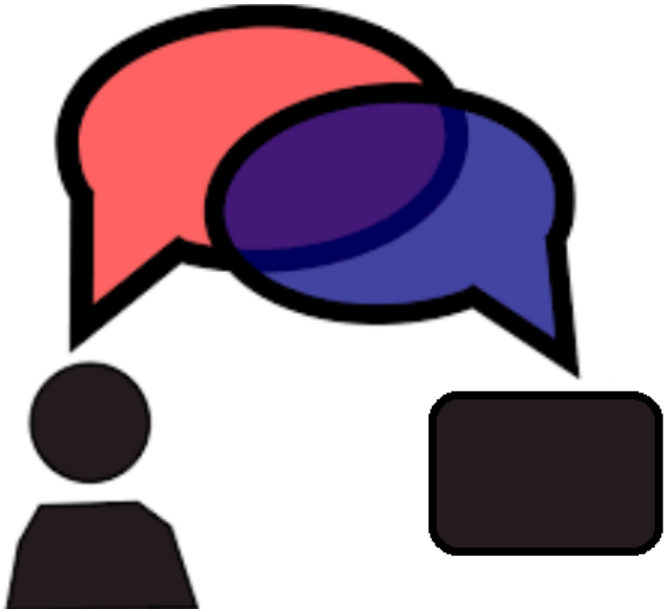
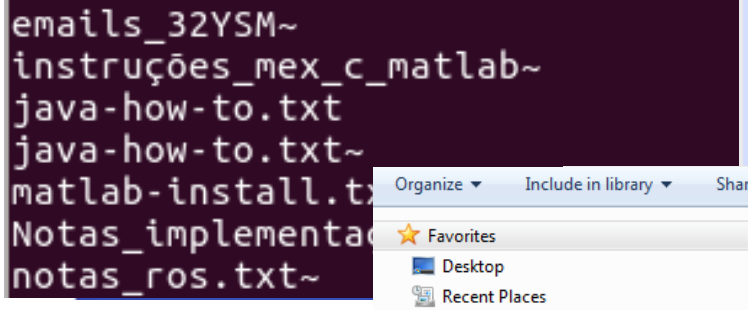
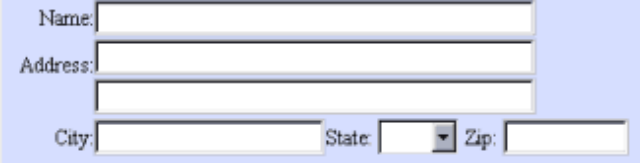
Universidade de Aveiro
Departamento de Electrónica,
Telecomunicações e Informática

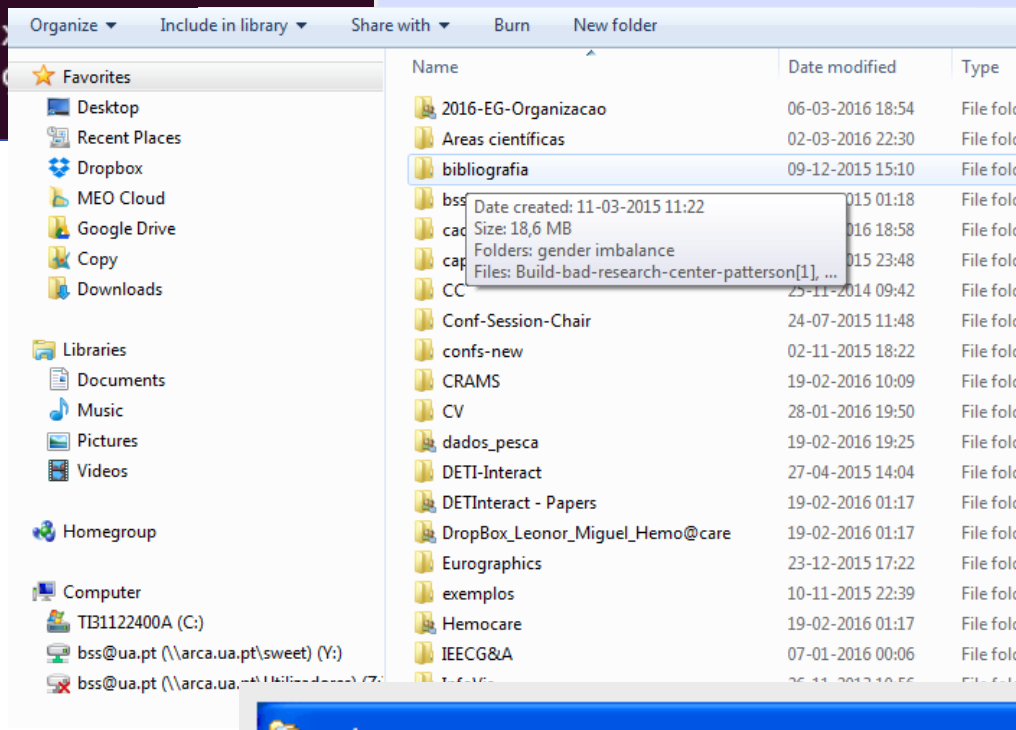
Other Interaction Styles



Interaction/ Dialog styles

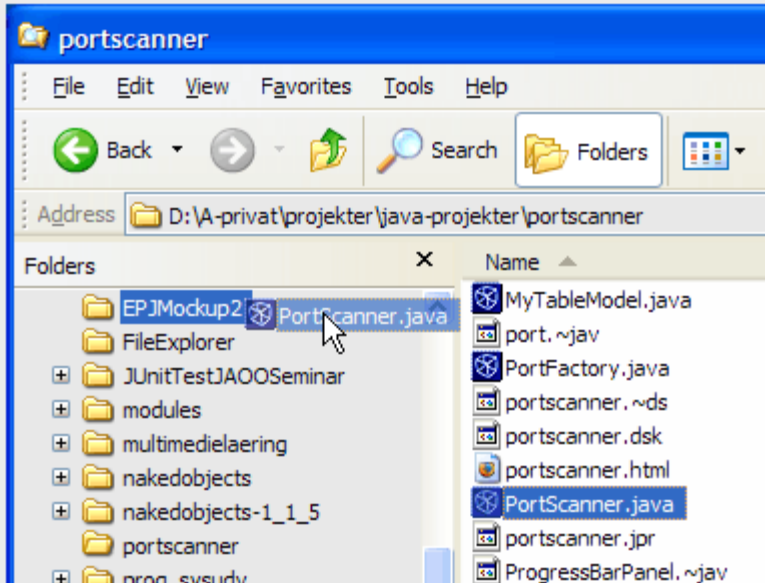






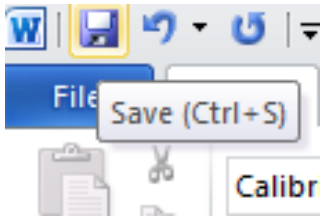
A possible classification:

- Menus ✓
- Direct manipulation ✓
- Fill-in-forms
- Function keys
- Question and answer
- Command languages
- Natural languages

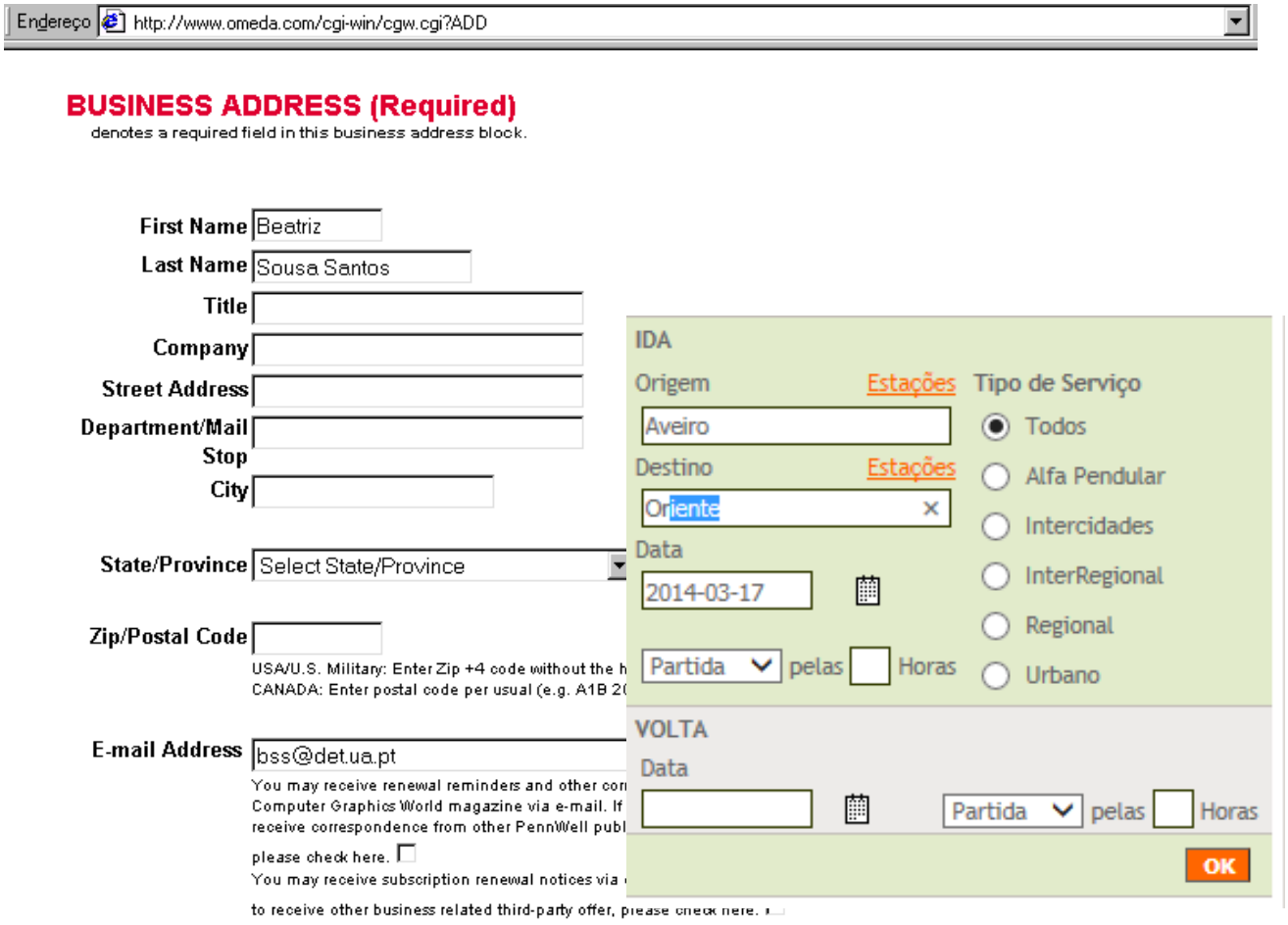


Often two or more styles are used simultaneously;

Why?



