ▶ use fonts for emphasis, headings
- ▶ but not too many!!

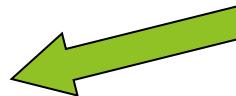


# alignment - text

- ▶ you read from left to right (English and European)  
⇒ align left hand side

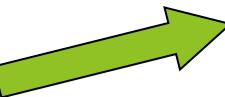
Willy Wonka and the Chocolate Factory  
Winston Churchill - A Biography  
Wizard of Oz  
Xena - Warrior Princess

boring but  
readable!



fine for special effects but hard  
to scan

Willy Wonka and the Chocolate Factory  
Winston Churchill - A Biography  
Wizard of Oz  
Xena - Warrior Princess



# alignment - names

- ▶ Usually scanning for surnames

⇒ make it easy!

Alan Dix  
Janet Finlay  
Gregory Abowd  
Russell Beale



Alan      Dix  
Janet      Finlay  
Gregory    Abowd  
Russell    Beale



Dix , Alan  
Finlay, Janet  
Abowd, Gregory  
Beale, Russell



# alignment - numbers

think purpose!

which is biggest?

532.56
179.3
256.317
15
73.948
1035
3.142
497.6256

# alignment - numbers

visually:

long number = big number

align decimal points

or right align integers

627.865
1.005763
382.583
2502.56
432.935
2.0175
652.87
56.34

# multiple columns

- ▶ scanning across gaps hard:  
(often hard to avoid with large data base fields)

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

# multiple columns - 2

- ▶ use leaders

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

# multiple columns - 3

- ▶ or greying (vertical too)

