



Other Interaction Styles



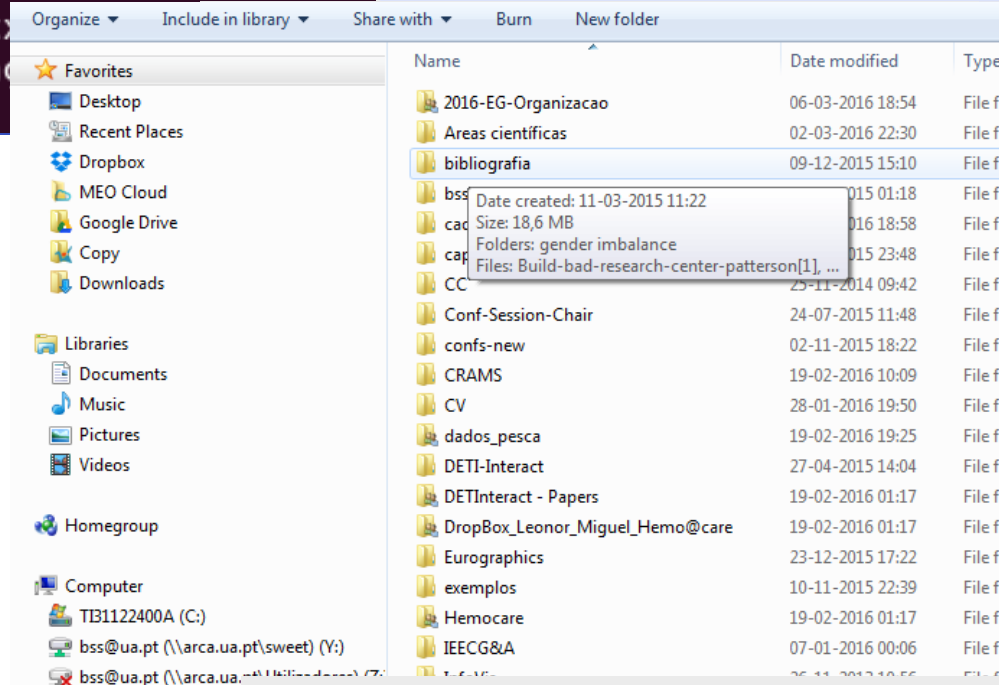
Interaction/ Dialog styles

```
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:

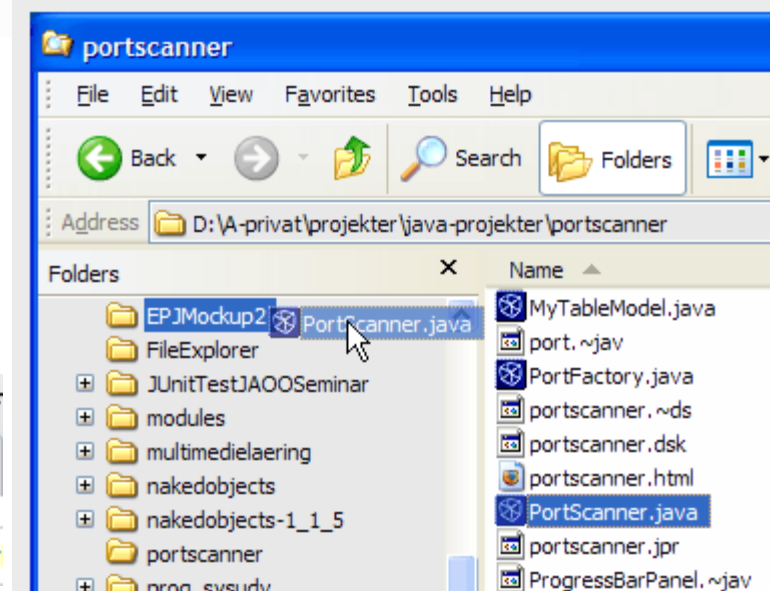
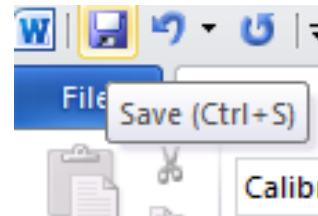
A possible classification:

- 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

Last Name

Title

Company

Street Address

Department/Mail

Stop

City

State/Province

Zip/Postal Code

USA/U.S. Military: Enter Zip +4 code without the h
CANADA: Enter postal code per usual (e.g. A1B 2C)

E-mail Address

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.

You may receive subscription renewal notices via
to receive other business related third-party offer, please check here.

