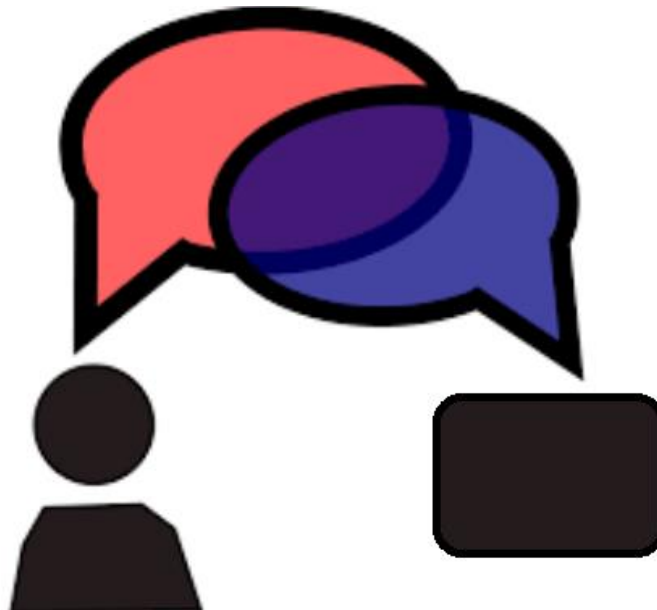




Universidade de Aveiro  
Departamento de Electrónica,  
Telecomunicações e Informática

# Other Interaction Styles



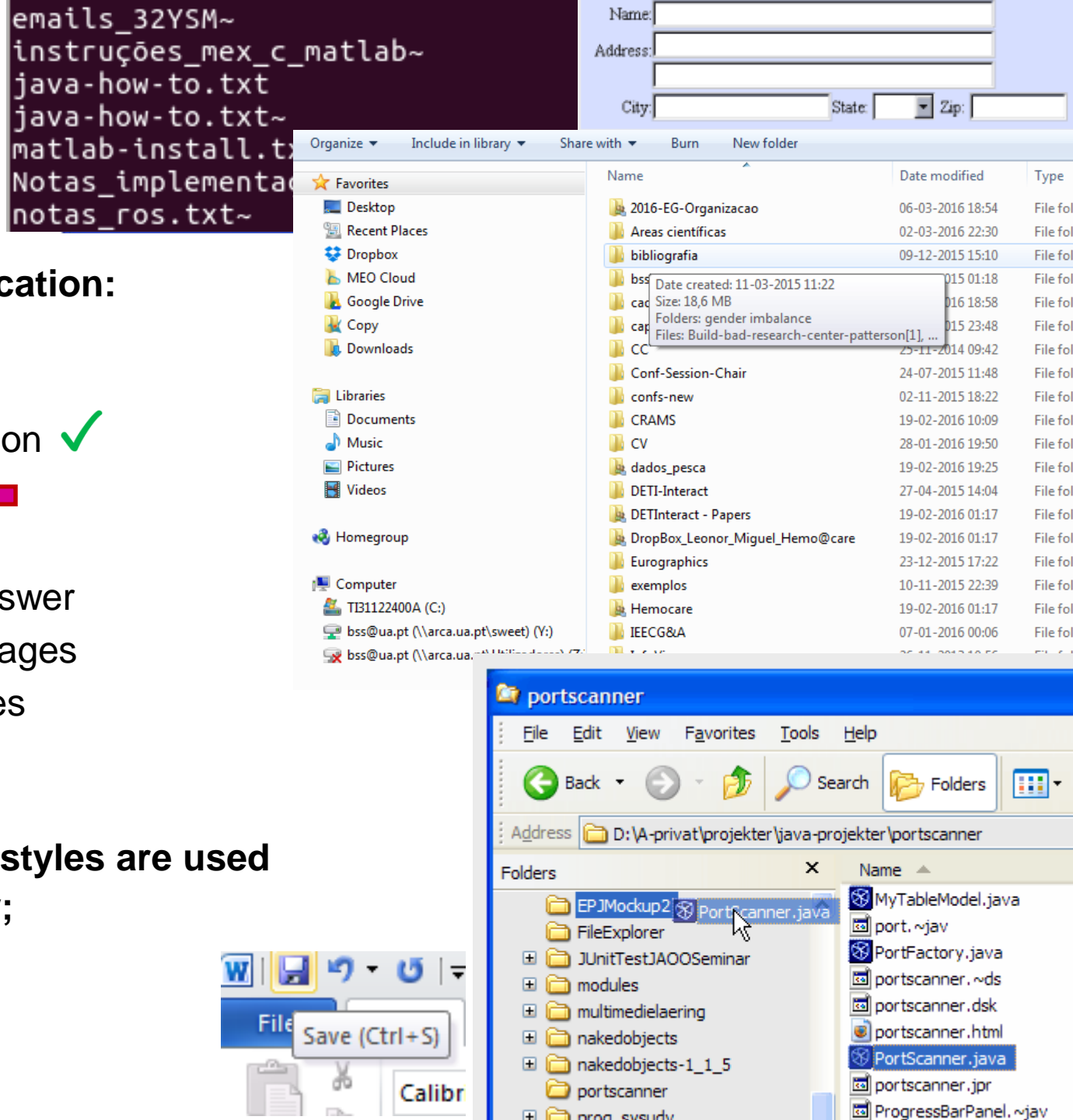
# Interaction/ Dialog styles

## 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

Endereço  http://www.ameda.com/cgi-win/cgw.cgi?ADD

## BUSINESS ADDRESS (Required)

denotes a required field in this business address block.