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

# multiple columns - 4

- ▶ or even (with care!) ‘bad’ alignment

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

white space - the counter

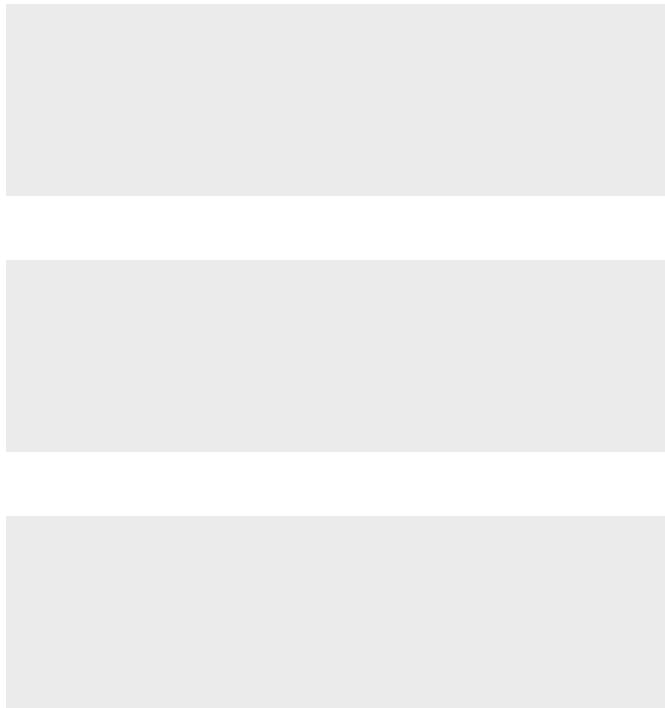
**WHAT YOU SEE**

white space - the counter

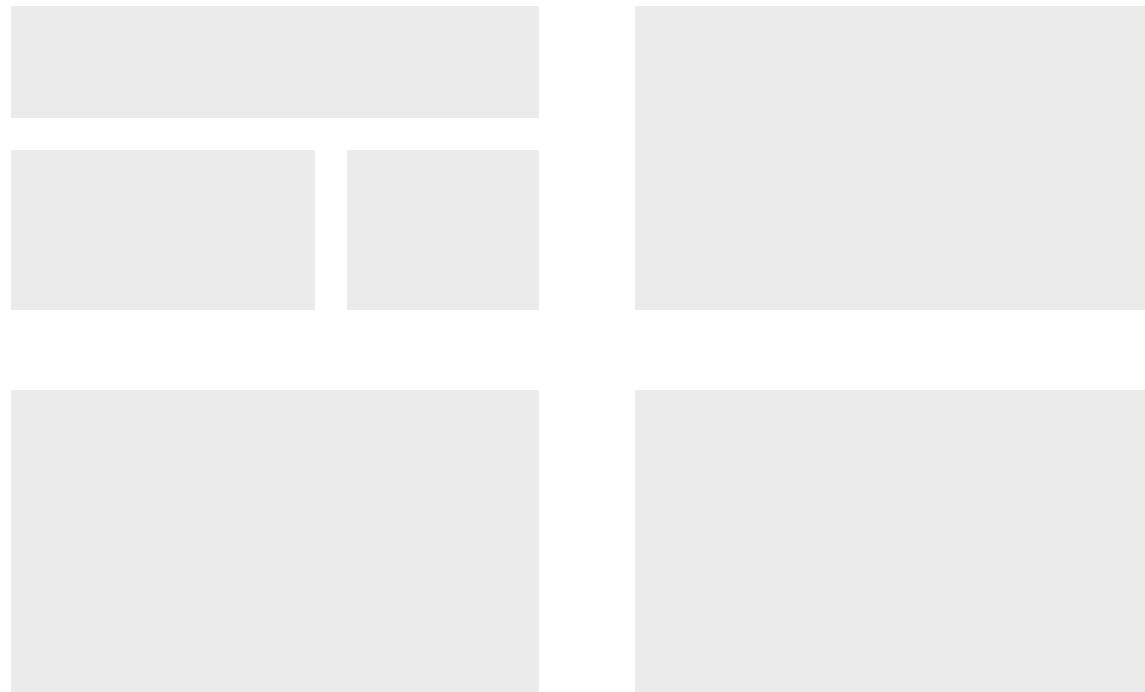
**WHAT YOU SEE**

LITTLE GAPS BETWEEN

space to separate



# space to structure

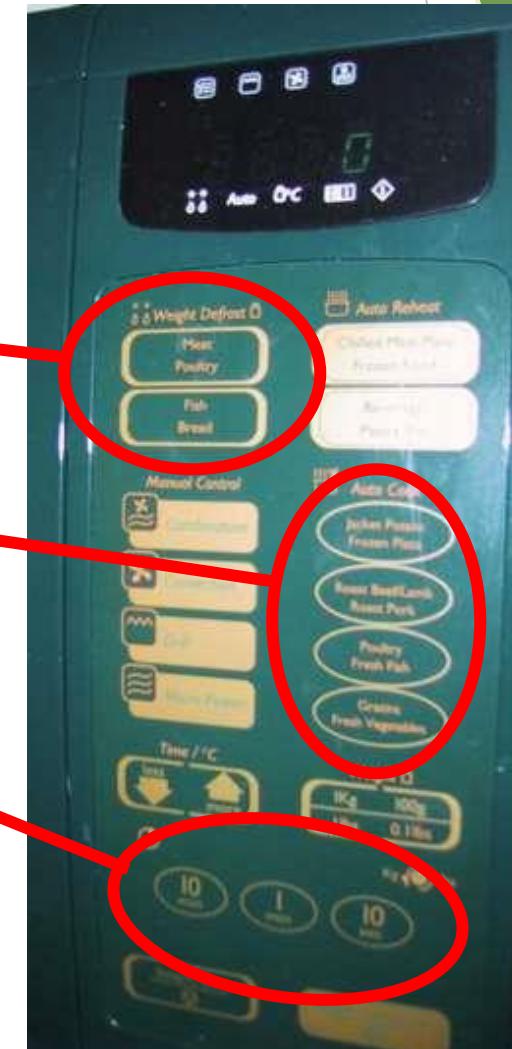


# space to highlight



# physical controls

- ▶ grouping of items
- defrost settings
- type of food
- time to cook



# physical controls

- ▶ grouping of items
- ▶ order of items
  - 1) type of heating
  - 2) temperature
  - 3) time to cook
  - 4) start

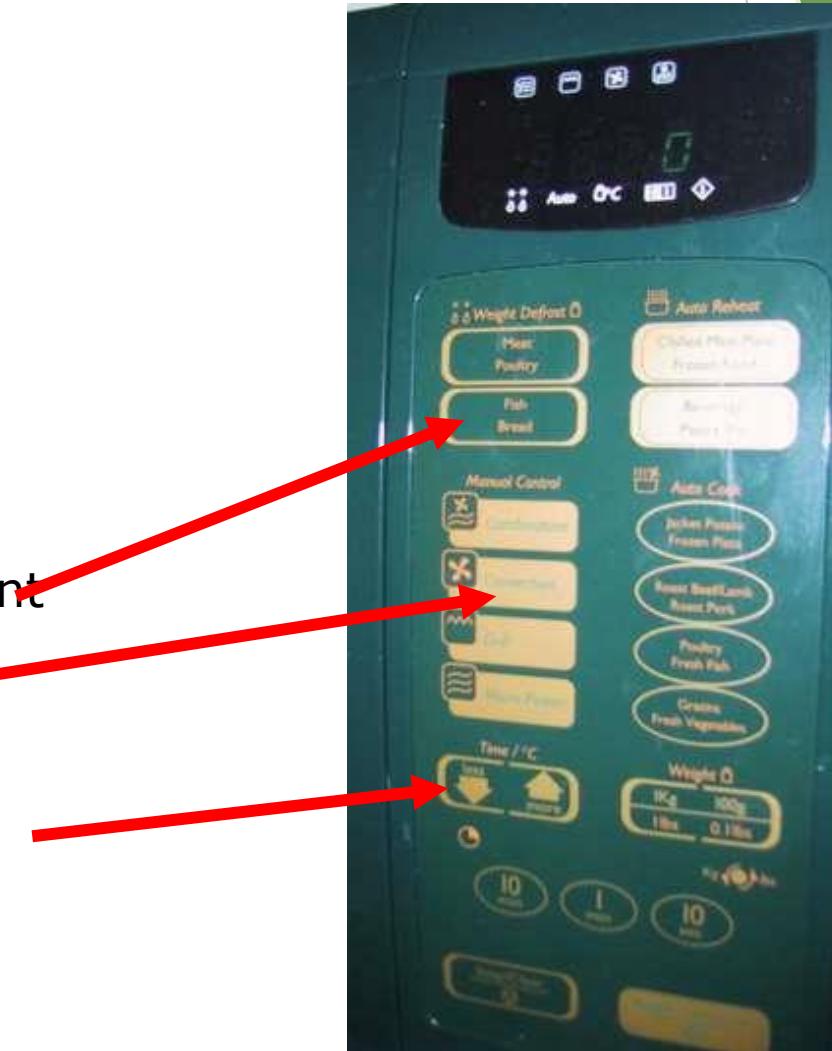


# physical controls

- ▶ grouping of items
- ▶ order of items
- ▶ decoration

different colours for different functions

lines around related buttons (temp up/down)



# physical controls

- ▶ grouping of items
- ▶ order of items
- ▶ decoration
- ▶ alignment

centred text in buttons

? easy to scan ?



# physical controls

- ▶ grouping of items
- ▶ order of items
- ▶ decoration
- ▶ alignment
- ▶ white space

gaps to aid grouping



# user action and control

entering information  
knowing what to do  
affordances

# entering information

- ▶ forms, dialogue boxes
  - ▶ presentation + data input
  - ▶ similar layout issues
  - ▶ alignment - N.B. different label lengths
- ▶ logical layout
  - ▶ use task analysis (ch15)
  - ▶ groupings
  - ▶ natural order for entering information
    - ▶ top-bottom, left-right (depending on culture)
    - ▶ set tab order for keyboard entry

<b>Name:</b> Alan Dix
<b>Address:</b> Lancaster

<b>Name:</b> Alan Dix
<b>Address:</b> Lancaster

<b>Name:</b> Alan Dix
<b>Address:</b> Lancaster

N.B. see extra slides for widget choice

# knowing what to do

- ▶ what is active what is passive
  - ▶ where do you click
  - ▶ where do you type
- ▶ consistent style helps
  - ▶ e.g. web underlined links
- ▶ labels and icons
  - ▶ standards for common actions
  - ▶ language - bold = current state or action

# affordances

- ▶ psychological term
- ▶ for physical objects
  - ▶ shape and size suggest actions
    - ▶ pick up, twist, throw
  - ▶ also cultural - buttons 'afford' pushing
- ▶ for screen objects
  - ▶ button-like object 'affords' mouse click
  - ▶ physical-like objects suggest use
- ▶ culture of computer use
  - ▶ icons 'afford' clicking
  - ▶ or even double clicking ... not like real buttons!



mug handle

'affords'  
grasping



# appropriate appearance

presenting information  
aesthetics and utility  
colour and 3D  
localisation & internationalisation

# presenting information

- ▶ purpose matters
  - ▶ sort order (which column, numeric alphabetic)
  - ▶ text vs. diagram
  - ▶ scatter graph vs. histogram
- ▶ use paper presentation principles!
- ▶ but add interactivity
  - ▶ softens design choices
    - ▶ e.g. re-ordering columns
    - ▶ ‘dancing histograms’ (chap 21)

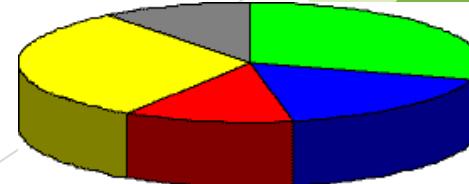
name	size
chap10	12
chap5	16
chap1	17
chap14	22
chap20	27
chap8	32
...	...