IDA

Origem [Estações](#)

Destino [Estações](#)

Data

pelas Horas

Tipo de Serviço

- Todos
- Alfa Pendular
- Intercidades
- InterRegional
- Regional
- Urbano

VOLTA

Data

pelas Horas

- 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

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

- Lisboa - Cais do Sodre
- Lisboa - Entrecampos
- Lisboa - Oriente
- Lisboa - Rossio
- Lisboa - Santa Apolonia
- Lisboa - Sete Rios

Cartão

Mastercard 

Número do cartão

Data de validade

MM / AA

Titular do cartão

Titular do cartão

Cód. de segurança

Cód. de segurança

Payment options

Payment options*:

Billing currency*:

Card number*:


Card type*:

Card expiration date*:

CVV2/CVC2 code*:

Card holder name*:

- Visa/MasterCard/Eurocard
- PayPal
- American Express
- Bank/Wire transfer
- Discover/Novus
- Diners Club
- JCB
- Fax



Provide a format for fields that may be ambiguous

Show which fields are mandatoty

The image shows a web registration form with a sidebar menu on the left. The sidebar menu lists various product categories, each with a sub-menu. The main form area is titled 'Mbit.pt > Registo de Clientes' and contains several input fields, some of which are marked with an asterisk (*) to indicate they are mandatory. The form is divided into three main sections: 'Área Cliente', 'Informação', and 'Pesquisa'. The 'Área Cliente' section contains fields for 'Nome do utilizador:' and 'Password:', with an 'OK' button and links for 'Registrar' and 'Recuperar Password'. The 'Informação' section contains text about '13 Anos de Experiência, 14 Lojas para o servir!' and 'Loja 1 - Porto Torrinha'. The 'Pesquisa' section contains a search input field and an 'OK' button. The 'Top Vendas' section is partially visible at the bottom.

Área Cliente

Nome do utilizador:

Password:

OK

Registrar