Fill in forms



- Fill in forms are particularly useful for routine, clerical work or for tasks that require much data entry

- The concept already existed long ago

- Currently they are often used with other styles

```
  PINE 3.96   ADDRESS BOOK (Edit)

Nickname  : NBA
Fullname  : Players in the NBA
Fcc       :
Comment   :
Addresses : mjordan@nba.com,
            kmalone@nba.com,
            drobinson@aol.com

^G Get Help  ^X eXit/Save ^R RichView  ^Y PrvPg/Top
^C Cancel                              ^V NxtPg/End
```

Main advantages and disadvantages

Advantages (potential)

- Self-explanatory
- Recognition instead of recall
- Allow many different inputs (unlike menus)
- Give context and guide the user
- New functionality is visible (unlike command languages)

Disadvantages

- Imply knowledge of valid inputs
- Error prone
- Not very flexible

Fill in form design: relevant aspects in design

- Organization and layout
- Titles and fields
- Input formats
- Instructions and help
- Navigation
- Error handling

Fill in form design: guidelines

Avoid unfamiliar layouts

Example:

Zip code:
Name:
Country:
Address:
City:

Better:

Name:
Address:
Zip code:
City:
Country:

Alignment of field titles

Not a good solution

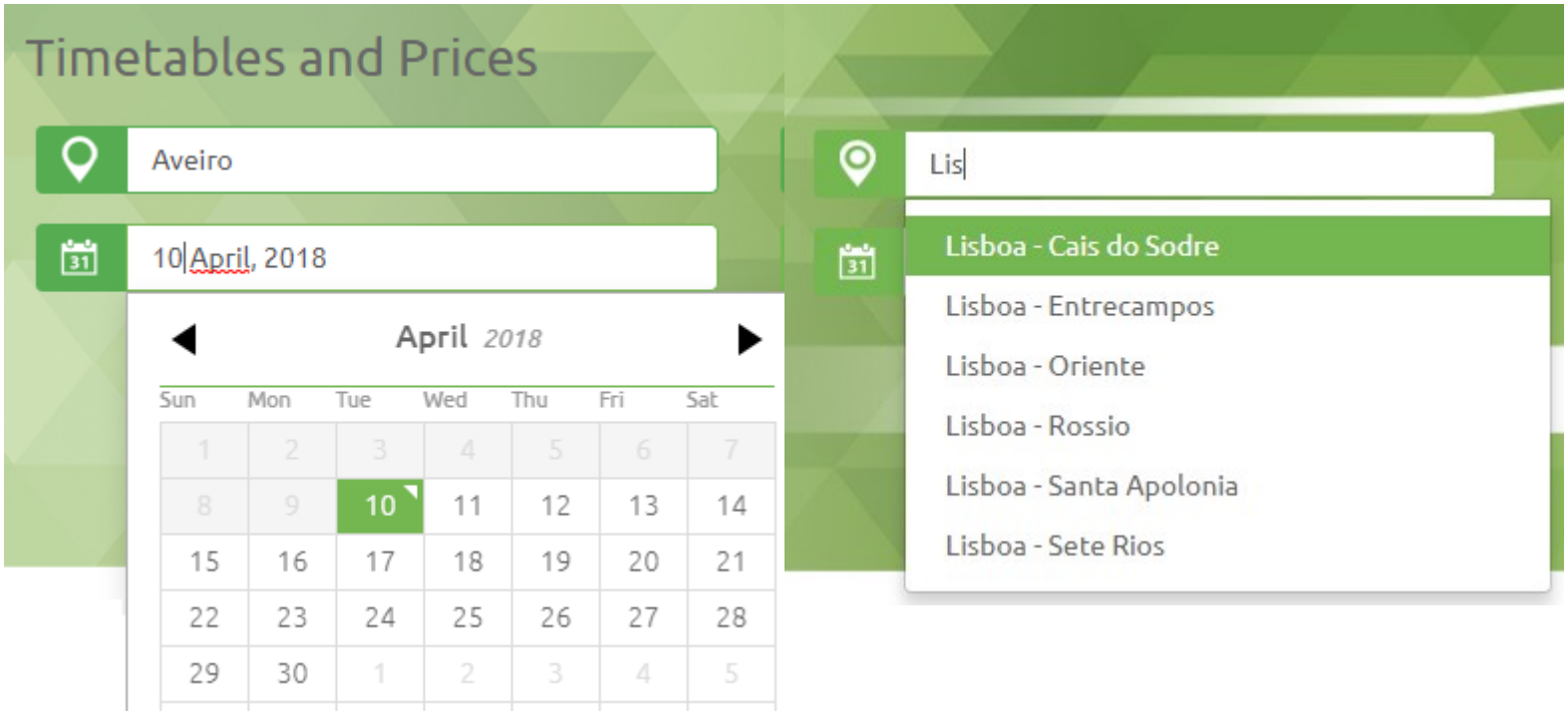
Name: ----------
Title: ----------
Rank: ----------
Telephone number: ----------

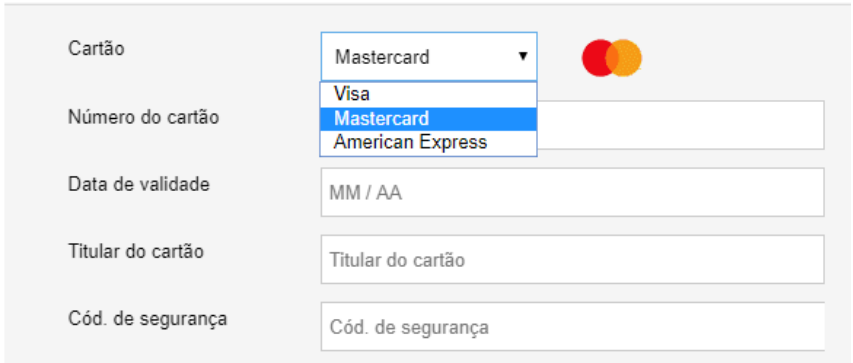
Name: ..... ----------
Title: ..... ----------
Rank: ..... ----------
Telephone number: ----------

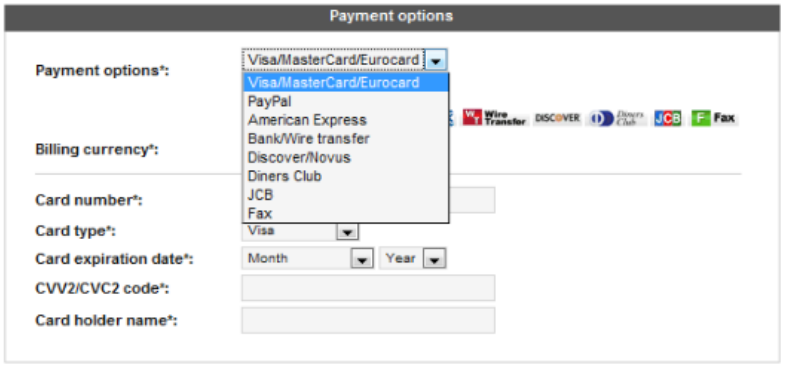
Better solutions

Name: ----------
Title: ----------
Rank: ----------
Telephone number: ----------

Provide a menu when possible inputs are known (combining two interaction styles…)