# aesthetics and utility

- ▶ aesthetically pleasing designs
  - ▶ increase user satisfaction and improve productivity
- ▶ beauty and utility may conflict
  - ▶ mixed up visual styles ⇒ easy to distinguish
  - ▶ clean design - little differentiation ⇒ confusing
  - ▶ backgrounds behind text
    - ... good to look at, but hard to read
- ▶ but can work together
  - ▶ e.g. the design of the counter
  - ▶ in consumer products - key differentiator (e.g. iMac)

# colour and 3D

- ▶ both often used very badly!
- ▶ colour
  - ▶ older monitors limited palette
  - ▶ colour over used because ‘it is there’
  - ▶ beware colour blind!
  - ▶ use sparingly to reinforce other information
- ▶ 3D effects
  - ▶ good for physical information and some graphs
  - ▶ but if over used ...  
e.g. text in perspective!! 3D pie charts



# bad use of colour

- ▶ over use - without very good reason (e.g. kids' site)
- ▶ colour blindness
- ▶ poor use of contrast
- ▶ do adjust your set!
  - ▶ adjust your monitor to greys only
  - ▶ can you still read your screen?

# across countries and cultures

- ▶ localisation & internationalisation
  - ▶ changing interfaces for particular cultures/languages
- ▶ globalisation
  - ▶ try to choose symbols etc. that work everywhere
- ▶ simply change language?
  - ▶ use ‘resource’ database instead of literal text
    - ... but changes sizes, left-right order etc.
- ▶ deeper issues
  - ▶ cultural assumptions and values
  - ▶ meanings of symbols
    - e.g tick and cross ... +ve and -ve in some cultures
      - ... but ... mean the same thing (mark this) in others



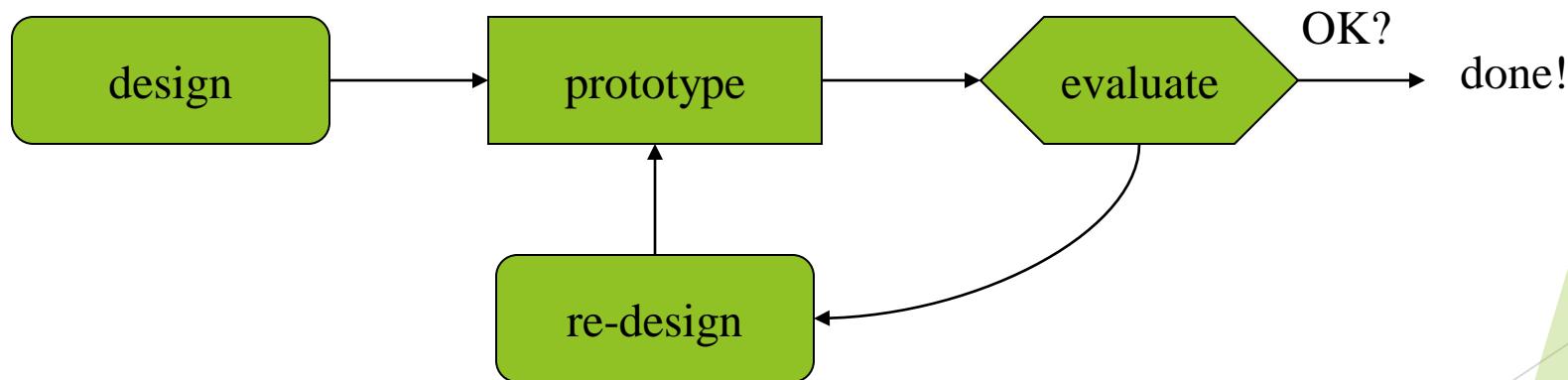
# prototyping

# iteration and prototyping

getting better ...  
... and starting well

# prototyping

- ▶ you never get it right first time
- ▶ if at first you don't succeed ...



# pitfalls of prototyping

- ▶ moving little by little ... but to where
- ▶ Malverns or the Matterhorn?

1. need a good start point
2. need to understand what is wrong

# Designing Effective Interfaces

# The User Interface

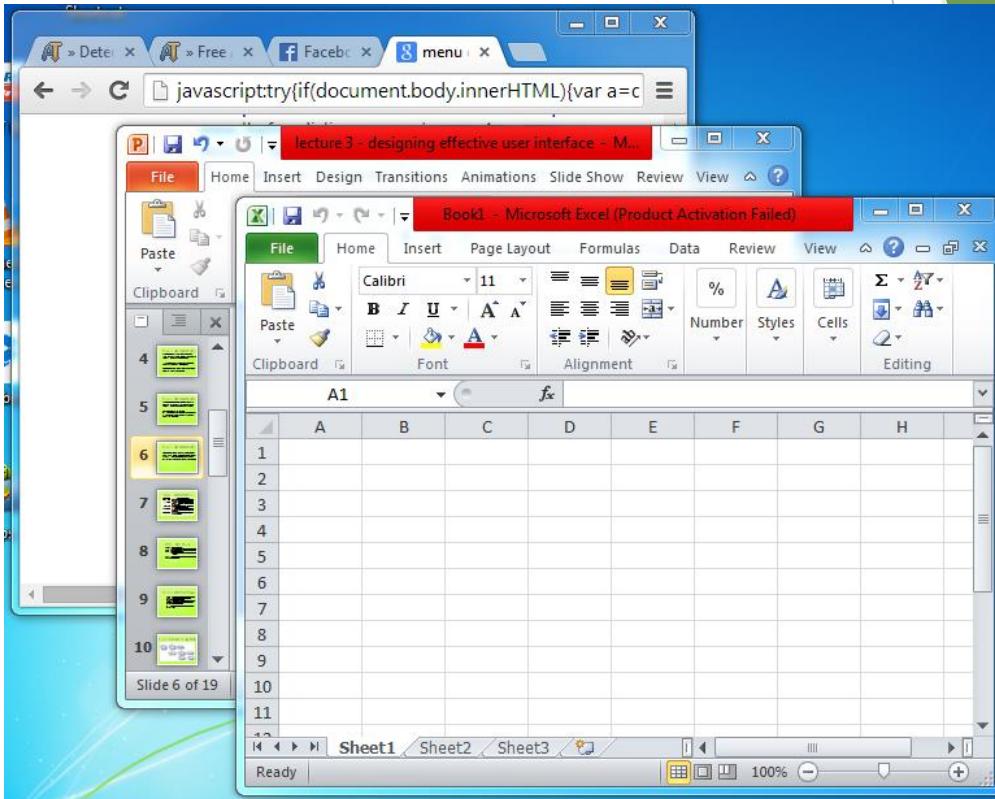
- System users often judge a system by its interface rather than its functionality
- A poorly designed interface can cause a user to make catastrophic errors
- Poor user interface design is the reason why so many software systems are never used