Recuperar Password

Informação

13 Anos de Experiência, 14 Lojas para o servir!

Loja 1 - Porto Torrinha

Pesquisa

OK

Top Vendas

Área Cliente

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

Registrar

••• voltar

Área Cliente

- 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

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

Better:

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

Date: _____
(e.g. 01122000)

Time: _____
(eg. 8-15)

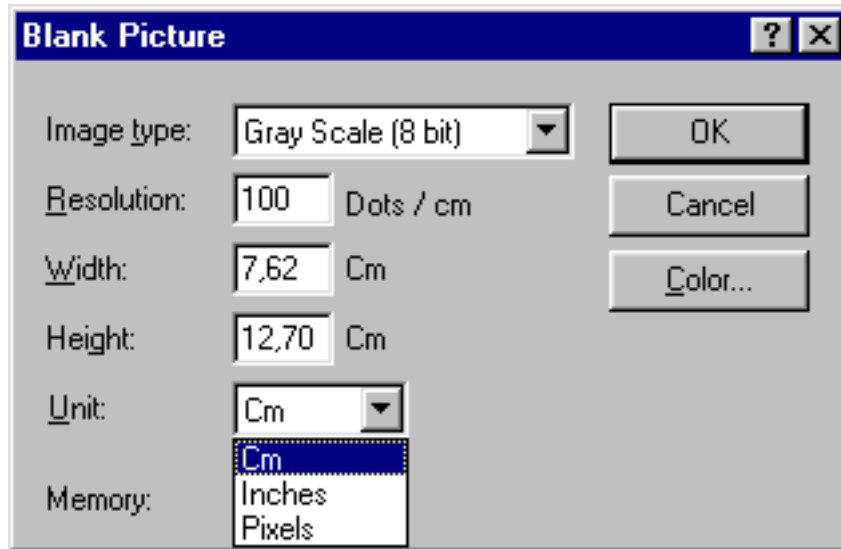
Time: ___ - _____
(e.g. 08-15)

Time: _____
(e.g. 0815)

Card#: _____
(e.g. 123456789012)

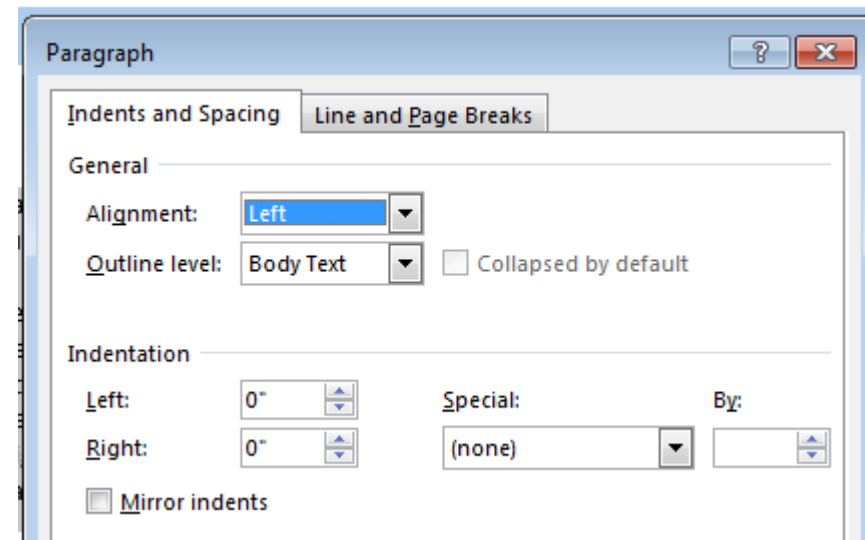
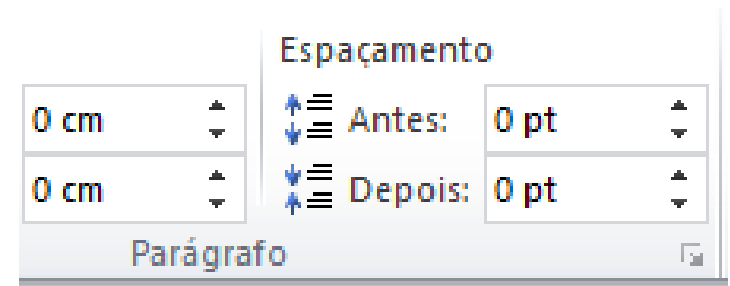
Card#: ___ - ___ - _____
(1234-5678-9012)

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



English version (inches):

Portuguese version (cm):



Instructions to fill the fields should be clear

Messages