First Name	<input type="text" value="Beatriz"/>
Last Name	<input type="text" value="Sousa Santos"/>
Title	<input type="text"/>
Company	<input type="text"/>
Street Address	<input type="text"/>
Department/Mail	<input type="text"/>
Stop	<input type="text"/>
City	<input type="text"/>
State/Province	<input type="text" value="Select State/Province"/>
Zip/Postal Code	<input type="text"/>
<small>USA/U.S. Military: Enter Zip +4 code without the h CANADA: Enter postal code per usual (e.g. A1B 2C)</small>	
E-mail Address	<input type="text" value="bss@det.ua.pt"/>
<small>You may receive renewal reminders and other con Computer Graphics World magazine via e-mail. If receive correspondence from other PennWell publ please check here. <input type="checkbox"/></small>	
<small>You may receive subscription renewal notices via to receive other business related third-party offer, please check here. <input type="checkbox"/></small>	

IDA	
Origem	<input type="text" value="Aveiro"/> <a href="#">Estações</a>
Destino	<input type="text" value="Oriente"/> <a href="#">Estações</a> <input type="button" value="x"/>
Data	<input type="text" value="2014-03-17"/> <input type="button" value="Calendar"/>
Partida	<input type="text" value="Partida"/> pelas <input type="text" value="Horas"/>
Tipo de Serviço	
<input checked="" type="radio"/> Todos	
<input type="radio"/> Alfa Pendular	
<input type="radio"/> Intercidades	
<input type="radio"/> InterRegional	
<input type="radio"/> Regional	
<input type="radio"/> Urbano	
VOLTA	
Data	<input type="text"/> <input type="button" value="Calendar"/>
Partida	<input type="text" value="Partida"/> pelas <input type="text" value="Horas"/>
<input type="button" value="OK"/>	

- 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
Fee :
Comment :
Addresses : mjordan@nba.com,
            kmalone@nba.com,
            drobinson@aol.com

^G Get Help  ^X eXit/Save  ^R RichView  ^V PrvPg/Top
^C Cancel    ^U 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...)

## Timetables and Prices

Aveiro

10|April, 2018

April 2018

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5

Lis|

Lisboa - Cais do Sodre

Lisboa - Entrecampos

Lisboa - Oriente

Lisboa - Rossio

Lisboa - Santa Apolonia

Lisboa - Sete Rios

Cartão

Mastercard

Visa

Mastercard

American Express

Número do cartão

Data de validade

MM / AA

Titular do cartão

Titular do cartão

Cód. de segurança

Cód. de segurança

Payment options

Payment options\*: 

Visa/MasterCard/Eurocard

Visa/MasterCard/Eurocard

PayPal

American Express

Bank/Wire transfer

Discover/Novus

Diners Club

JCB

Fax

Billing currency\*: 

Visa

Card number\*: 

Month

Year

Card type\*: 

Month

Year

Card expiration date\*: 

Month

Year

CVV2/CVC2 code\*:

Card holder name\*:

Provide a format for fields that may be ambiguous

Show which fields are mandatory

**Mbit.pt > Registo de Clientes**

Username\*

Password\*

Password\*

Nome\*

Email\*

N.º de Contribuinte\*

Morada\*

Código Postal\*  -

Telefone\*

Fax

Telemóvel

Data de Nascimento\* 1 ▾ Jan ▾ 1995 ▾

••• voltar

**Área Cliente**

Nome do utilizador:

Password:

[Registar](#)

[Recuperar Password](#)

**Informação**

13 Anos de Experiência, 14 Lojas para o servir!

Loja 1 - Porto Torrinha

**Pesquisa**

**Top Vendas**

- Audio/Multimédia
  - Apontadores Multimédia
  - Auscultadores/Microfones
  - Colunas de som
  - Emissores FM
  - Leitores de Mp3
  - Placas de Som
  - WebCams
- Caixas ATX/Fontes
  - Barebones
  - Caixas ATX
  - Fontes
- Câmaras Digitais
  - Acessórios
  - Câmaras
  - Cartões de Memória
- Captura de TV/Video
  - Placas de Edição de Video
  - Placas de TV
- CD/DVD
  - Bolsas
  - Caixas
  - Cd/R/RW
  - DVD/R/RW
- Computadores
  - Acer
  - Configurações Mbit
- Consumíveis
  - Epson
  - HP
  - Tinteiros
  - Reciclados/Compatíveis
- Descontinuados/Ocasão
  - Descontinuados/Ocasão
- Discos
  - Rígidos/Controladoras/Caixas para Disco
  - Acessórios p/ Disco
  - Caixas para Disco
  - Controladoras
  - Discos externos
  - Discos IDE
  - Discos p/ Portáteis
  - Discos SCSI

Usually indicated by \*

Input format must be familiar and clear

Better:

Date: \_\_\_\_\_  
(eg. 1/12/2000)

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_\_  
(e.g. 1/ 12 /2022)

Date: \_\_\_\_\_  
(e.g. 01122000)

Time: \_\_\_\_\_  
(eg. 8-15 )

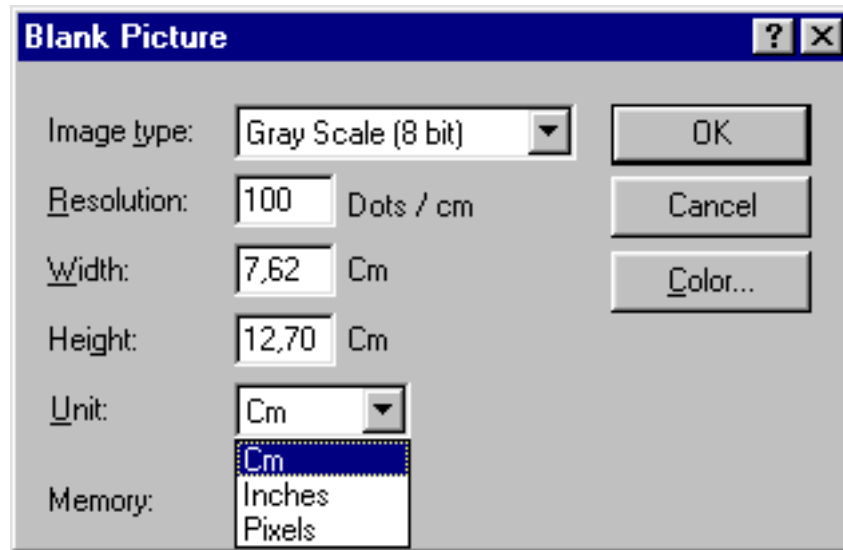
Time: \_\_\_\_ - \_\_\_\_  
(e.g. 08-15)