# Graphical user interface (GUI)

- Allows users to click and drag objects with a mouse instead of entering text at a command line.
- Most users of business systems interact with these systems through graphical interfaces although, in some cases, legacy text-based interfaces are still used

# GUI characteristics (WIMP)

- **WINDOWS** -  
Multiple windows  
allow different  
information to be  
displayed  
simultaneously on  
the user's screen.

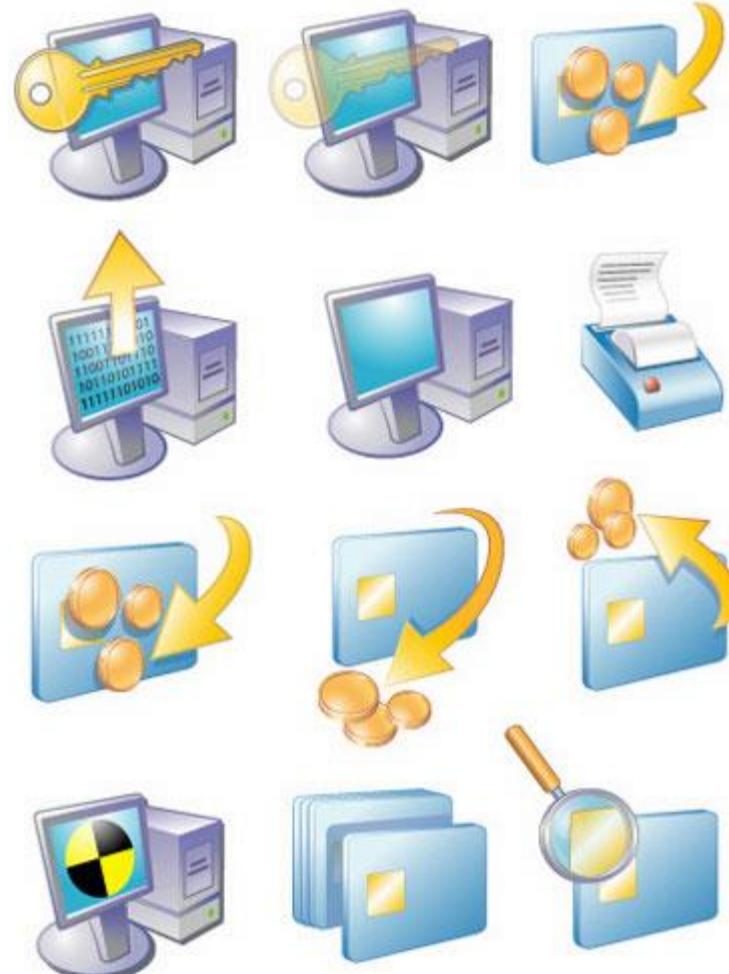


# Windows

- ▶ Areas of the screen that behave as if they were independent
  - can contain text or graphics
  - can be moved or resized
  - can overlap and obscure each other, or can be laid out next to one another (tiled)
- ▶ **Scrollbars**
  - allow the user to move the contents of the window up and down or from side to side
- ▶ **title bars**
  - describe the name of the window

# GUI characteristics

- **ICONS** - Icons different types of information. On some systems, icons represent files; on others, icons represent processes.

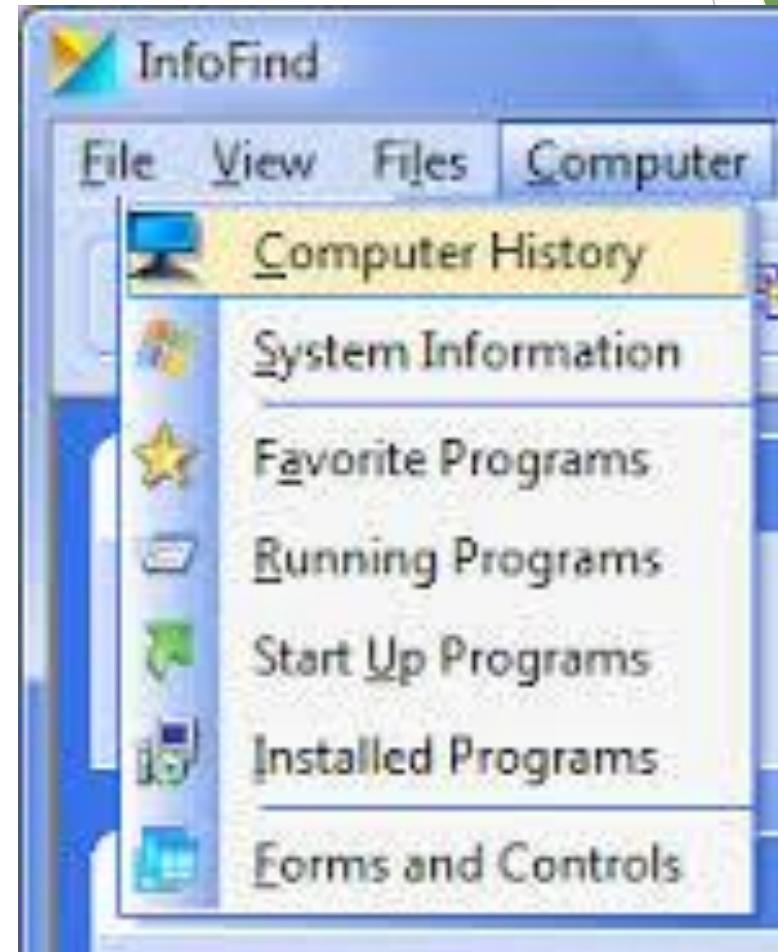


# Icons

- ▶ small picture or image:
- ▶ represents some object in the interface
  - often a window or action
- ▶ windows can be closed down (iconised)
  - small representation fi many accessible windows
- ▶ icons can be many and various
  - highly stylized
  - realistic representations.