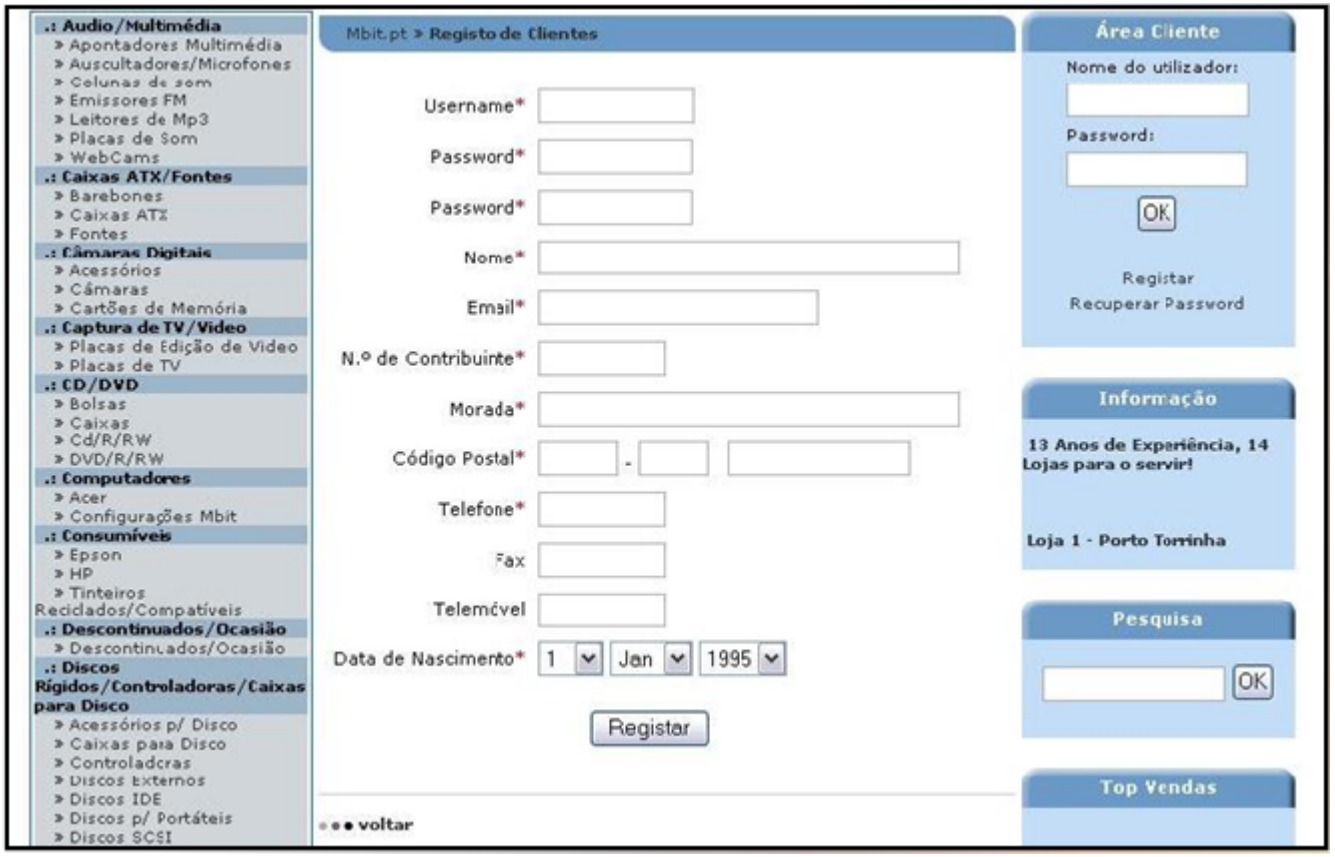






Provide a format for fields that may be ambiguous

Show which fields are mandatoty



Usually indicated by *

Input format must be familiar and clear

Date:_____
(eg. 1/12/2000)

Date:_____
(e.g. 01122000)

Time:_____
(eg. 8-15)

Time:_____
(e.g. 0815)

Card#:_____
(e.g. 123456789012)

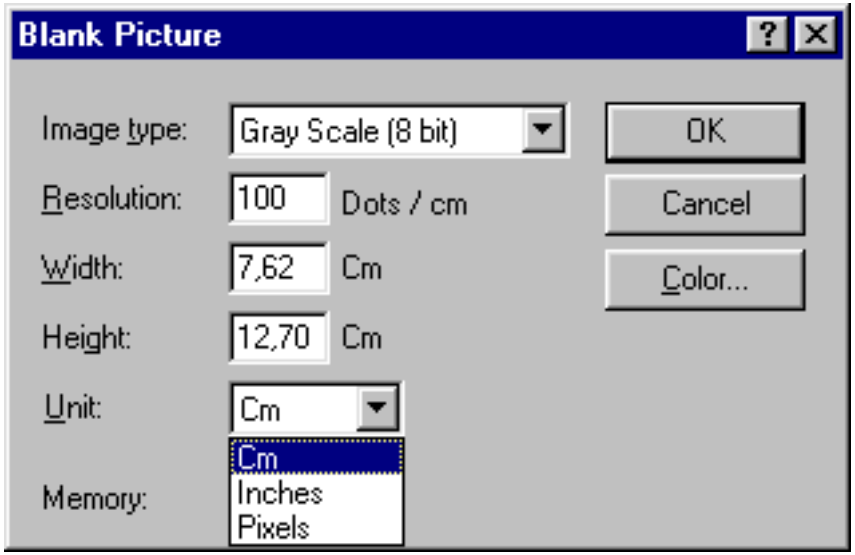
Better:

Date:___/__/_____
(e.g. 1/ 12 /2000)

Time:___-_____
(e.g. 08-15)

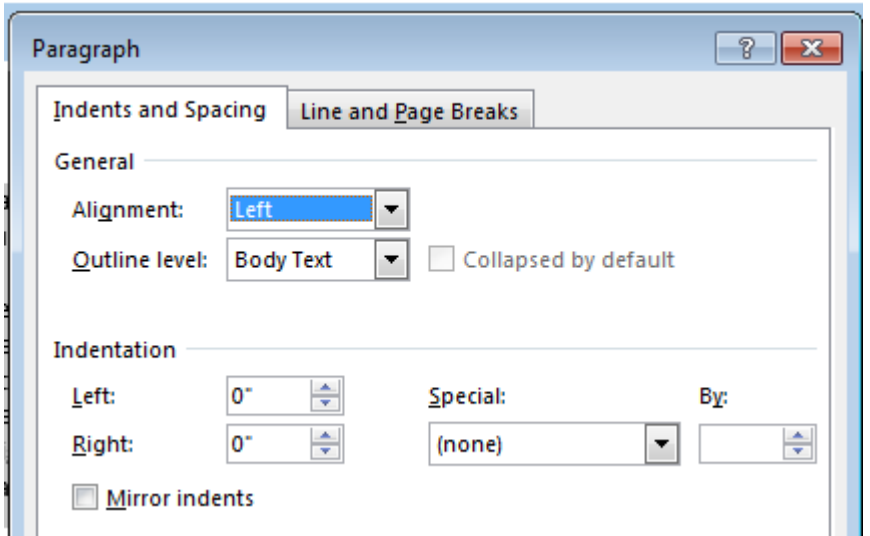
Card#:___-_____-_____
(1234-5678-9012)

It should be possible for the user to choose the type of input (it prevents errors) or adapt to the context

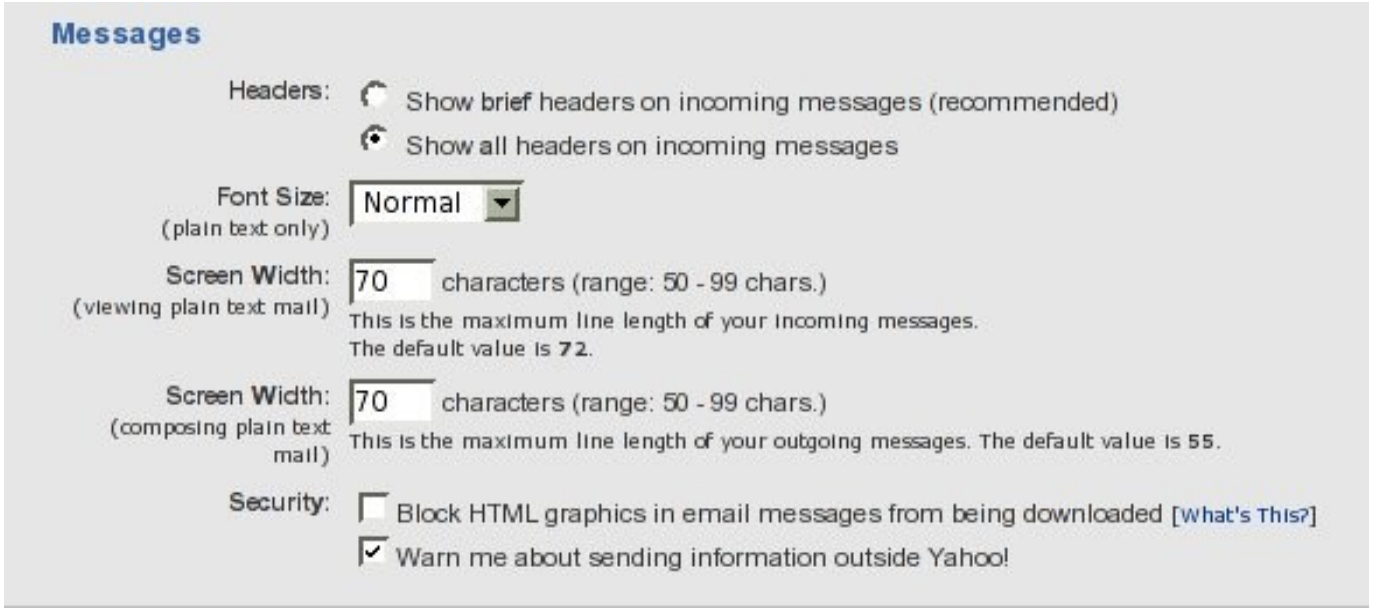


Portuguese version (cm):