Time: \_\_\_\_\_  
(e.g. 0815)

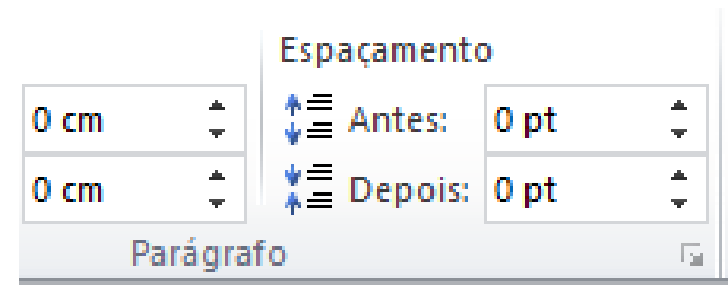
Card#: \_\_\_\_\_  
(e.g. 123456789012 )

Card#: \_\_\_\_ - \_\_\_\_ - \_\_\_\_  
(1234-5678-9012)

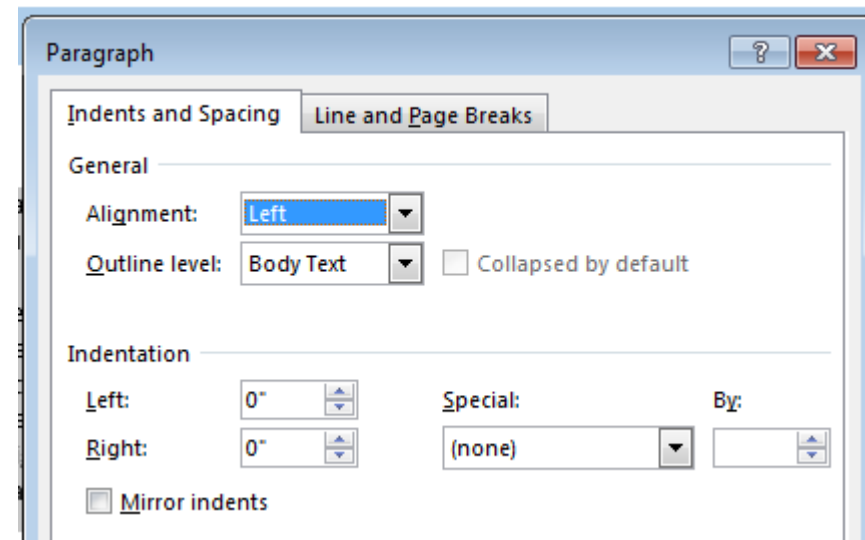
It should be possible for the user to choose the type of input (it prevents errors) or adapt to the context



Portuguese version (cm):




English version (inches):



Instructions to fill the fields should be clear

**Messages**

Headers: ☐ Show brief headers on incoming messages (recommended)  
☒ Show all headers on incoming messages

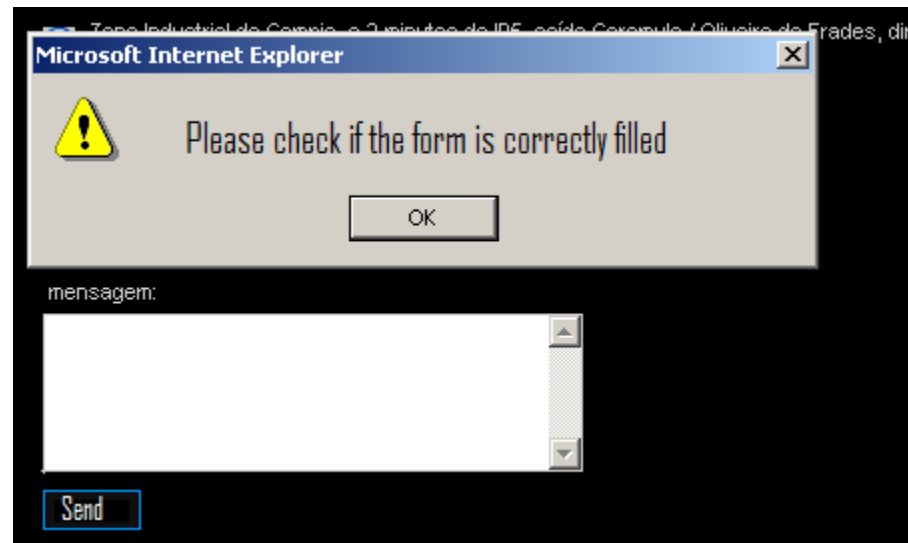
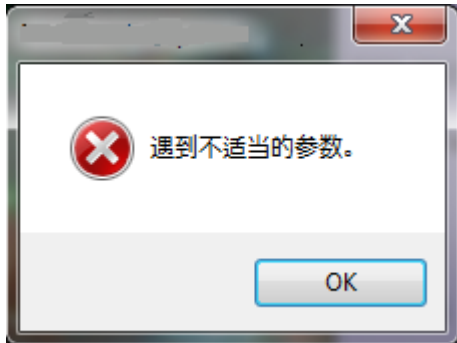
Font Size:    
(plain text only)

Screen Width:  characters (range: 50 - 99 chars.)  
(viewing plain text mail)  
This is the maximum line length of your incoming messages.  
The default value is 72.