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

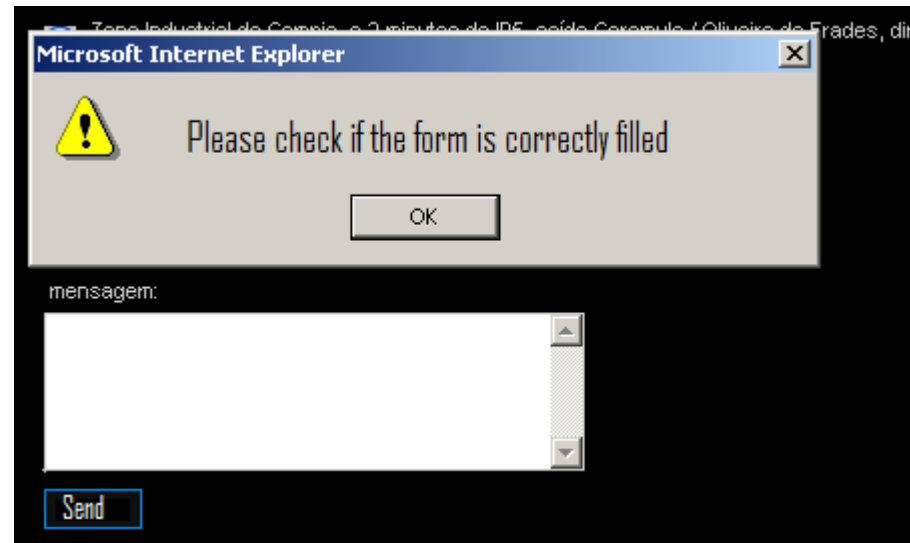
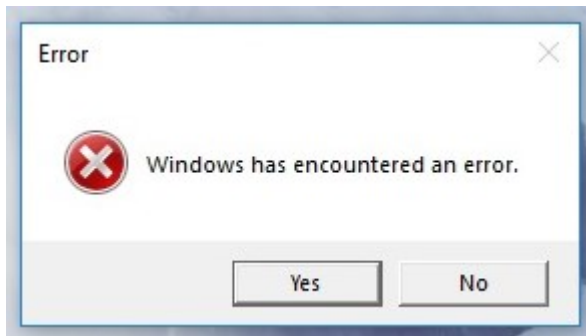
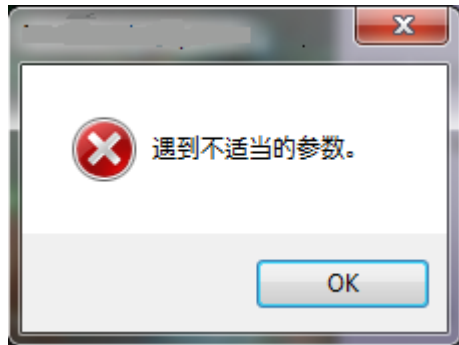
Font Size: (plain text only)

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



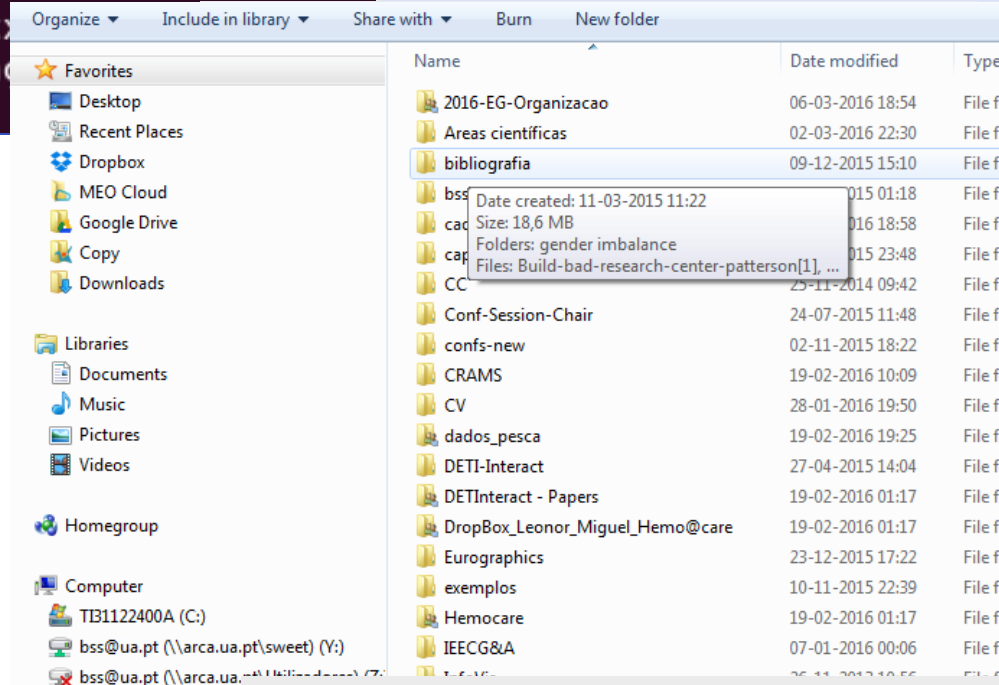
Interaction/ Dialog styles

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

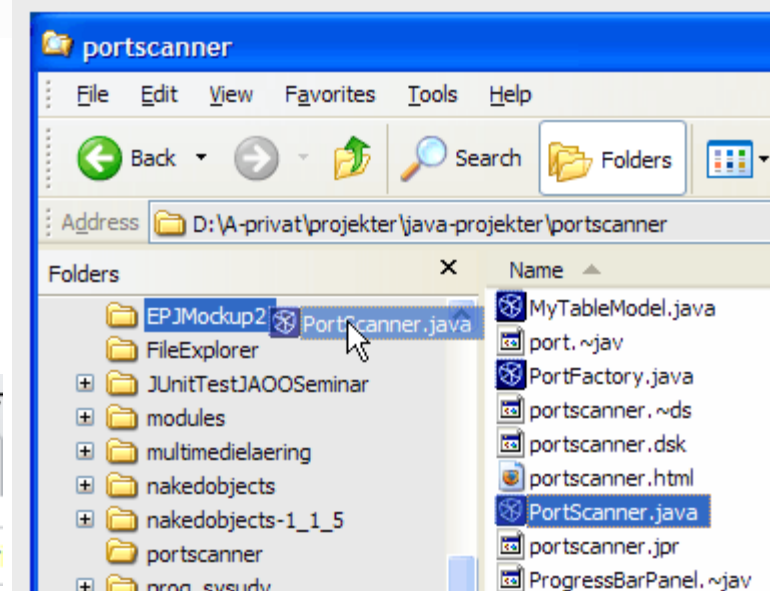
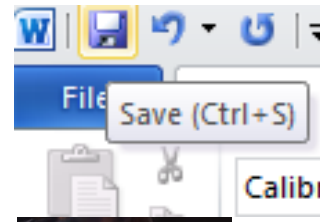
Name:
Address:
City: State: Zip:

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

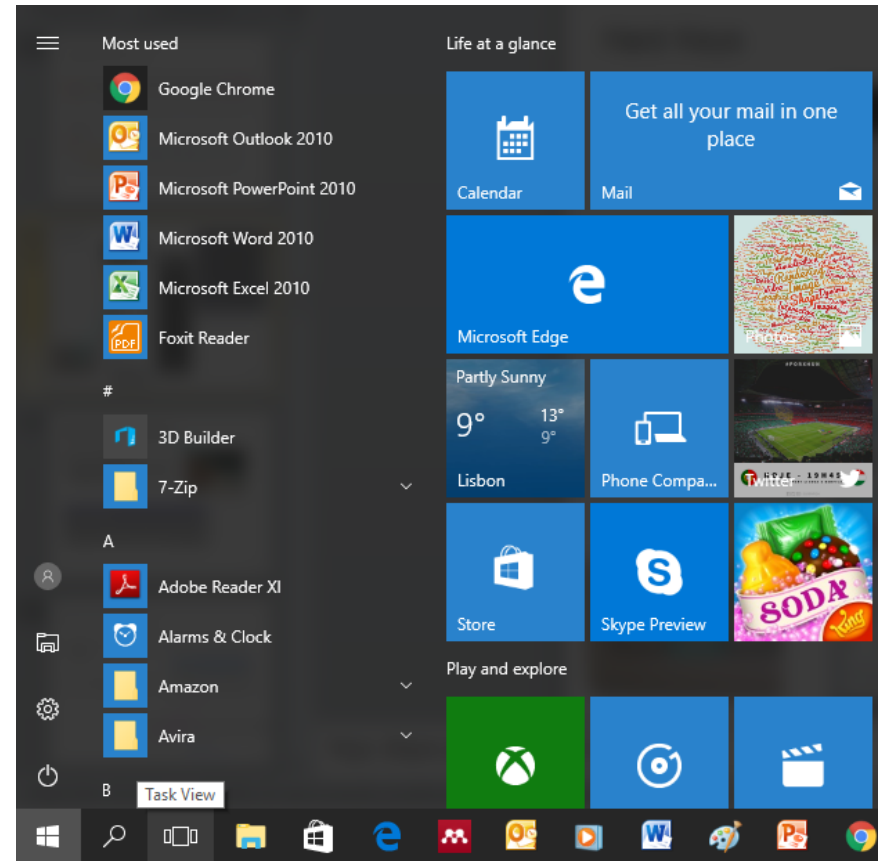


Hard Keys

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

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



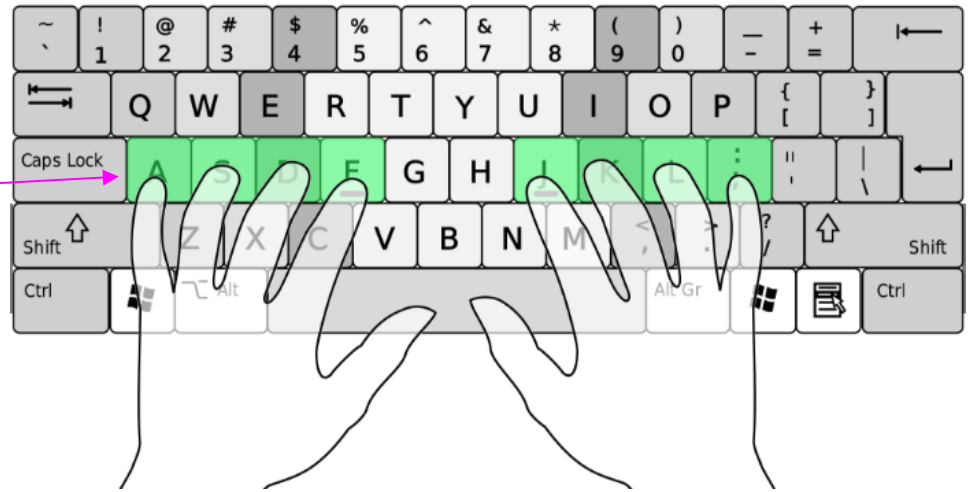
Shop system keyboard



TV remote control



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

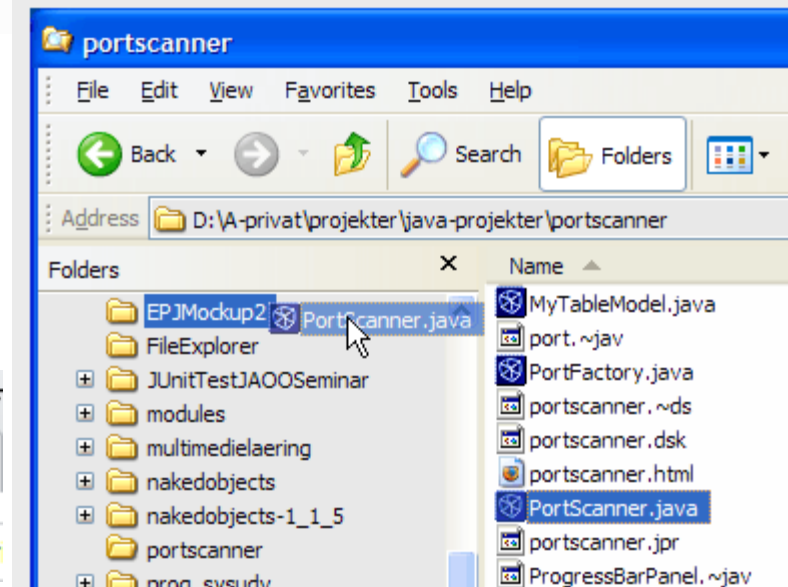
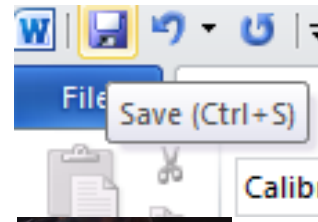