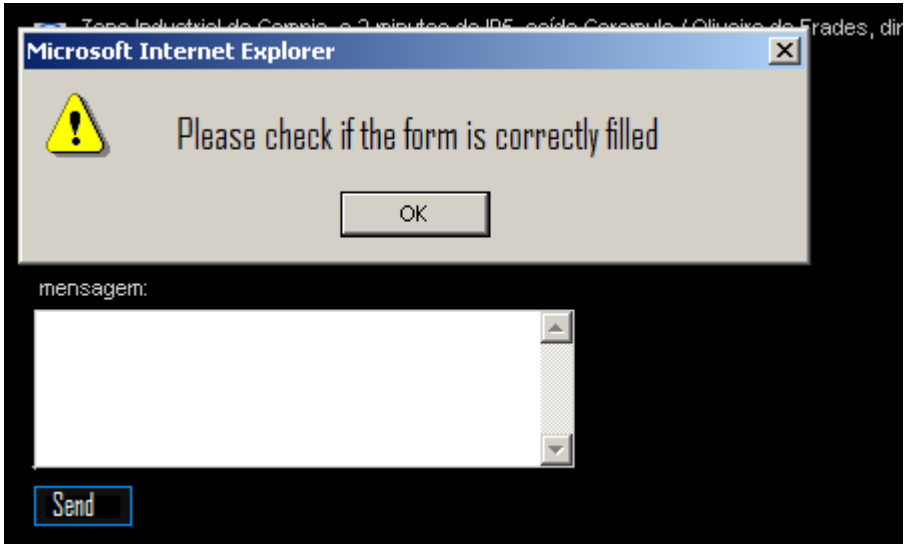
English version (inches):

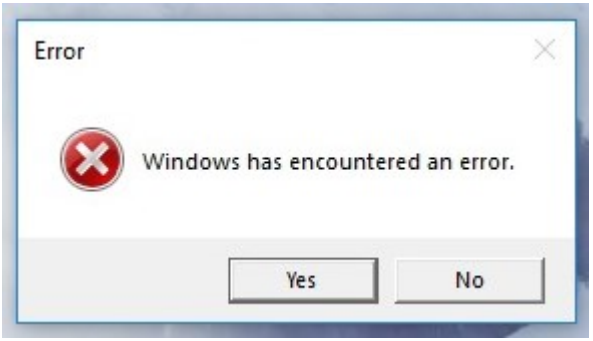


Instructions to fill the fields should be clear

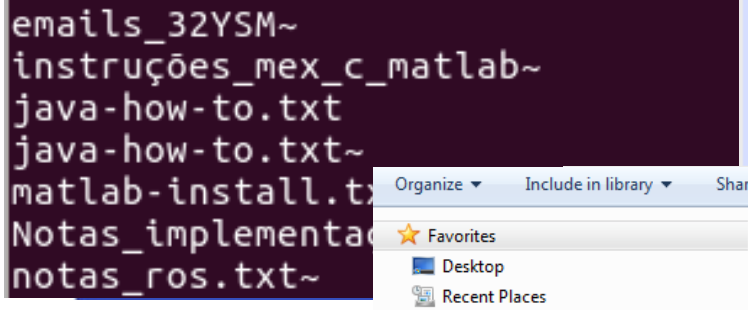


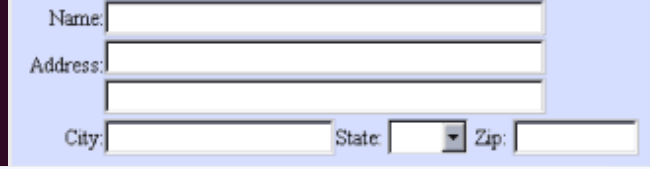
Messages not clear, nor helpful

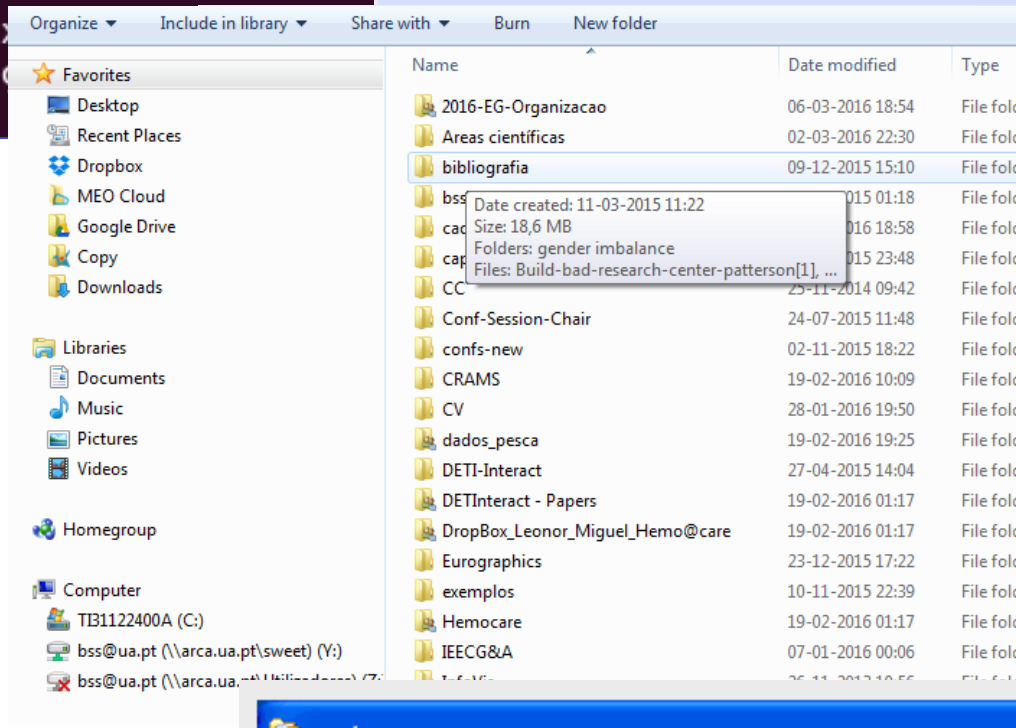




Interaction/ Dialog styles







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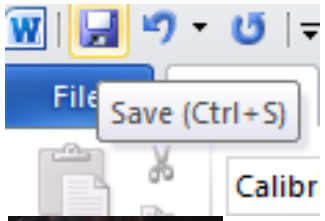
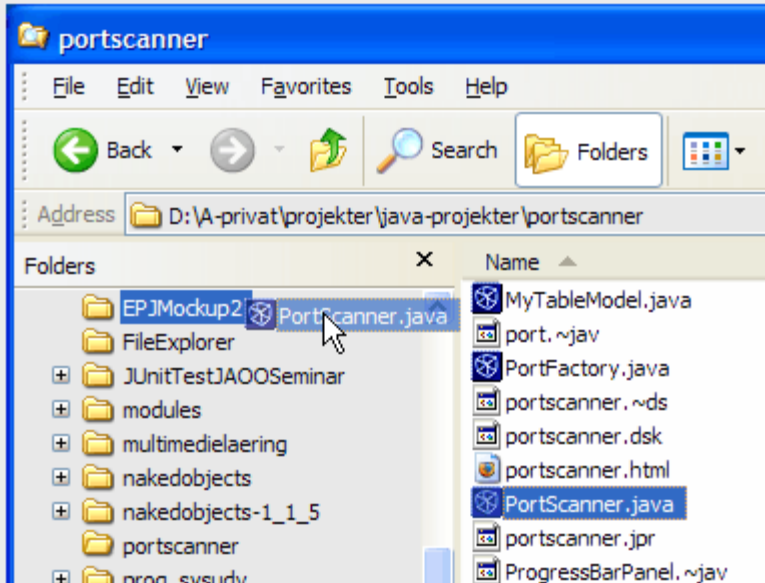




Function keys

- Two types:
  - *Hard Keys* – Always invoke the same functionality (as the keys of a calculator and some specific keys of PCs)
  - *Soft Keys* – invoke different functionality according the context of use (as the keys (F1...Fn) and the generic keys of an Automated Telling Machine, e.g. Multibanco)

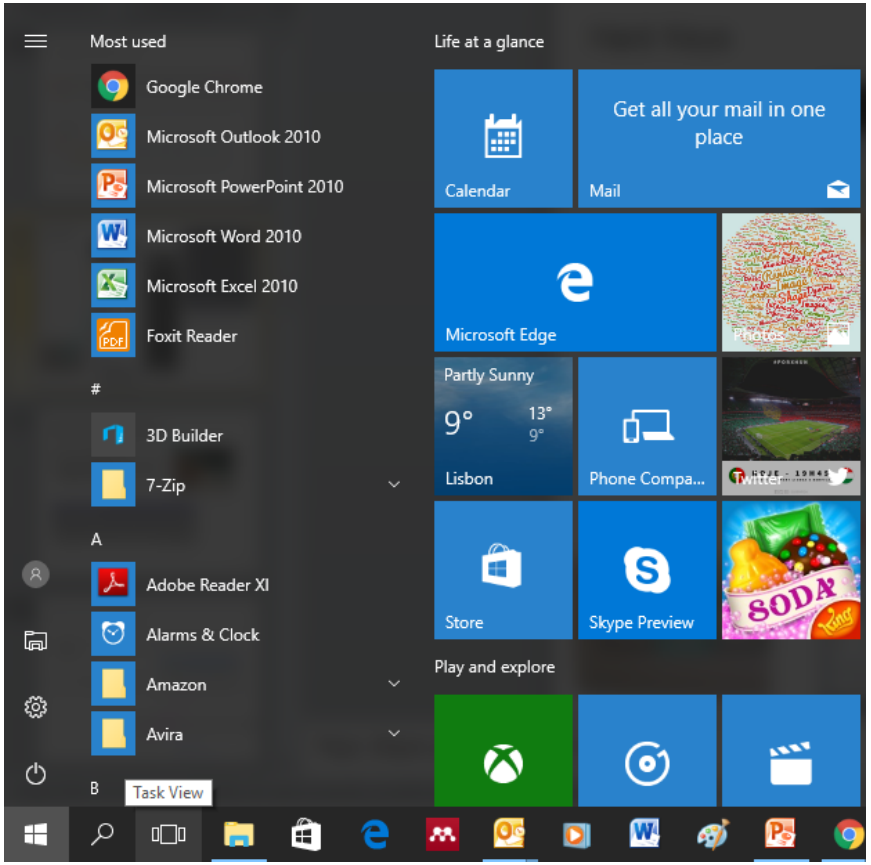
- PCs have 12 generic Keys (F1 a F12) and a few other specific keys

Keys that invoke specific functionality in PCs and MACs

Hard Keys

Hard function keys have abbreviations of default actions printed on/besides them

Specific keyboard



Start menu key

Soft Keys

Soft function keys don’t have abbreviations of default actions printed on/besides them, they may have "F-number" designations.