Screen Width:  characters (range: 50 - 99 chars.)  
(composing plain text mail)  
This is the maximum line length of your outgoing messages. The default value is 55.

Security: ☐ Block HTML graphics in email messages from being downloaded [\[What's This?\]](#)  
☒ Warn me about sending information outside Yahoo!

## Messages not clear, nor helpful

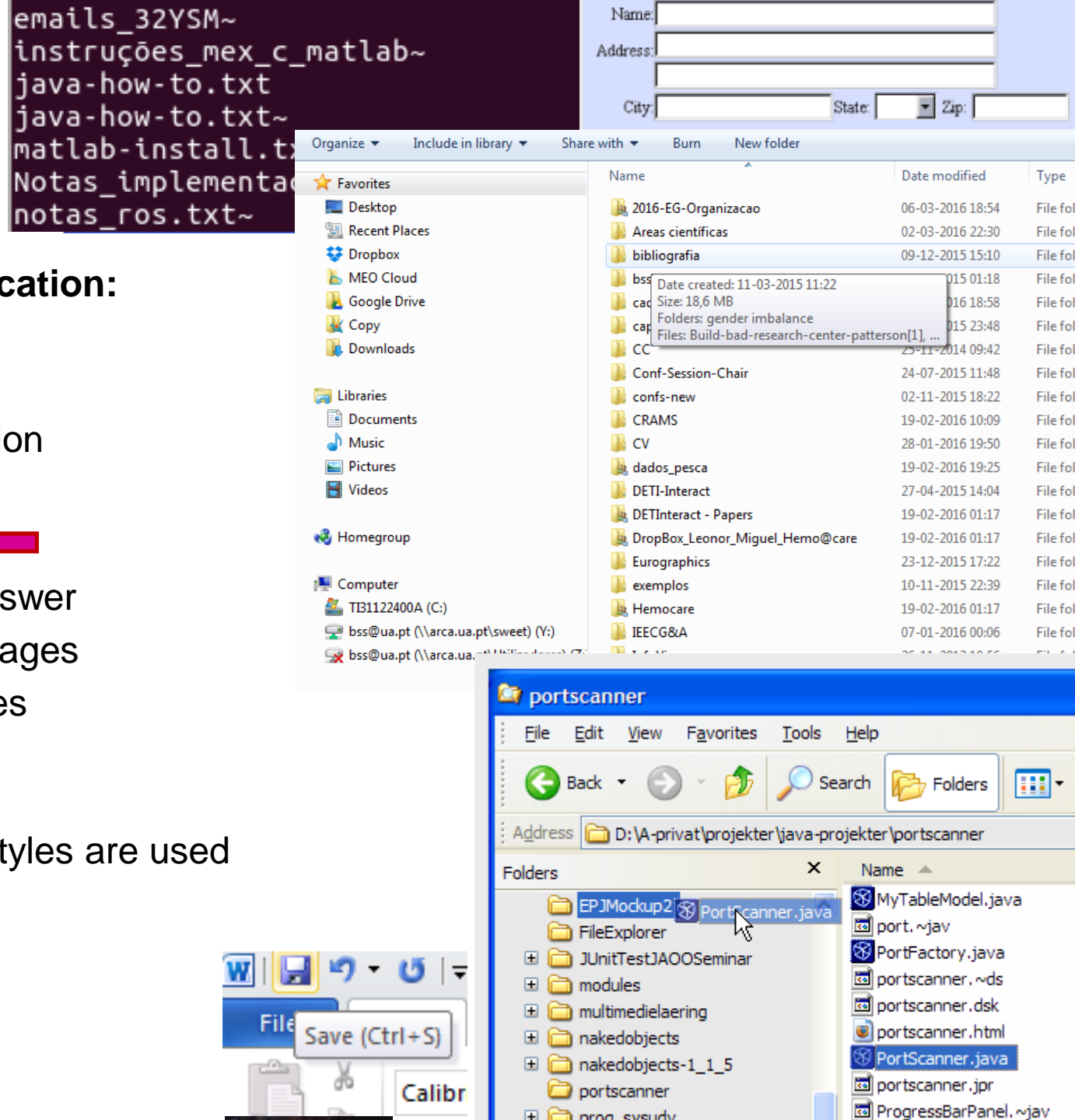


# Interaction/ Dialog styles

## 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



# 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



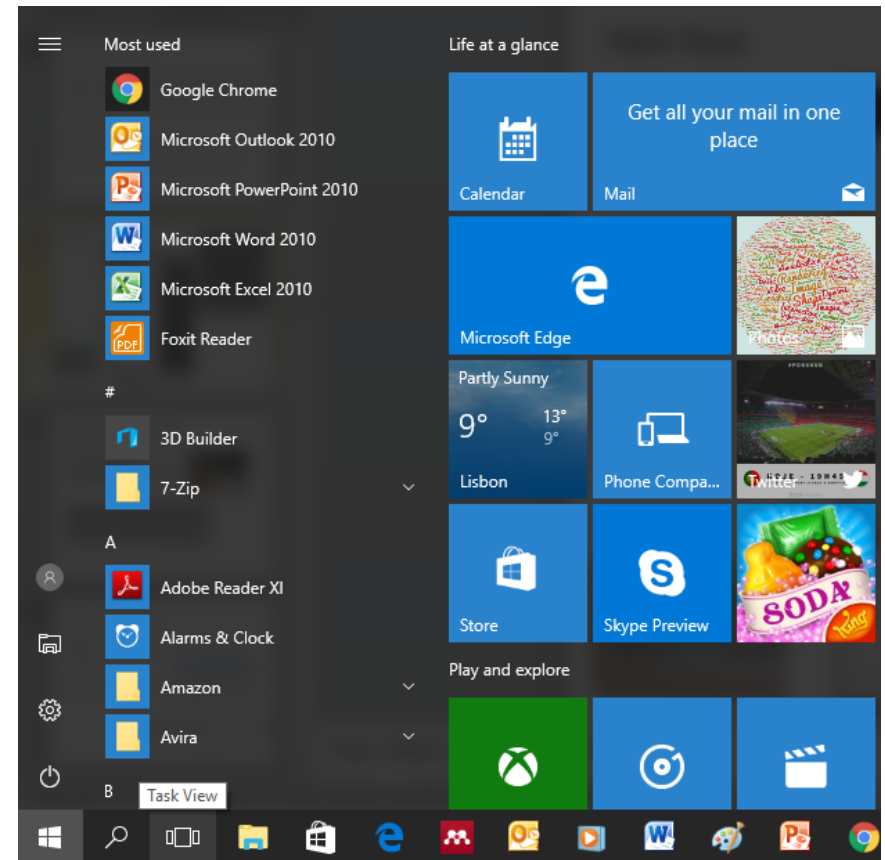