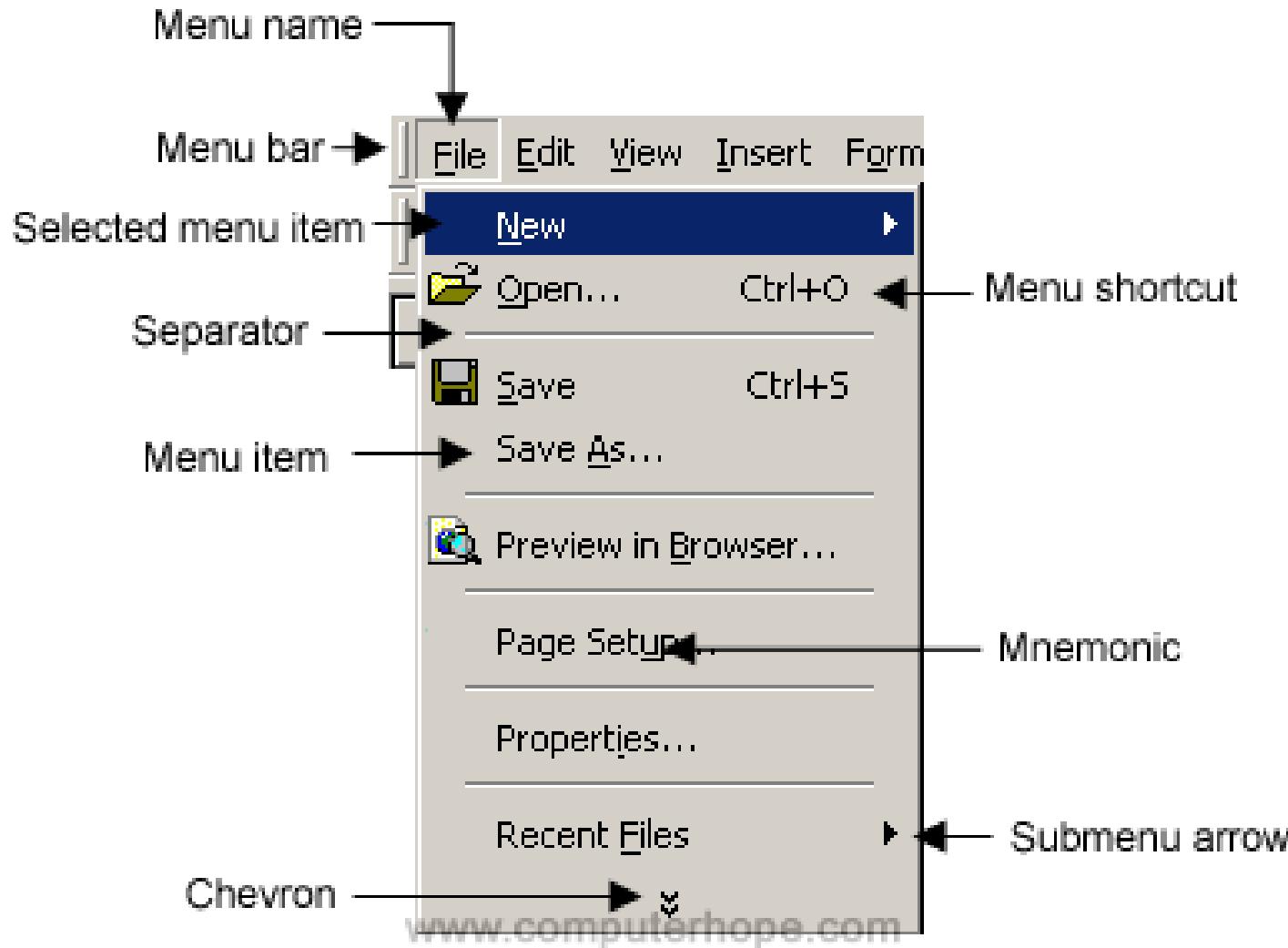
# GUI characteristics

**MENUS** - Commands are selected from a menu rather than typed in a command language.



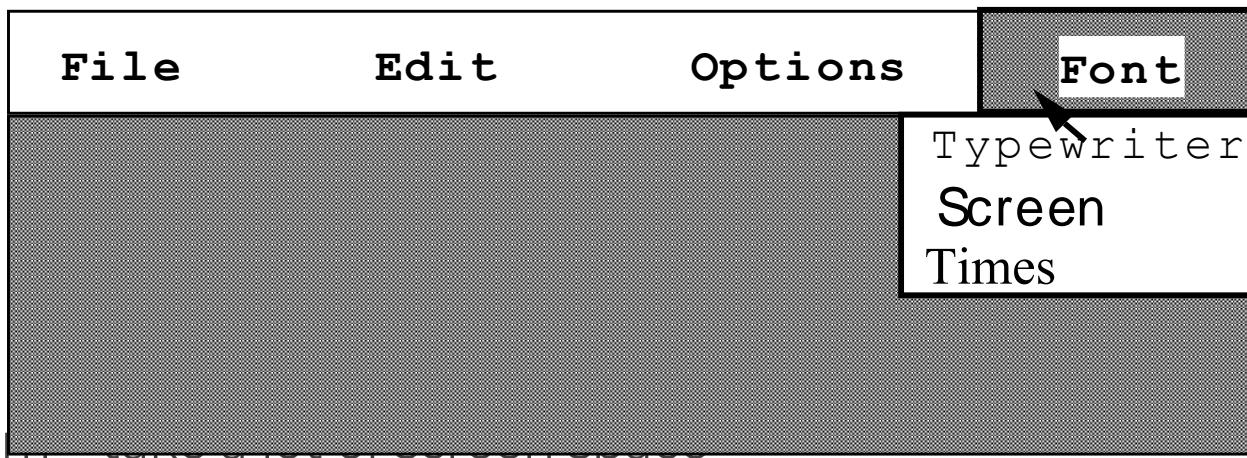
# GUI characteristics

## PARTS OF A COMPUTER MENU



# Menus

- ▶ Choice of operations or services offered on the screen
- ▶ Required option selected with pointer



problem

solution – pop-up: menu appears when needed

# Kinds of Menus

- ▶ Menu Bar at top of screen (normally), menu drags down
  - pull-down menu - mouse hold and drag down menu
  - drop-down menu - mouse click reveals menu
  - fall-down menus - mouse just moves over bar!
- ▶ Contextual menu appears where you are
  - pop-up menus - actions for selected object
  - pie menus - arranged in a circle
    - easier to select item (larger target area)
    - quicker (same distance to any option)
      - ... but not widely used!