Function keys (generic)

https://en.wikipedia.org/wiki/Function_key

Touch bar: is it a new type of function keys?

Discuss the advantages and disadvantages for several types of users and contexts of use

Main advantages and disadvantages

Advantages (potential)

- Self-explanatory
- Recognition instead of recall
- Easy to use
- Flexible
- Require little or no screen real estate

Disadvantages

- Limited number of keys
- Hardware expansions are expensive

Function keys design: guidelines

Provide enough keys to call the functionality

But no too many as not to make it difficult to learn

Use:

- free space
- different size, color and shape to different groups
- category groups
- clear and distinctive names

TV remote control

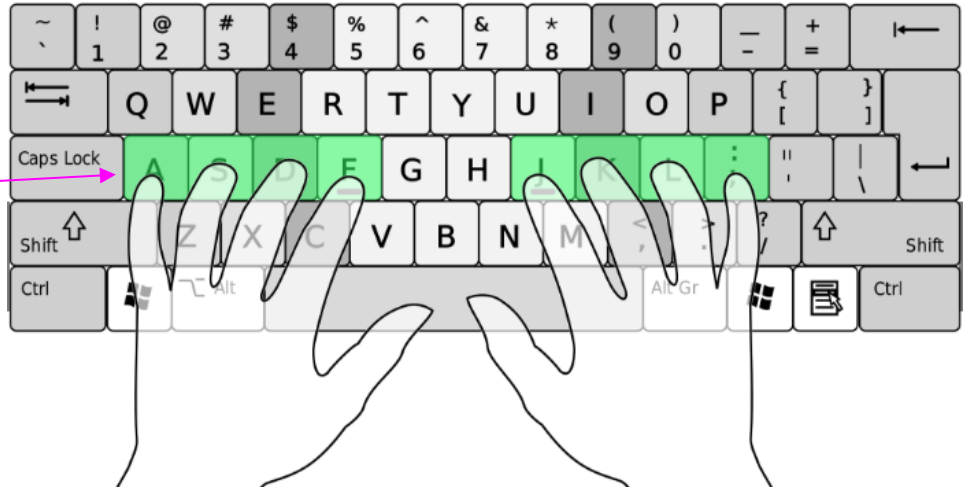
Multi-media remote control keyboard

Industrial keyboard

ATM keyboard

Shop system keyboard

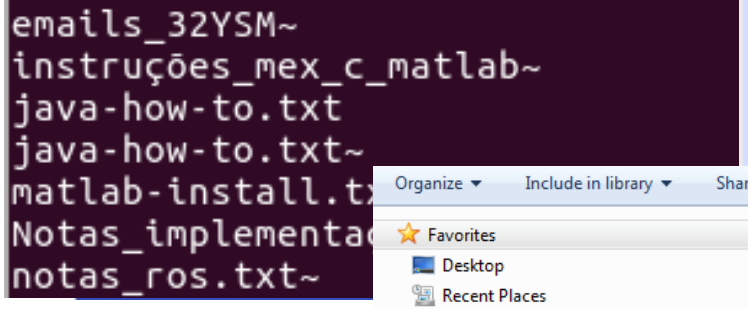
Often used keys should be near the “home row”

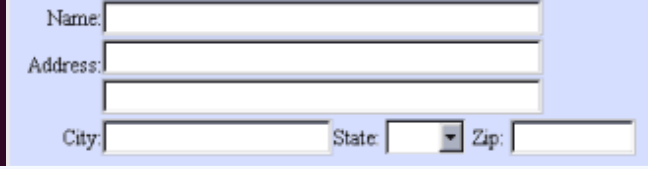


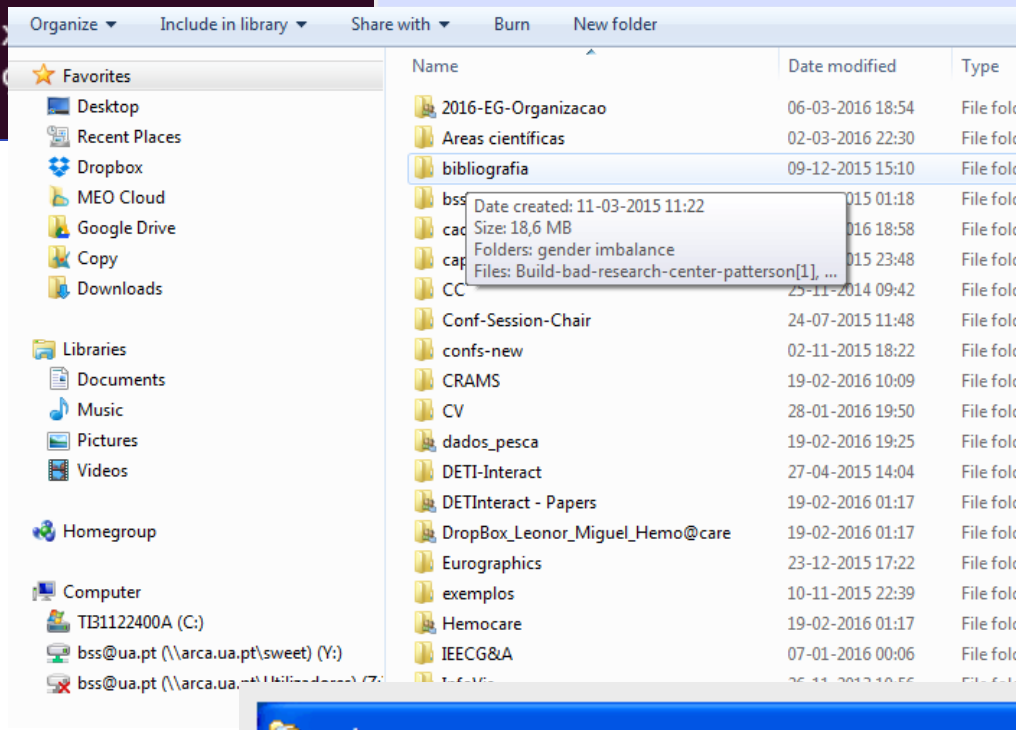
Keys with serious consequences should not be easy to activate

(e.g. ctrl Alt Del)

Interaction/ Dialog styles







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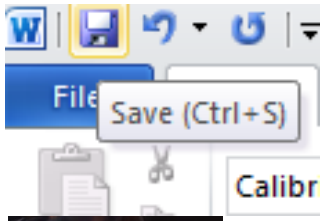
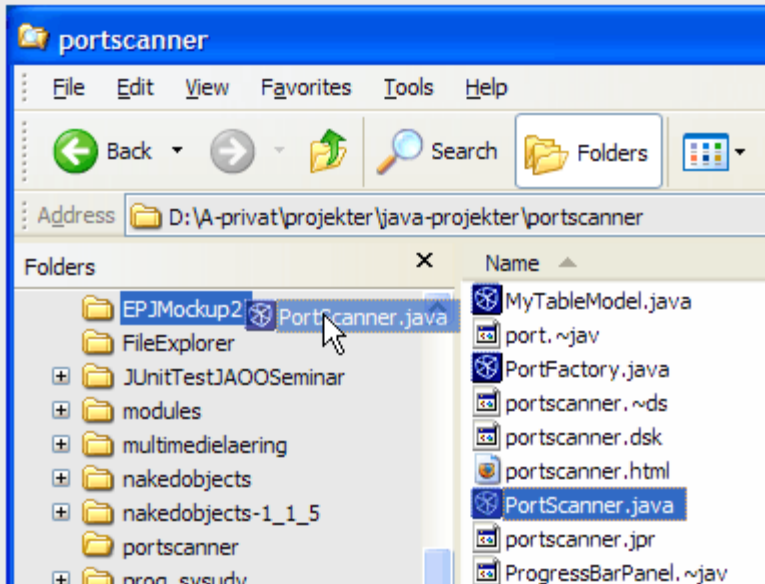




Command languages

```
cd /tmp
echo "line 1
line 2
line 4" > tmp1$$
echo "line 2
line 3" > tmp2$$
diff tmp1$$ tmp2$$
rm tmp1$$ tmp2$$
```

```
guru99@VirtualBox:~$ history
    1  cat > sample
    2  cat sample
    3  cat sample ^a
    4  cat sample a
    5  cat sample | grep a
    6  cat sample | grep ^a
    7  useradd home
    8  useradd mycomputer
    9  sudo useradd mycomputer
   10  sudo adduser MyLinux
   11  sudo adduser mylinux
   12  vi scriptsample.sh
```

Command languages shall also be designed as to be as usable as possible

Basic Goals of Language Design

- Precision
- Compactness
- Ease in writing and reading
- Speed in learning
- Simplicity to reduce errors
- Ease of retention over time

Usability Questions concerning a command language

- Does the language support necessary functions?
- Is it fast to enter a command?
- Is it easy to recognize what the command might do?
- Is it easy to recall a command?
- Are there few errors when using the language?