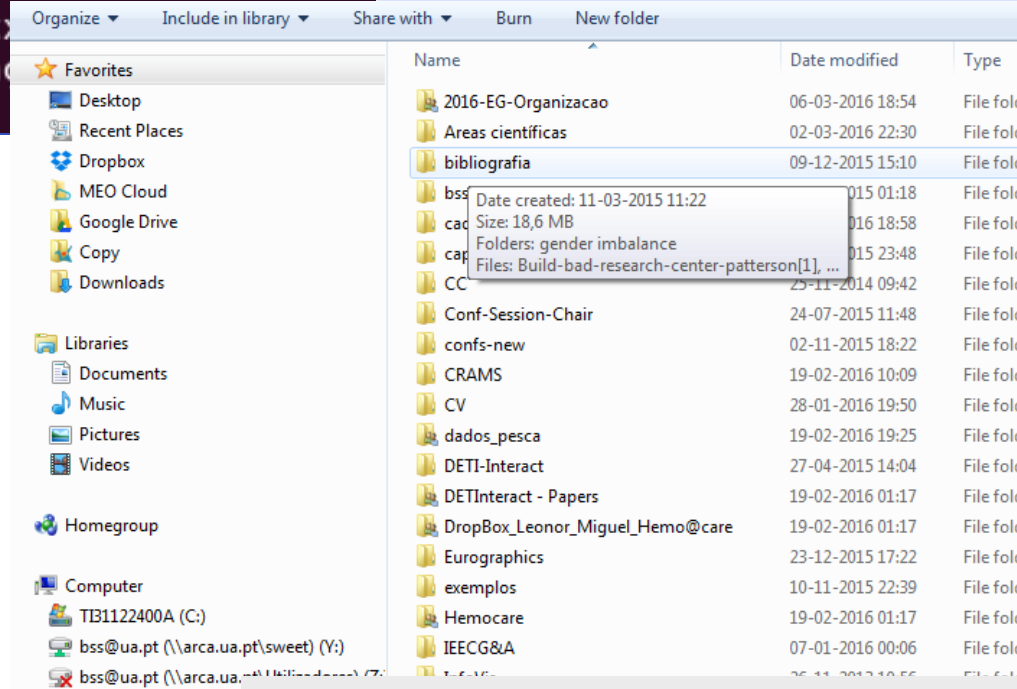
```
emails_32YSM~
instruções_mex_c_matlab~
java-how-to.txt
java-how-to.txt~
matlab-install.t
Notas_implementa
notas_ros.txt~
```

Name:
Address:
City: State: Zip:

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



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:

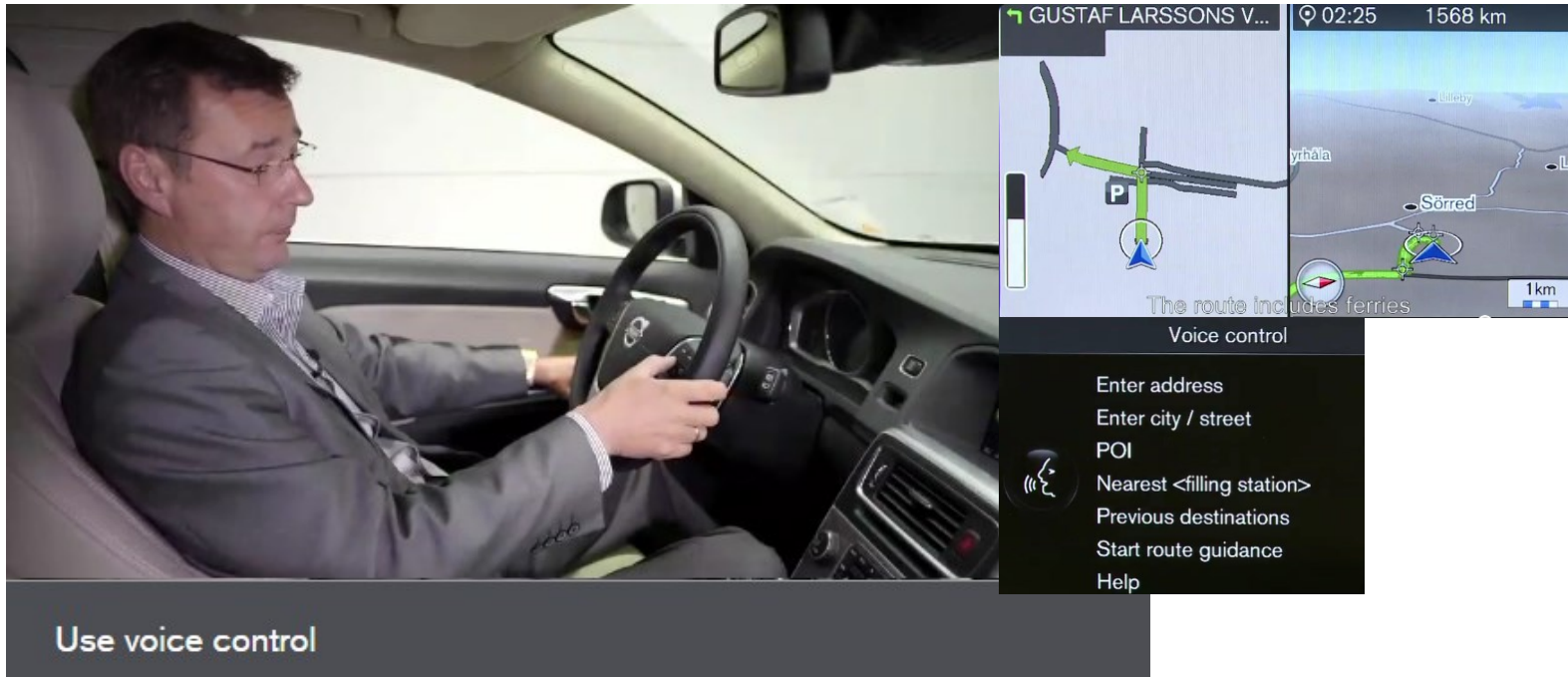
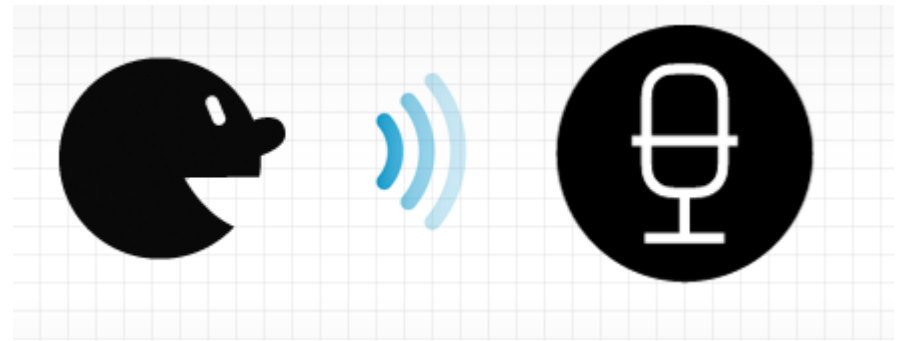
- High usage frequency
- Formal training

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

Delete

Insert

Replace

Minimal

Delete

Insert

Copy

Move

Rename

Delete

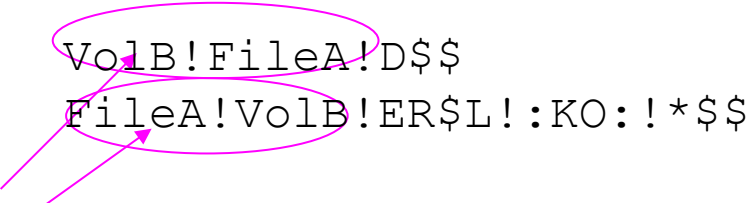
Copy

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:!*\$\$

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

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

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

- 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.