# Menus extras

- ▶ Cascading menus

- hierarchical menu structure
- menu selection opens new menu
- and so in ad infinitum

- ▶ Keyboard accelerators

- key combinations - same effect as menu item
- two kinds
- active when menu open – usually first letter
- active when menu closed – usually Ctrl + letter
- usually different !!!

# Menus design issues

- ▶ Which kind to use?
- ▶ What to include in menus at all?
- ▶ Words to use (action or description).
- ▶ How to group items?
- ▶ Choice of keyboard accelerators.

# Buttons

- ▶ individual and isolated regions within a display that can be selected to invoke an action

## ▶ Special kinds

- ▶ radio buttons
  - set of mutually exclusive choices
- ▶ check boxes
  - set of non-exclusive choices

Gender:  Male  Female

Interests:  web development  user interfaces  music

**Submit**

# Toolbars

- ▶ long lines of icons ...  
... but what do they do?
- ▶ fast access to common actions
- ▶ often customizable:
  - choose *which* toolbars to see
  - choose *what* options are on it

# Palettes and tear-off menus

- ▶ Problem  
menu not there when you want it
- ▶ Solution  
palettes – little windows of actions
  - shown/hidden via menu option  
e.g. available shapes in drawing package

## tear-off and pin-up menus

- menu ‘tears off’ to become palette

# Dialogue boxes

- ▶ information windows that pop up to inform of an important event or request information.

e.g: when saving a file, a dialogue box is displayed to allow the user to specify the filename and location. Once the file is saved, the box disappears.

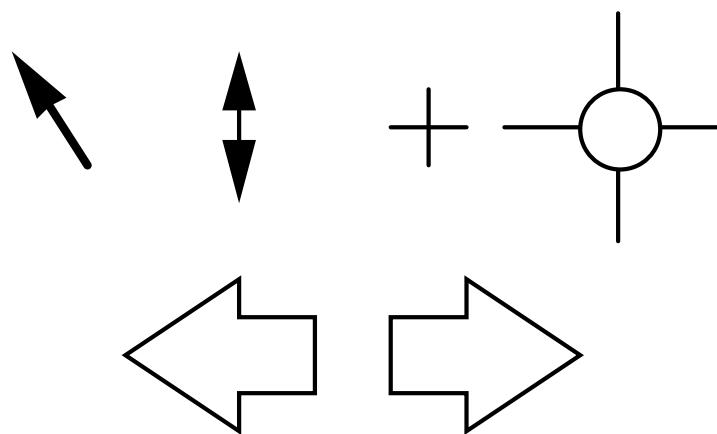
# GUI characteristics

- **POINTING** - A pointing device such as a mouse is used for selecting choices from a menu or indicating items of interest in a window.



# Pointers

- ▶ important component
  - WIMP style relies on pointing and selecting things
- ▶ uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts
- ▶ wide variety of graphical images



# GUI characteristics

- **GRAPHICS** - Graphical elements can be mixed with text on the same display.



# GUI Advantages

- They are easy to learn and use.
- Users without experience can learn to use the system quickly.
- Fast, full-screen interaction is possible with immediate access to anywhere on the screen