Main advantages and disadvantages

Advantages (potential)

- Powerful
- Flexible
- Efficient
- Do not take much screen real estate

Disadvantages

- Difficult to learn
- Not self-explainable
- Error prone
- Improvements are not visible

User profile to whom Command languages are adequate

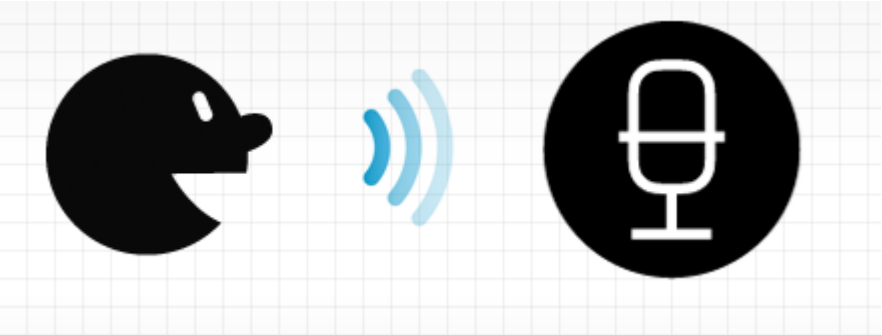
Knowledge and experience:

- High task experience
- High application experience
- High computational literacy
- High typing skill

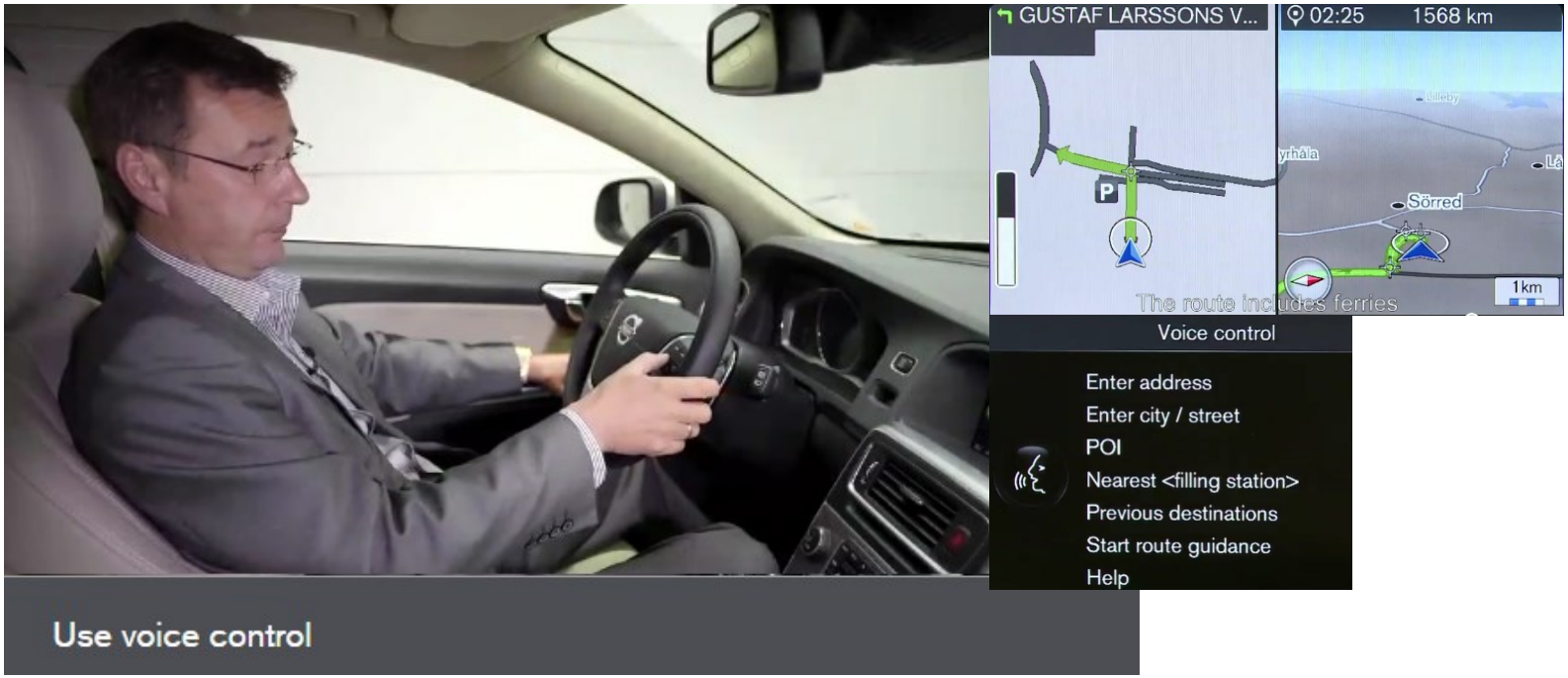
Task characteristics:

- High usage frequency
- Formal training

Note that:
Command languages may be used
not only through text but also via voice



e.g.
While driving a car to control the media, the phone or navigate



http://support.volvocars.com/uk/Pages/article.aspx?article=a8275b1eb0ed6a0fc0a8015159f7fdd6

Relevant issues in Command Language design

- Semantics
- Syntax
- Lexicon
- Interaction

Command Languages Design guidelines

Balance richness and minimalism
(similar to semantic distance in direct manipulation)

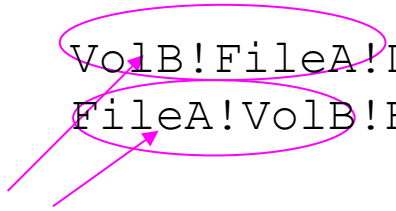
Examples :

Rich	**Minimal**
Delete	Delete
Insert	Insert
Replace	
Copy	Copy
Move	Delete
Rename	
Delete	

(the functionality is the same)

Use a coherent syntaxe

Use a natural and easy to remember action-object grammar



Uncoherent syntax and unfamiliar commands

```
search filea volb.
open filea volb.
list all lines with “KO”.
```

or

```
s filea volb.
o filea volb.
lal “KO”.
```

Command abbreviations should be simple and coherent

Easy to remember (not easy to recognize as for function keys)

Name	Abbreviations	
	Poor:	Improved:
Move forward	MovF	MovF
Move backward	Mvb	MovB
Insert	I	Ins
Delete	Dl	Del
Replace	Repl	Rep
Search	Srch	Sea
Delete	X	Del
Send	Sn	Sen
Print	Prt	Pri
Search	Srch	Sea
Send	Sn	Sen
Find	Fi	Fin
Choose	Ch	Cho

Allow the following interaction features:

- Defaults
- Command edition
- Intelligent interpretation
- Type-ahead
- Feedback
- Help and documentation
- Make the language “user tailorable”

Example of intelligent interpretation:
“delate”: did you mean “delete”? Y or N

Example of a (complex) command with defaults

ls - Linux man page

Name

ls - list directory contents

Synopsis

ls [*OPTION*]... [*FILE*]...

Description

List information about the FILEs (the current directory by default). Sort entries alphabetically if none of **-cftuvSUX** nor **--sort**.

Mandatory arguments to long options are mandatory for short options too.

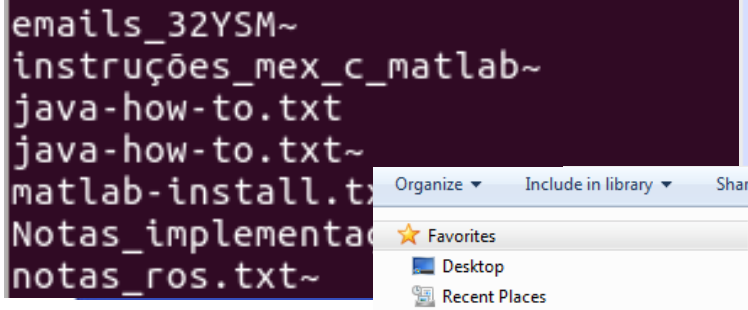
-a, **--all**
do not ignore entries starting with .
-A, **--almost-all**
do not list implied . and ..
--author
with **-l**, print the author of each file
-b, **--escape**
print octal escapes for nongraphic characters

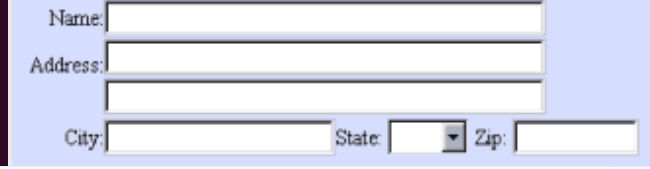
You don't need to use all arguments; there are default values