# Hard Keys

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](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



Multi-media remote control keyboard



Industrial keyboard

ATM keyboard



Shop system keyboard



TV remote control

# Interaction/ Dialog styles

## A possible classification:

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

...

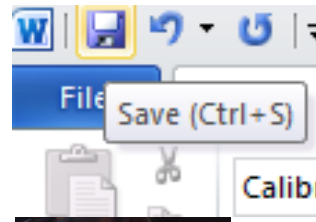
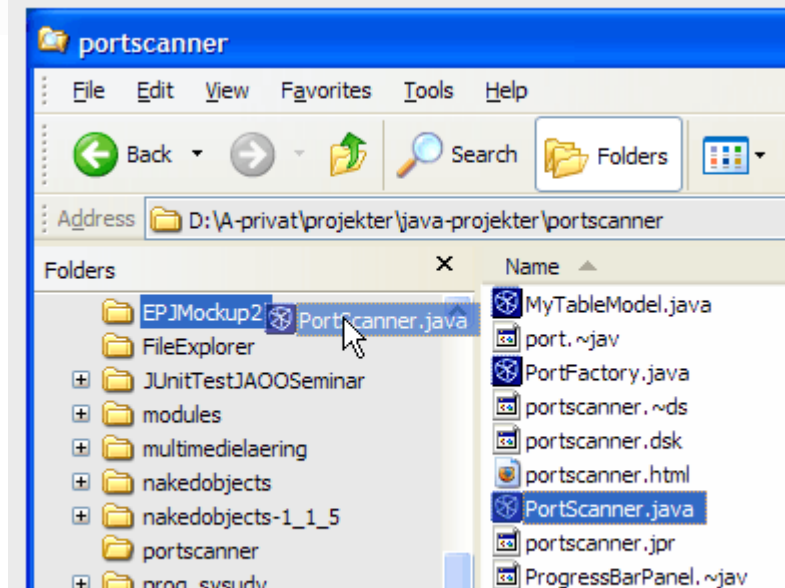
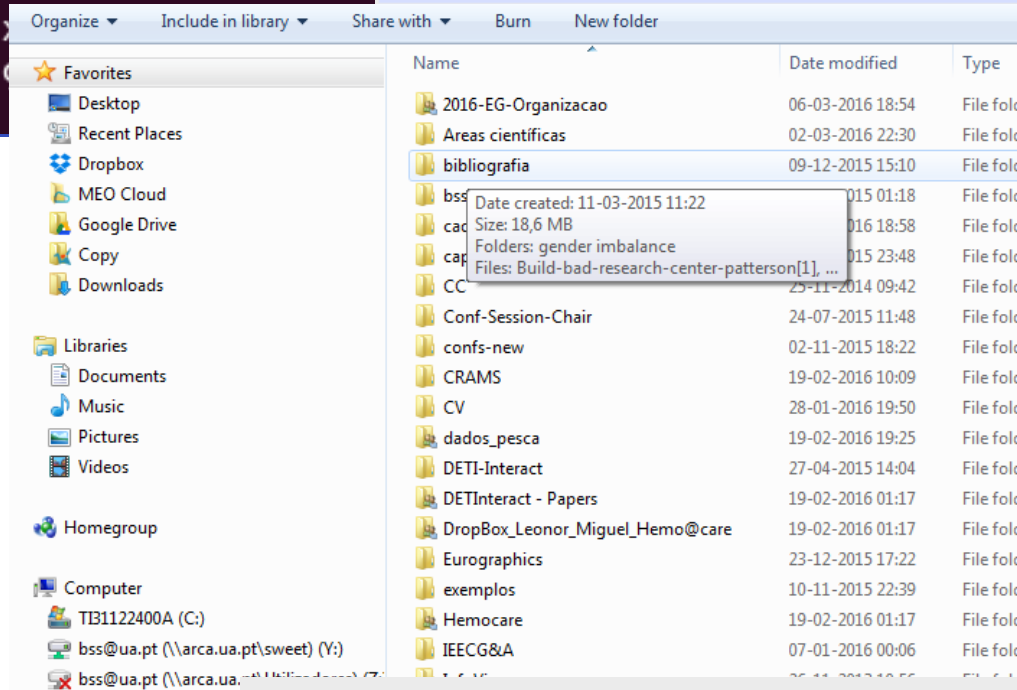
Often two or more styles are used  
simultaneously

```
emails_32YSM~
instruções_mex_c_matlab~
java-how-to.txt
java-how-to.txt~
matlab-install.t
Notas_implementa
notas_ros.txt~
```