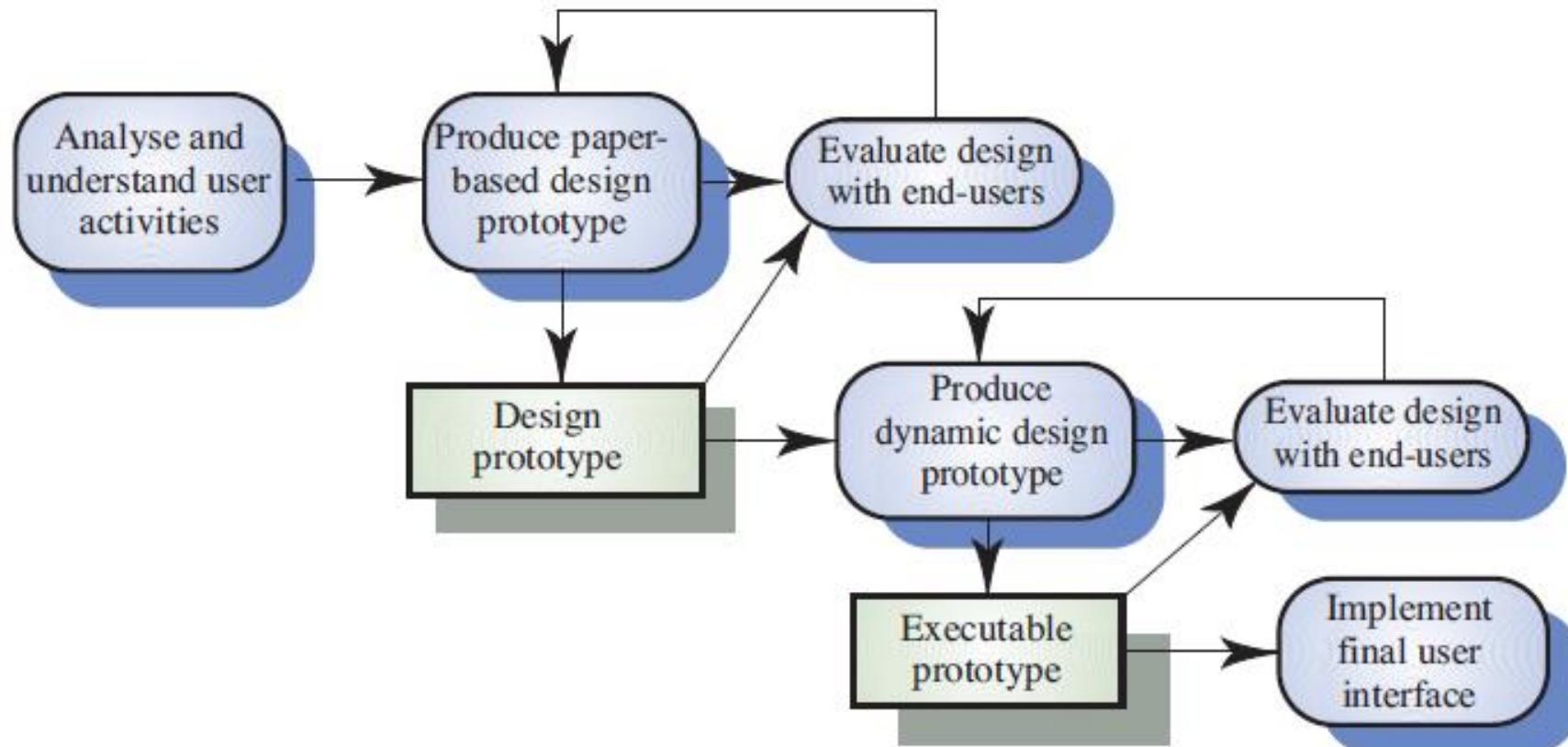
# GUI Advantages

- The user may switch quickly from one task to another and can interact with several different applications.
- Information remains visible in its own window when attention is switched.

# User-Centered Design

- **User-centered Design** is an approach to UI design where the needs of the user are paramount and where the user is involved in the design process
- UI design always involves the development of prototype interfaces

# User Interface Design Process



# UI Design Principles

- UI design must take account of the needs, experience and capabilities of the system users
- UI design principles underlie interface designs although not all principles are applicable to all designs

# UI Design Principles

- Designers should be aware of people's physical and mental limitations (e.g. limited short-term memory) and should recognize that people make mistakes



# UI design principles

- User familiarity
- Consistency
- Minimal Surprise
- Recoverability
- User Guidance
- User Diversity

# User familiarity

- The interface should use terms and concepts which are drawn from the experience of the people who will make most use of the system.
- The interface should be based on user-oriented terms and concepts rather than computer concepts. For example, an office system should use concepts such as letters, documents, folders etc. rather than directories, file identifiers, etc.

# Consistency

- The interface should be consistent in that, wherever possible, comparable operations should be activated in the same way.
- The system should display an appropriate level of consistency. Commands and menus should have the same format, command punctuation should be similar, etc.

# Minimal Surprise

- Users should never be surprised by the behavior of a system.
- If a command operates in a known way, the user should be able to predict the operation of comparable commands

# Recoverability

- The interface should include mechanisms to allow users to recover from errors.
- 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 Guidance

- The interface should provide meaningful feedback when errors occur and provide context-sensitive user help facilities.
- Some user guidance such as help systems, on-line manuals, etc. should be supplied

# User Diversity

- The interface should provide appropriate interaction facilities for different types of system user.
- Interaction facilities for different types of user should be supported. For example, some users have seeing difficulties and so larger text should be available

# User - System Interaction

# 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
- Form fill-in
- Command language
- Natural language

# Direct manipulation advantages

- Users feel in control of the computer and are less likely to be intimidated by it
- User learning time is relatively short
- Users get immediate feedback on their actions so mistakes can be quickly detected and corrected

# Direct manipulation problems

- The derivation of an appropriate information space model can be very difficult
- Given that users have a large information space, what facilities for navigating around that space should be provided?
- Direct manipulation interfaces can be complex to program and make heavy demands on the computer system

# Menu systems

- Users make a selection from a list of possibilities presented to them by the system
- The selection may be made by pointing and clicking with a mouse, using cursor keys or by typing the name of the selection
- May make use of simple-to-use terminals such as touchscreens

# Advantages of Menu Systems

- Users need not remember command names as they are always presented with a list of valid commands
- Typing effort is minimal
- User errors are trapped by the interface
- Context-dependent help can be provided.
- The user's context is indicated by the current menu selection

# Problems with Menu Systems

- Actions which involve logical conjunction (and) or disjunction (or) are awkward to represent
- Menu systems are best suited to presenting a small number of choices. If there are many choices, some menu structuring facility must be used
- Experienced users find menus slower than command language

# Command Interface

- User types commands to give instructions to the system e.g. UNIX
- May be implemented using cheap terminals.
- Easy to process using compiler techniques
- Commands of arbitrary complexity can be
- created by command combination
- Concise interfaces requiring minimal typing can be created

# Problems with Command Interface

- Users have to learn and remember a command language. Command interfaces are therefore unsuitable for occasional users
- Users make errors in command. An error detection and recovery system is required
- System interaction is through a keyboard so typing ability is required