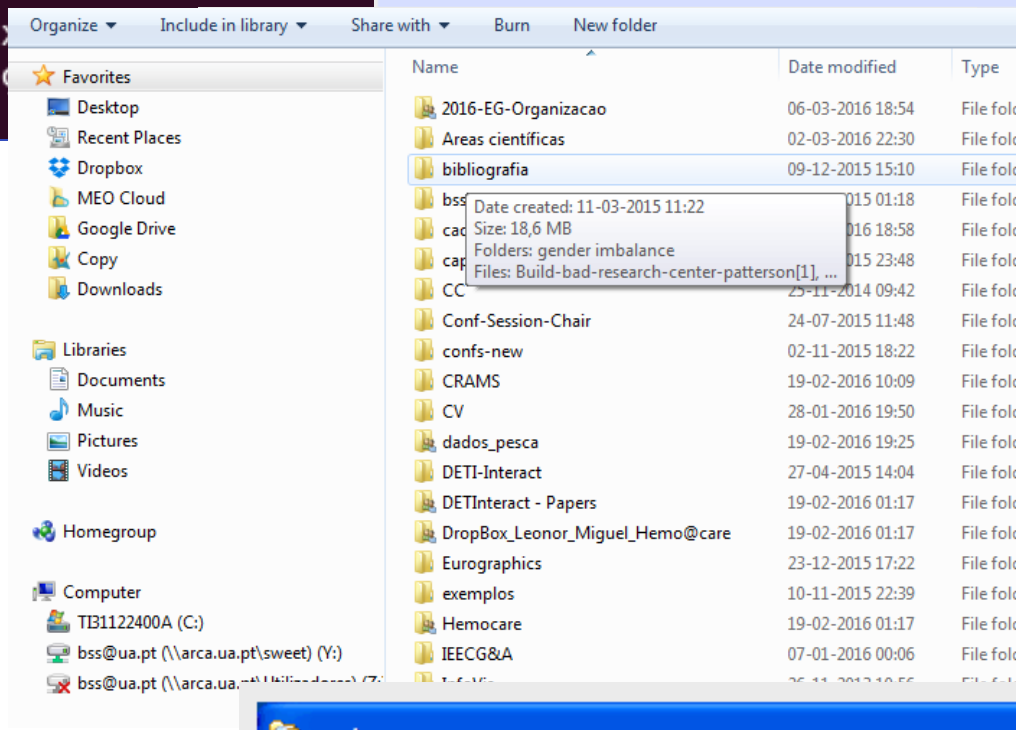
-d, **--directory**
list directory entries instead of contents, and do not dereference symbo
-D, **--dired**
generate output designed for Emacs' dired mode
-f
do not sort, enable **-aU**, disable **-ls --color**
-F, **--classify**
append indicator (one of */=>@|) to entries
--file-type
likewise, except do not append '*'
--format=*WORD*
across **-x**, commas **-m**, horizontal **-x**, long **-l**, single-column **-1**, verbose
--full-time
like **-l --time-style**=*full-iso*
-g
like **-l**, but do not list owner
--group-directories-first
group directories before files.
augment with a **--sort** option, but any
use of **--sort**=*none* (**-U**) disables grouping
-G, **--no-group**
in a long listing, don't print group names
-h, **--human-readable**
with **-l**, print sizes in human readable format (e.g., 1K 234M 2G)
--si
likewise, but use powers of 1000 not 1024
-H, **--dereference-command-line**
follow symbolic links listed on the command line

Etc.., etc., etc.

Interaction/ Dialog styles







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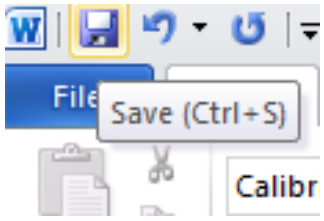
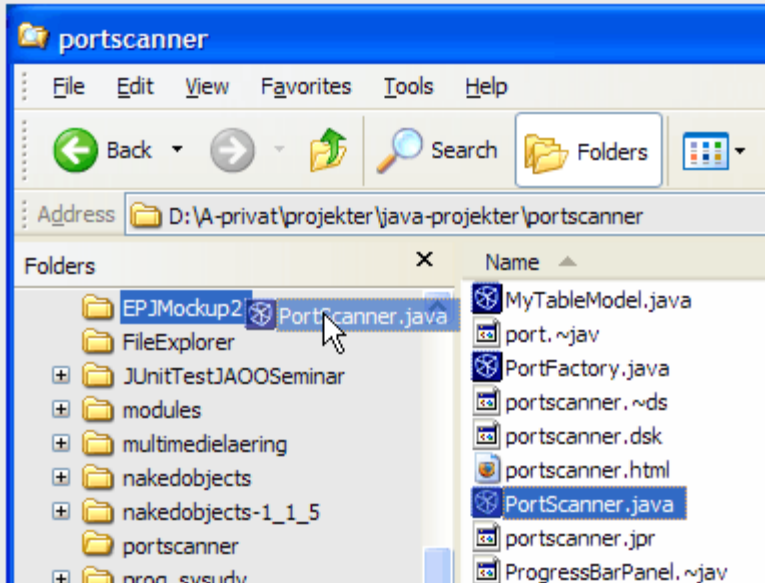




Natural language

Note: NLP has evolved a lot, yet It still is not possible to maintain a conversation with a computer as in 2001 A Space Odyssey …

- Communication between humans and computers through natural language involves:
  - recognition
  - generation
- Natural languages as interaction style are not full blown natural languages, they are restricted natural languages
- Natural languages (as interaction style) differ in “habitability” (how easy and natural is it for users)

Note:
natural language as a dialog style and voice interaction are different things! Why?

- Habitability (mismatch between the users' expectations and the capabilities of a natural language) is related to the language domains:
  - Conceptual - the set of objects and actions provided by the language
  - Functional – what may be directly expressed by the language
  - Syntactic – syntactic forms that may be understood
  - Lexical - the variety of words that may be understood
- Conceptual model limitations are not very disturbing; however, limitations in any other domain make the language less habitable

Example:

- Imagine an information system of a University including a data base with information about employees that may be accessed using a natural language:

  - Conceptual domain: information about employees

  - The question “What is the salary of the University Restaurant manager?” may be out of the functional domain and imply two questions due to functional domain limitations:
    - “Who is the University Restaurant manager?” (answer: Mr. XXX)
    - “What is the salary of Mr. XXX?”

  - “What is the salary of Mr. XXX?” may not be recognized (due to syntactic domain limitations) even if the information is stored in the DB

  - *“*What are the wages of Mr. XXX*?”* may not be recognized due to lexical domain limitations if wages does not belong to the lenguage

User profile to whom Natural languages are adequate

Knowledge and experience
High task experience
Low application experience
Low computer literacy
High typing skill (if written)

Task characteristics
Low frequency of use
No or little training
Optional use

Main advantages and disadvantages of Natural Language dialog style

Advantages (potential)

- Powerful
- Flexible
- Efficient

(second to command languages)

Disadvantages

- Assume problem domain knowledge
- Imply clarification dialogs
- Imply typing skills (if written)
- Improvements are not visible
- May create unrealistic expectations, and generate negative reactions
- Difficult and expensive to implement

A few Natural Language design guidelines

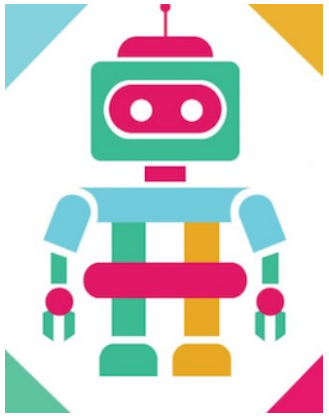
- Provide a (restrict) natural language habitable in all domains
- Define a subset of a (real) natural language using the Wizard of Oz method
- Generate valid outputs concerning the four domains (e.g. always use words that the system recognizes)

Conversational User interfaces (CUIs)

Think of the potential advantages and disadvantages of CUIs:

- Chatbots

- Voice assistants



"Just like the touch interface, not everything will become conversational"

What doesn't fit the principles of Conversational UI well?
Products where the use case involves a technical user who wants fine grain control over the interface, …. e.g. CAD software, or a programming IDE…."

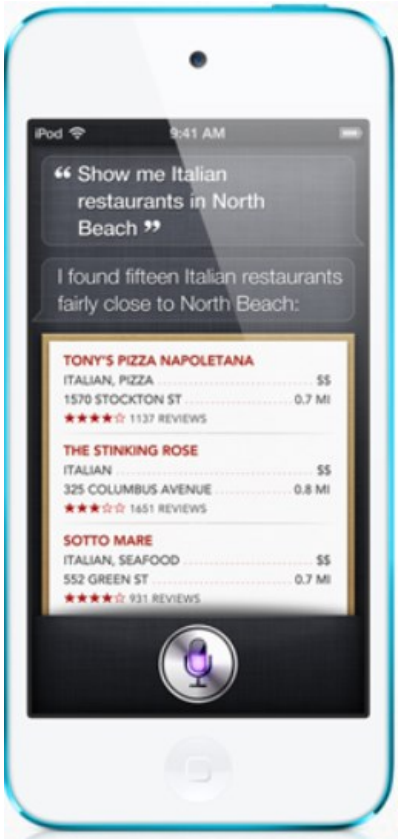
https://uxdesign.cc/conversational-ui-its-not-just-chat-bots-and-voice-assistants-case-study-cb1865da306a