Name:

Address:

City:  State:  Zip:





# 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 (in most cases)

## **Task characteristics:**

- High usage frequency
- Formal training

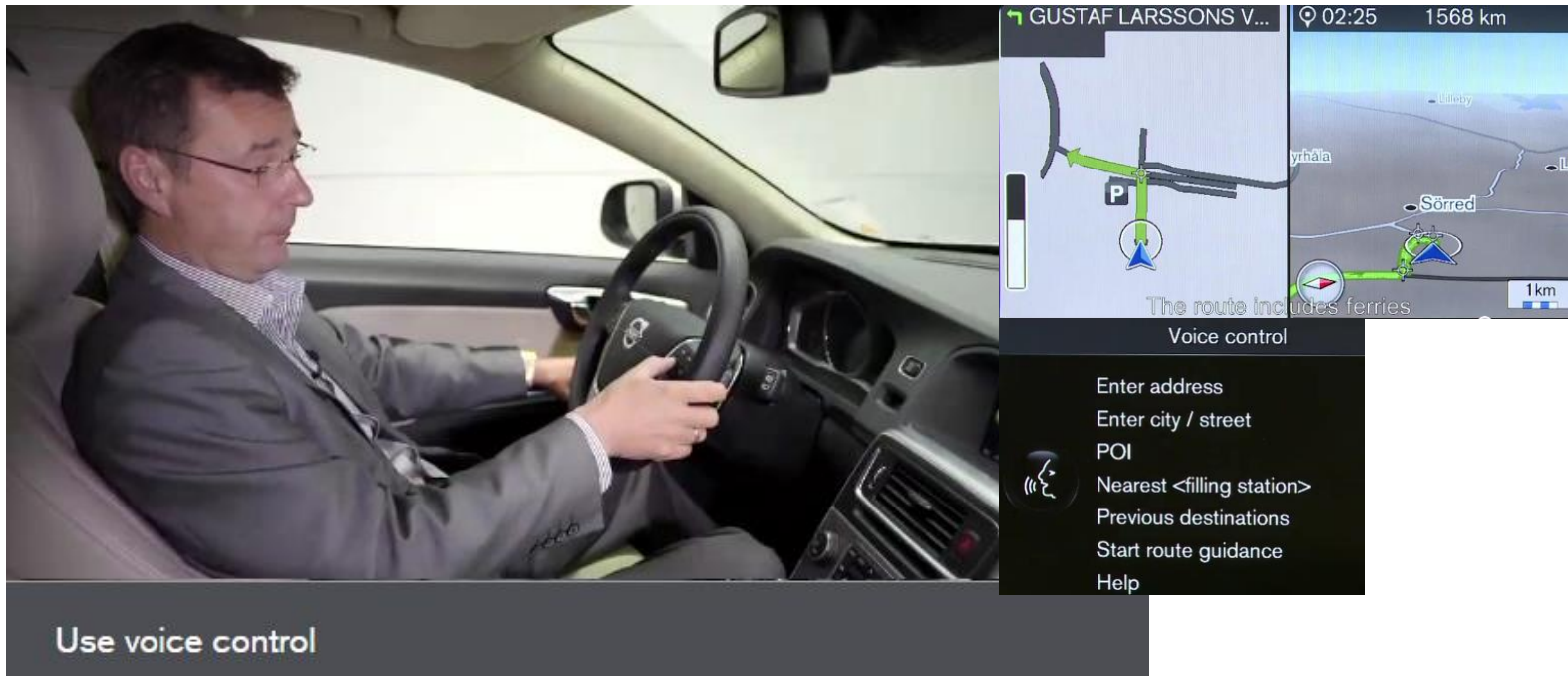
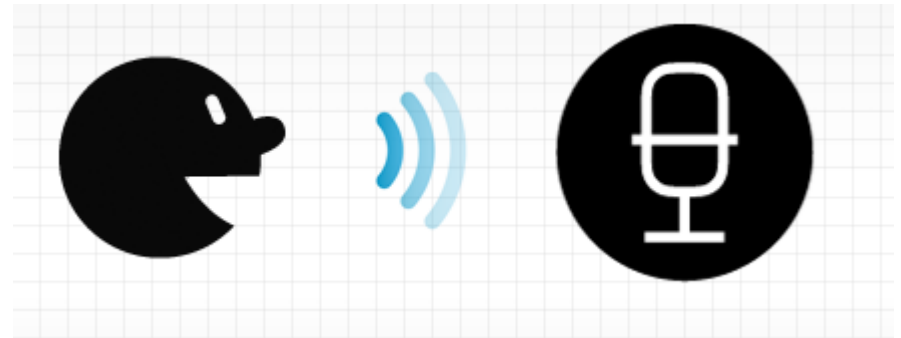
Note that:

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

But they must be very simple ...

e.g.

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



## **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**

Delete  
Insert  
Replace

## **Minimal**

Delete  
Insert

---

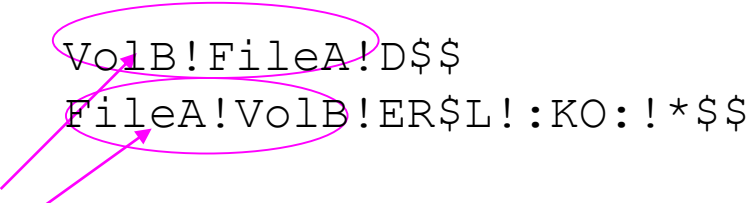
Copy  
Move  
Rename  
Delete

Copy  
Delete

(the functionality is the same)

Use a coherent syntaxe

Use a natural and easy to remember action-object grammar



VolB!FileA!D\$\$  
FileA!VolB!ER\$L!:KO:!\*\$\$

The diagram shows two lines of text. The first line is 'VolB!FileA!D\$\$' and the second line is 'FileA!VolB!ER\$L!:KO:!\*\$\$'. There are two pink ovals: one around 'VolB!FileA!D\$\$' and another around 'FileA!VolB!ER\$L!:KO:!\*\$\$'. Two pink arrows point from the text 'Uncoherent syntax and unfamiliar commands' to the two ovals.