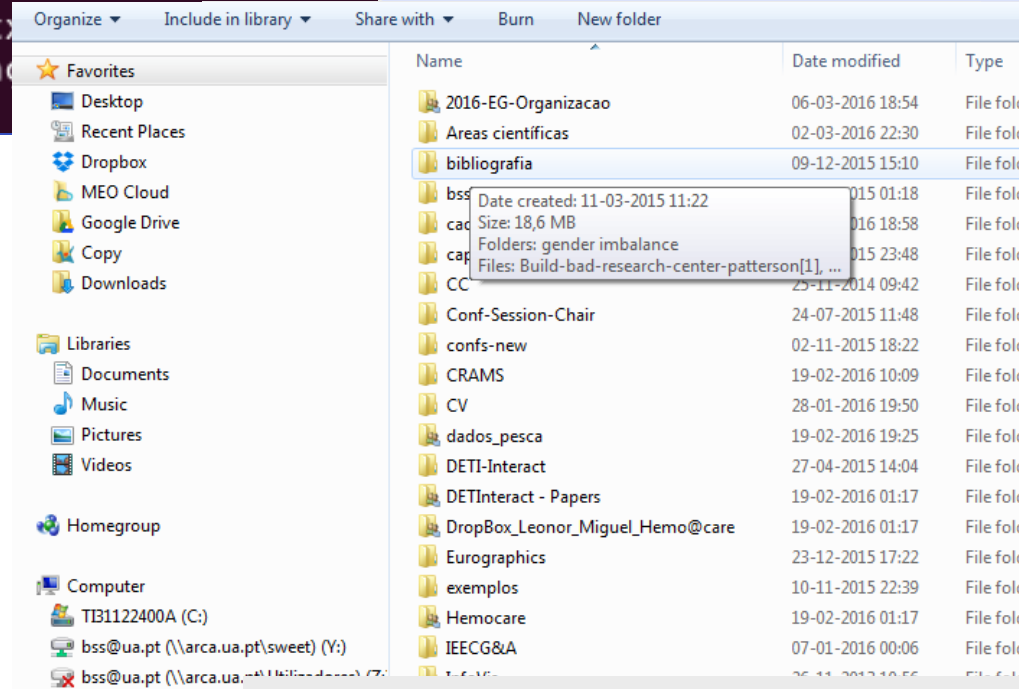
Interaction/ Dialog styles

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

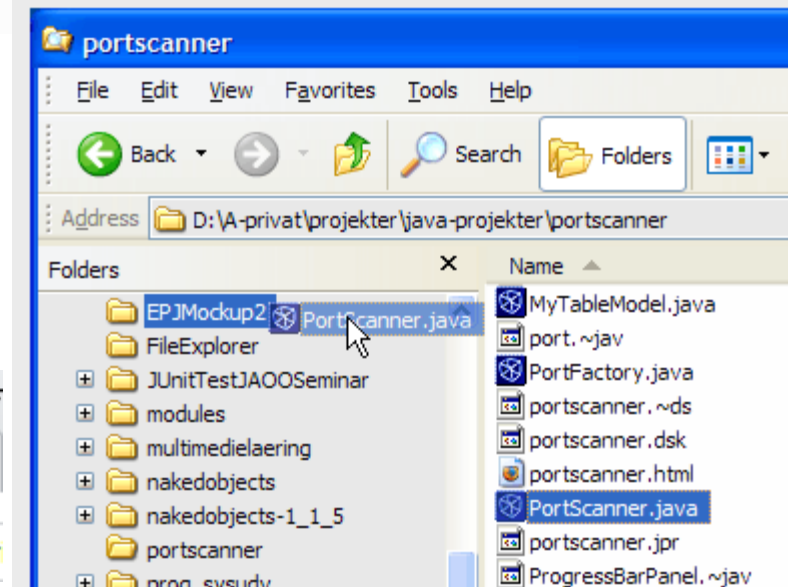
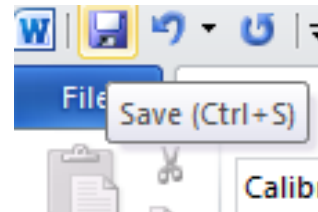
Name:
Address:
City: State: Zip:

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

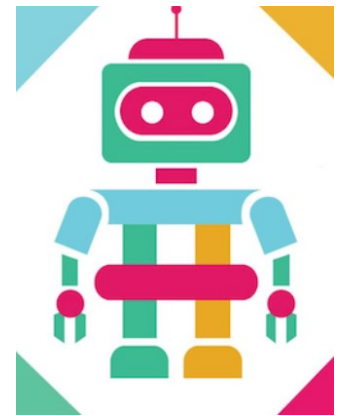
A few Natural Language design guidelines

- 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”

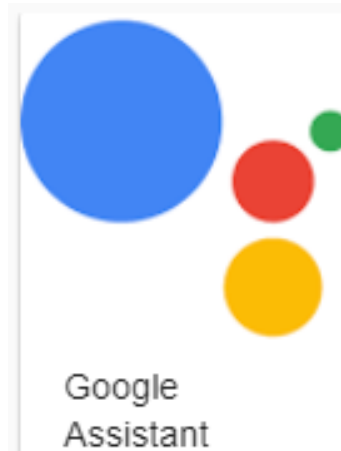
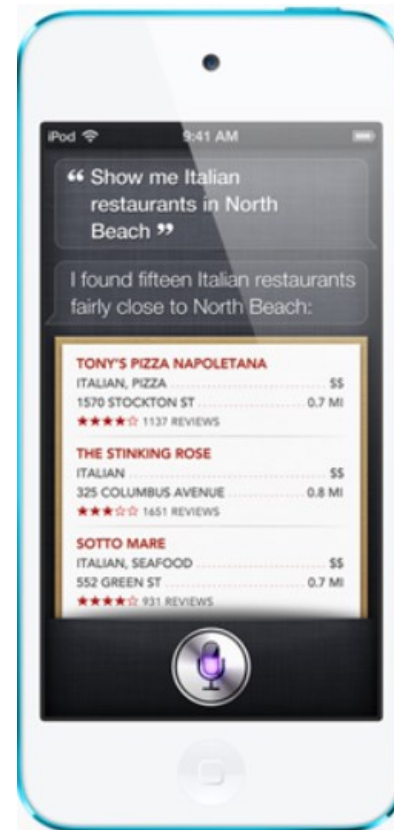
What doesn't fit the principles of Conversational UI well?