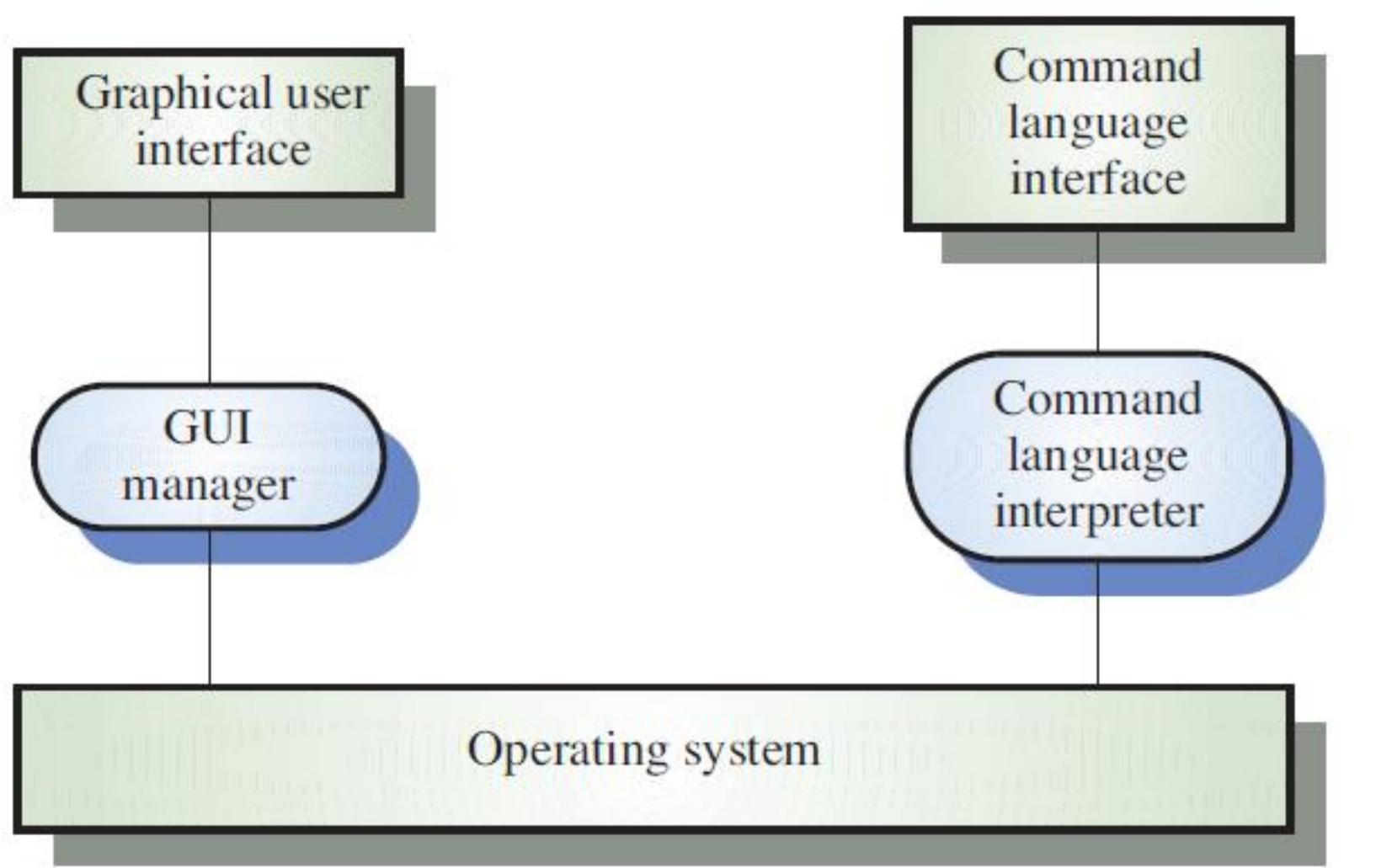
# Command Languages

- Often preferred by experienced users because they allow for faster interaction with the system
- Not suitable for casual or inexperienced users
- May be provided as an alternative to menu commands (keyboard shortcuts). In some cases, a command language interface and a menu-based interface are supported at the same time

# Natural Language Interface

- The user types a command in a natural language.
- Generally, the vocabulary is limited and these systems are confined to specific application domains (e.g. timetable enquiries)
- NL processing technology is now good enough to make these interfaces effective for casual users but experienced users find that they require too much typing

# Multiple User Interface

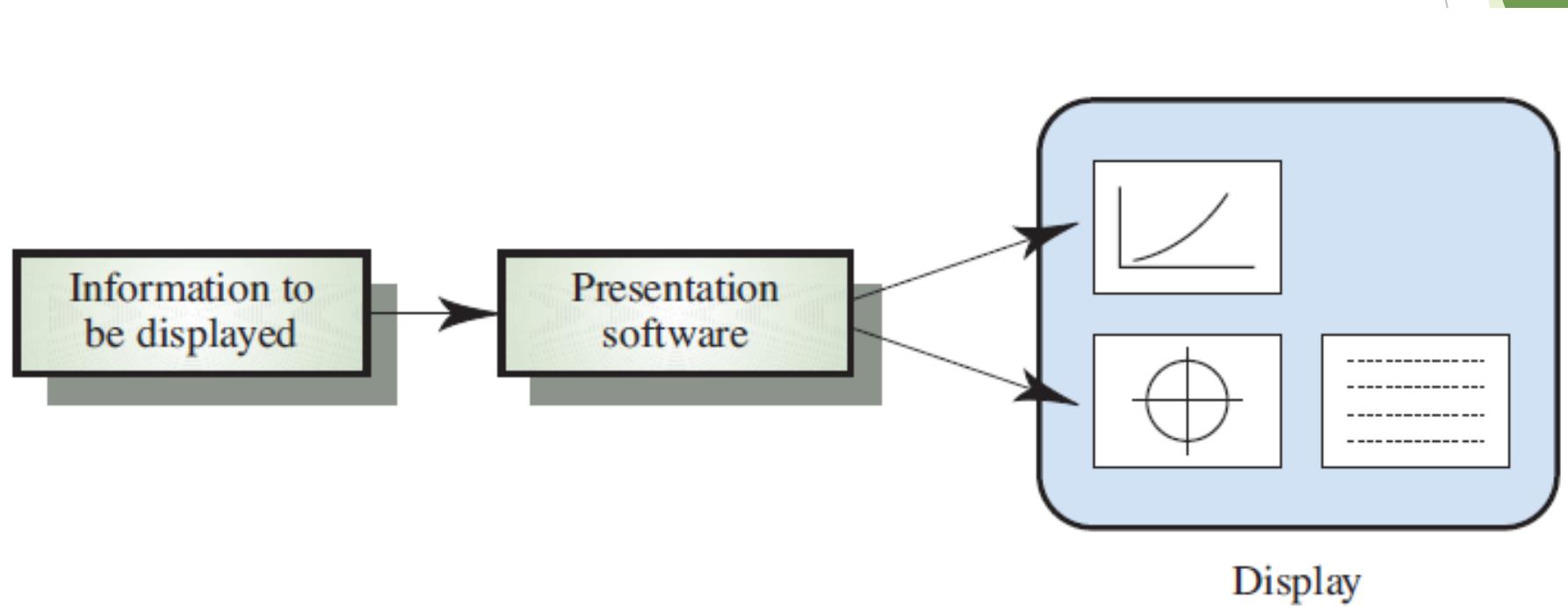


# Information Presentation

Information presentation is concerned with presenting system information to system users

- The information may be presented directly (e.g. text in a word processor) or may be transformed in some way for presentation (e.g. in some graphical form)

# Information Presentation



# Data Visualization

- Concerned with techniques for displaying large amounts of information
- Visualization can reveal relationships between entities and trends in the data

- Possible data visualizations are:
  - • Weather information collected from a number of sources
  - • The state of a telephone network as a linked set of nodes
  - • Chemical plant visualized by showing pressures and temperatures in a linked set of tanks and pipes
  - • A model of a molecule displayed in 3 dimensions

# Color Displays

- Color adds an extra dimension to an interface and can help the user understand complex information structures
- Can be used to highlight exceptional events
- Common mistakes in the use of color in interface design include:
  - The use of color to communicate meaning
  - Over-use of color in the display

# Color Guidelines

- Don't use too many colors
- Use color coding to support use tasks
- Allow users to control color coding
- Design for monochrome then add color
- Use color coding consistently
- Avoid color pairings which clash
- Use color change to show status change
- Be aware that color displays are usually lower resolution