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	DI	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 symlinks
- 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

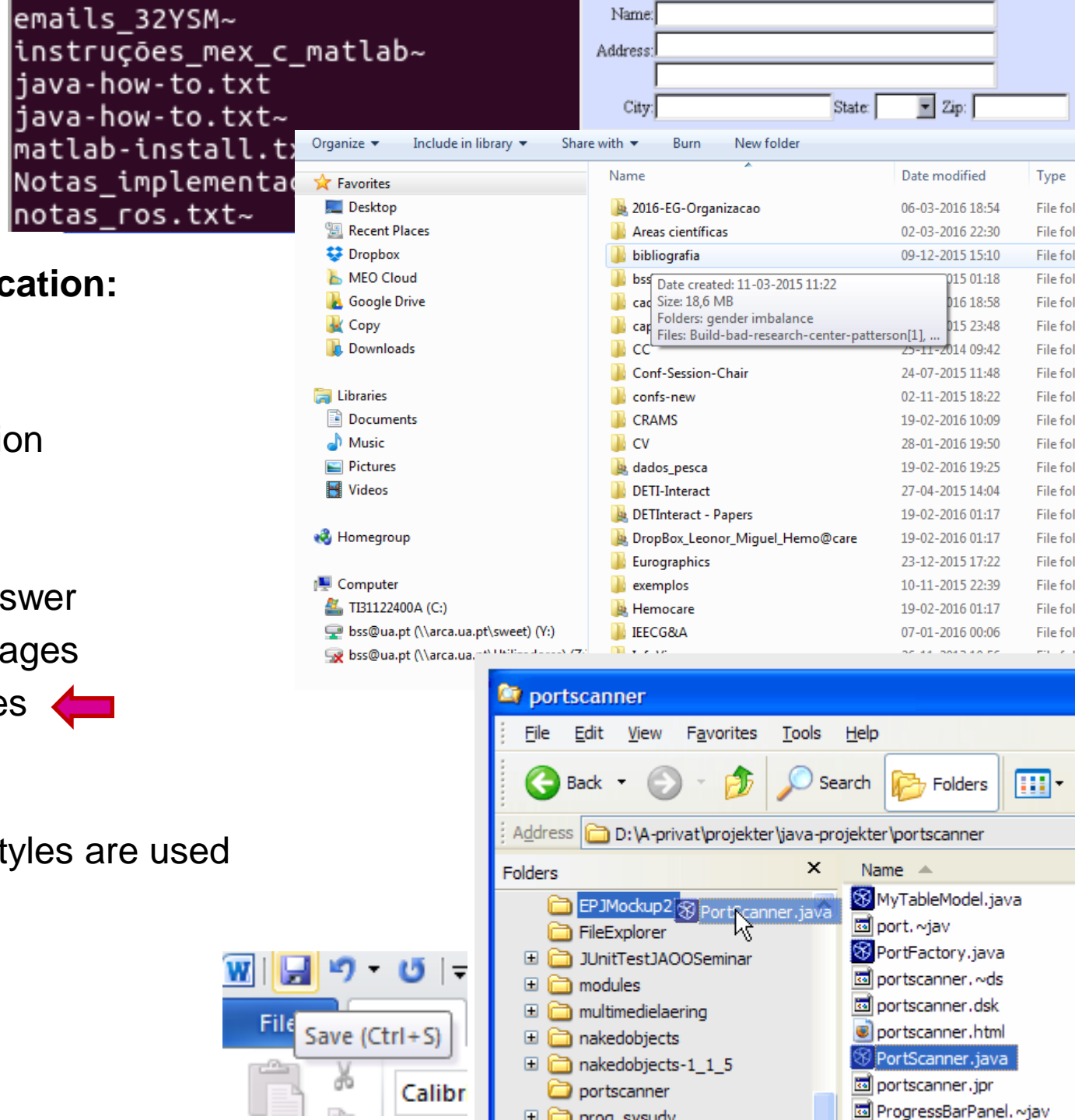
Etc., etc., etc.

# Interaction/ Dialog styles

## 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



# 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 language

# **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



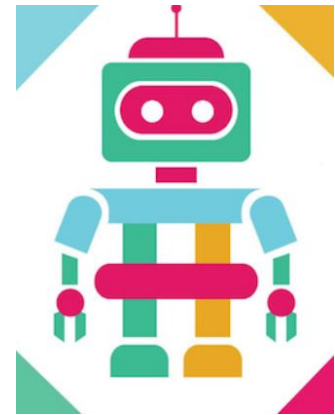
## **A few Natural Language design guidelines**

- 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”