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”

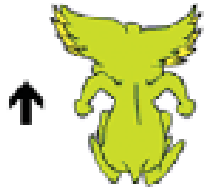
https://en.wikipedia.org/wiki/Wizard_of_Oz_experiment



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

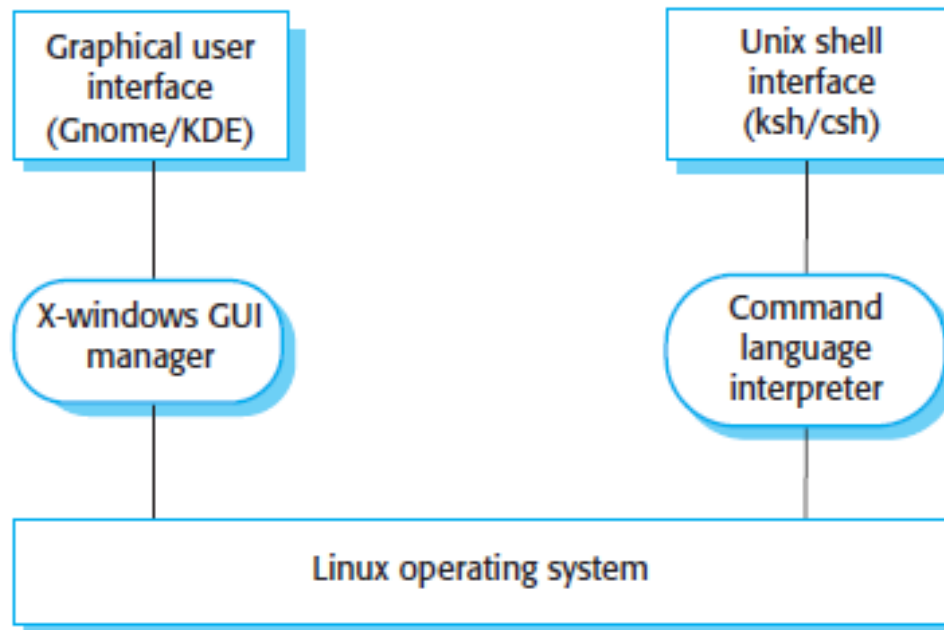


Main advantages and disadvantages of interaction styles

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)

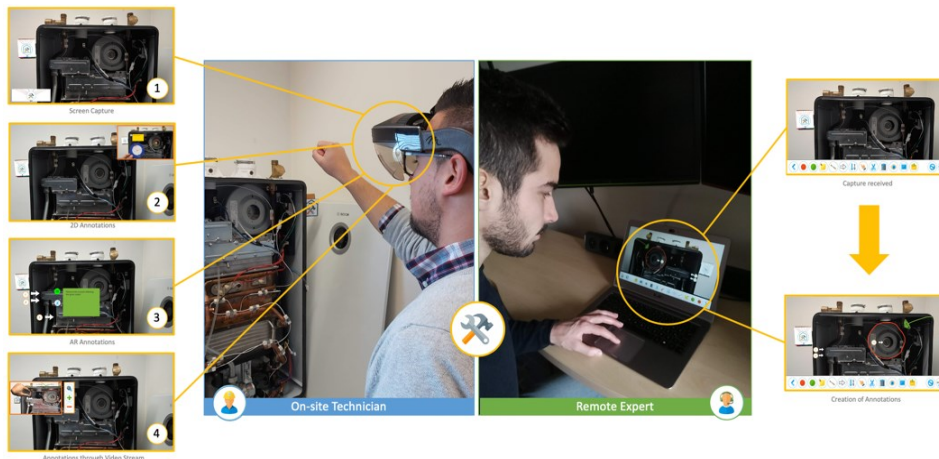
3D User Interfaces

- 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
- ...



Main bibliography

- B. Shneiderman et al., *Designing the User Interface- Strategies for Effective Humaman–Computer Interaction*, 5th ed., Addison Wesley, 2009
- Soegaard, Mads. Interaction Styles
http://www.interactiondesign.org/encyclopedia/interaction_styles.html
<https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/3d-user-interfaces>
- Ian Sommerville, *Software Engineering*, 9 ed, Addison Wesley , 2010
https://ifs.host.cs.st-andrews.ac.uk/Books/SE9/WebChapters/PDF/Ch_29%20Interaction_design.pdf