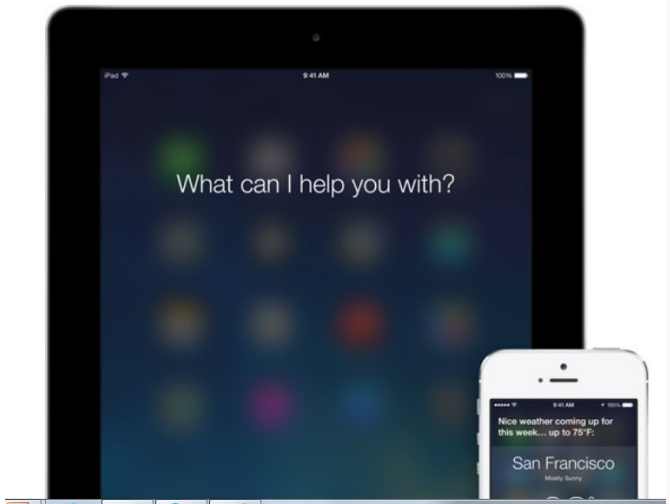
Current examples of Natural language interaction (mostly via voice)

Mobile phone personal assistants:

- Siri for Apple's iOS

- Google assistant

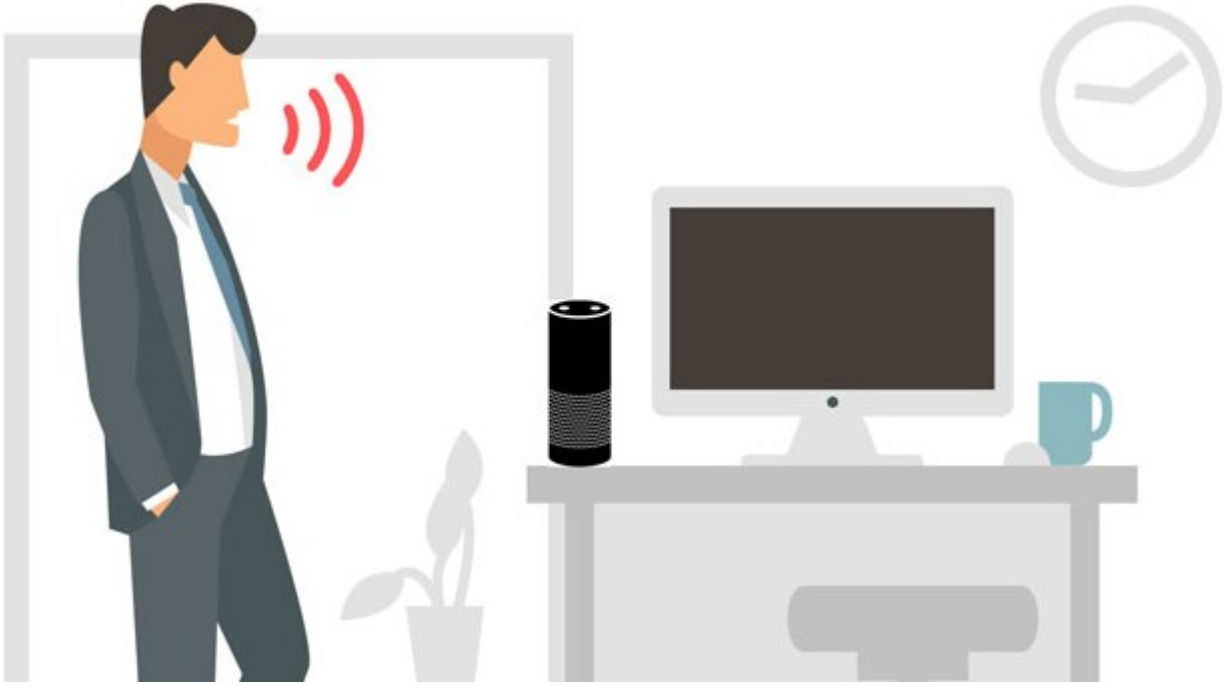




Another example
(natural language via voice)

amazon echo

- Amazon Alexa



https://www.nngroup.com/articles/voice-interaction-ux/

Wizard of Oz prototyping

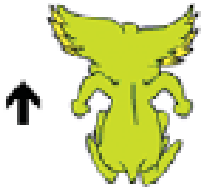
- A prototype that only works by having someone behind-the-scenes “pulling the levers and flipping the switches” (named after the classical film)
- A user interacts with an interface without knowing that the responses are given by someone

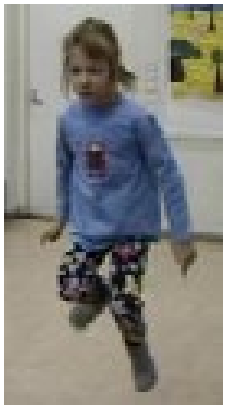
The “wizard” was a “man behind-the-scene”

https://en.wikipedia.org/wiki/Wizard_of_Oz_experiment

Example of using the Wizard of Oz method in other situations

- Definition of a set of gestures to use in a game





Höysniemi, J., Hämäläinen, P., Turkki, L., and Rouvi, T. 2005. “Children's intuitive gestures in vision-based action games”. *Commun. ACM* 48, 1, Jan. 2005, 44-50

Example of using the Wizard of Oz method in other situations



- Haptic Wizard of Oz Prototyping aids designers in rapidly designing and testing interactive hardware like this above car cockpit

D. Leithinger, C. Zheng, and E. Y. Do, “Haptic Wizard of Oz Prototyping in VR,” in *VR/MR Workshop*, 2018.

Wizard of Oz @ HCI-UA-2013

Paulo Dias, T. Sousa, J. Parracho, I. Cardoso, A. Monteiro, Beatriz Sousa Santos "Student Projects Involving Novel Interaction with Large Displays", IEEE Computer Graphics and Applications, vol.34, no.2, Mar.-Apr. 2014, pp.80-86

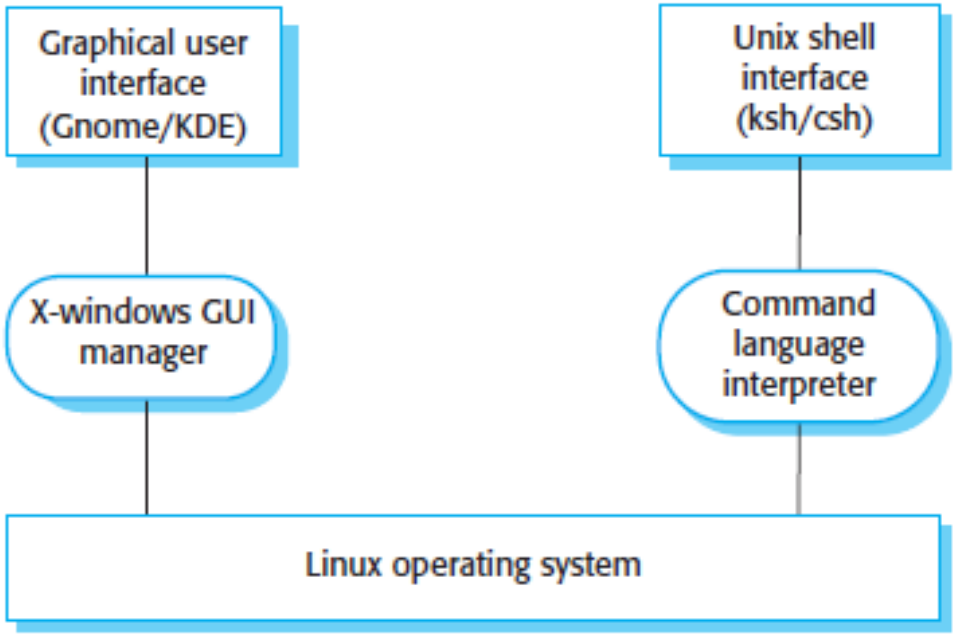
Used to get insight on which gestures might be more intuitive to control a Pac-Man game

Main advantages and disadvantages of interaction styles

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

(Sommerville, 2010, chap.29)

Multiple user interfaces example



(Sommerville, 2010, chap.29)

3D User Interfaces

- User interfaces involving 3D interaction (i.e. interaction in which the user's tasks are performed directly in a 3D spatial context).

- Are more and more used:

  - Virtual and augmented reality
  - 3D workspaces
  - Data Visualization …

- But have some issues:
  - User disorientation

  (in the real world we have more information)

Applications of virtual and augmented reality

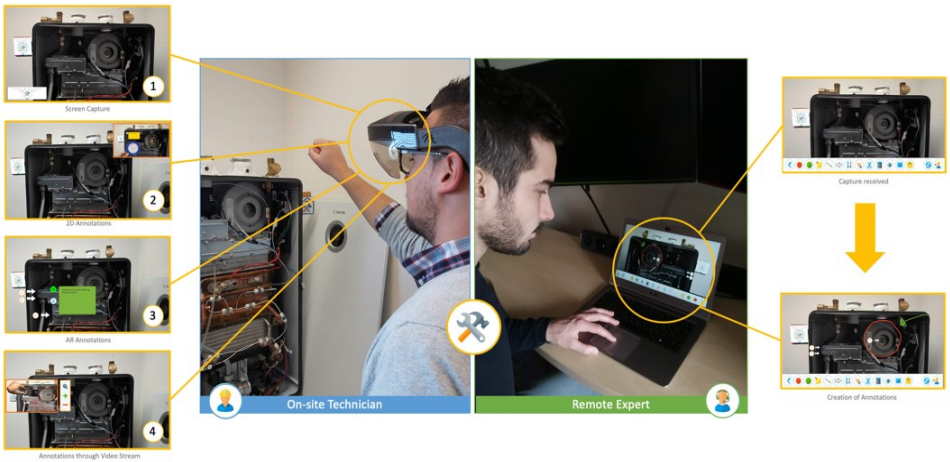
- Training and simulation

- Project review

- Therapy

- Entertainment

…



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- Ian Sommerville, Software Engineering, 9 ed, Addison Wesley , 2010
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