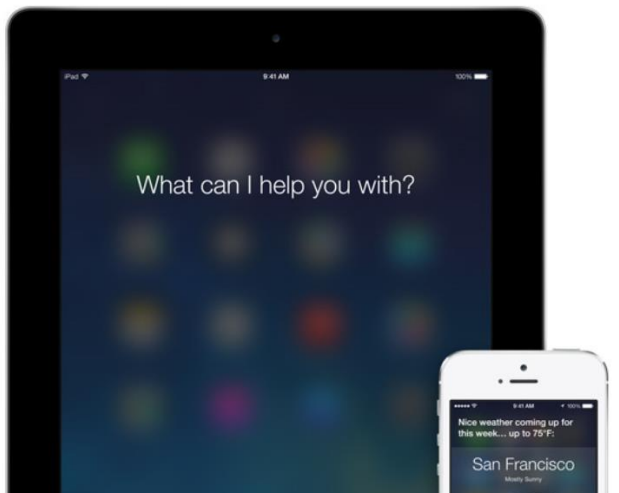
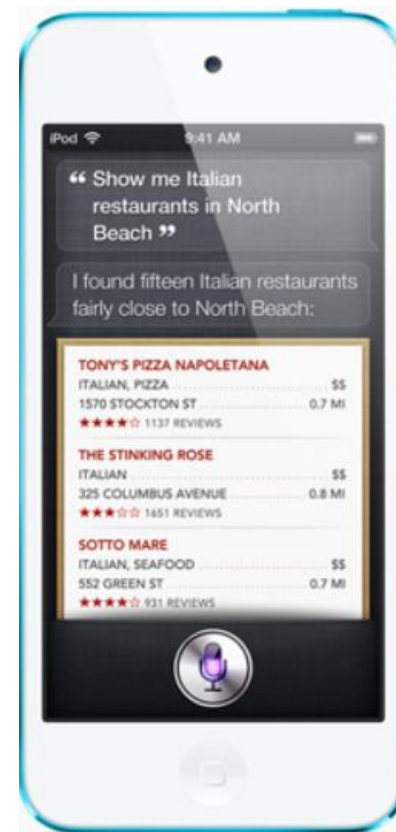
What doesn't fit the principles of Conversational UI well?

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....”

# 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 Alexa

amazon echo



<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”

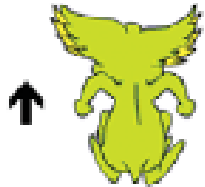
[https://en.wikipedia.org/wiki/Wizard\\_of\\_Oz\\_experiment](https://en.wikipedia.org/wiki/Wizard_of_Oz_experiment)



# 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

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

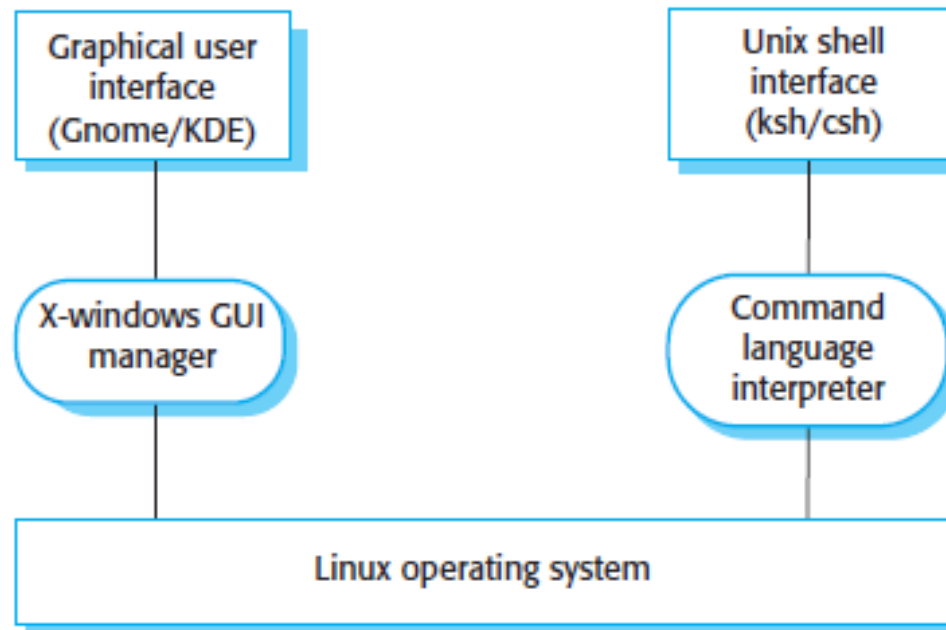




# Main advantages and disadvantages of interaction styles

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

# Multiple user interfaces example



(Sommerville, 2010, chap.29)

# 3D User Interfaces

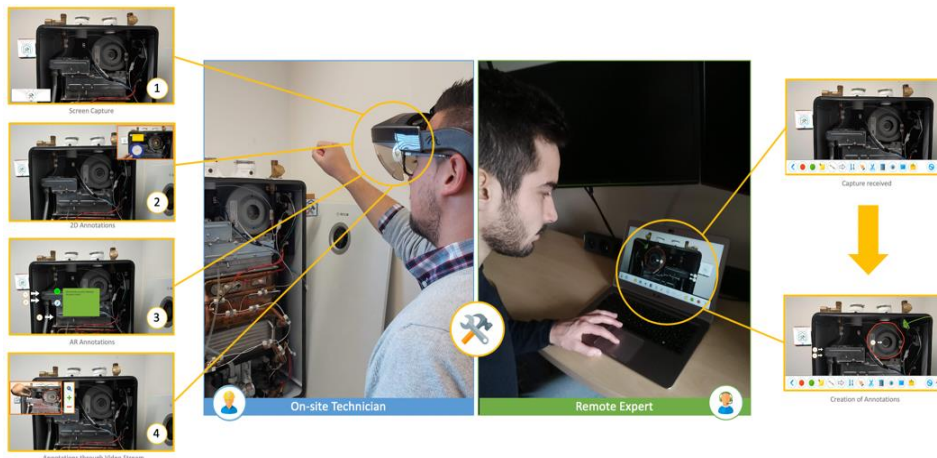
- User interfaces involving 3D interaction (i.e. interaction in which the user's tasks are performed directly in a 3D spatial context).
- Are more and more used:
  - Virtual and augmented reality
  - 3D workspaces
  - Data Visualization ...
- But have some issues:
  - User disorientation  
(in the real world we have more information)



# Applications of virtual and augmented reality

- Training and simulation
- Project review
- Therapy
- Entertainment

...



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