Corso di Laurea in INFORMATICA Magistrale

# Interazione Uomo-Macchina II

# Modulo A

# a.a. 2009-2010

.

II

I fenomeni che caratterizzano l'interazione: co-evoluzione, grain, divario comunicazionale, diversità degli utenti, d-experts, modello PCL, modello di interazione e co-evoluzione





# Motivation

- Evolution of computing
  - Old computing is about what computers can do,
  - new computing about what humans can do (Shneiderman 2003)
- Several phenomena make human-computer interaction difficult

# Communicational gap

- Users and software designers adopt different reasoning strategies:
  - ***heuristic*** vs. ***algorithmic***
  - ***examples***, ***analogies*** vs. ***deductive abstract tools***
  - ***concreteness*** vs. ***abstraction***

- Users are forced to express their problems in alien "***computerese***" and play the role designers think users have to play

- ... but users are ***domain experts*** !!!



# Tool Grain

- Tendency of a tool to (implicitly) force some user behaviors [Dix et al. 98]

- The grain is often not amenable to user reasoning, and possibly misleading for them

# User diversity within a community

- User history (skill, culture, knowledge), and specific abilities (physical/ cognitive)
- User geographical ($\leftrightarrow$ basic cultural) dispersion
- Tasks to be performed and context of activities



# Co-evolution

- The tool is not simply added on the human activity, rather it makes it evolve
- "Using the system changes the users, and as they change they will use the system in new ways"
  [Nielsen, Usability Engineering, 1993]
- New uses of the system require the environment to evolve and force the designers to adapt system and technology to the evolved user and environment

# Implicit Information

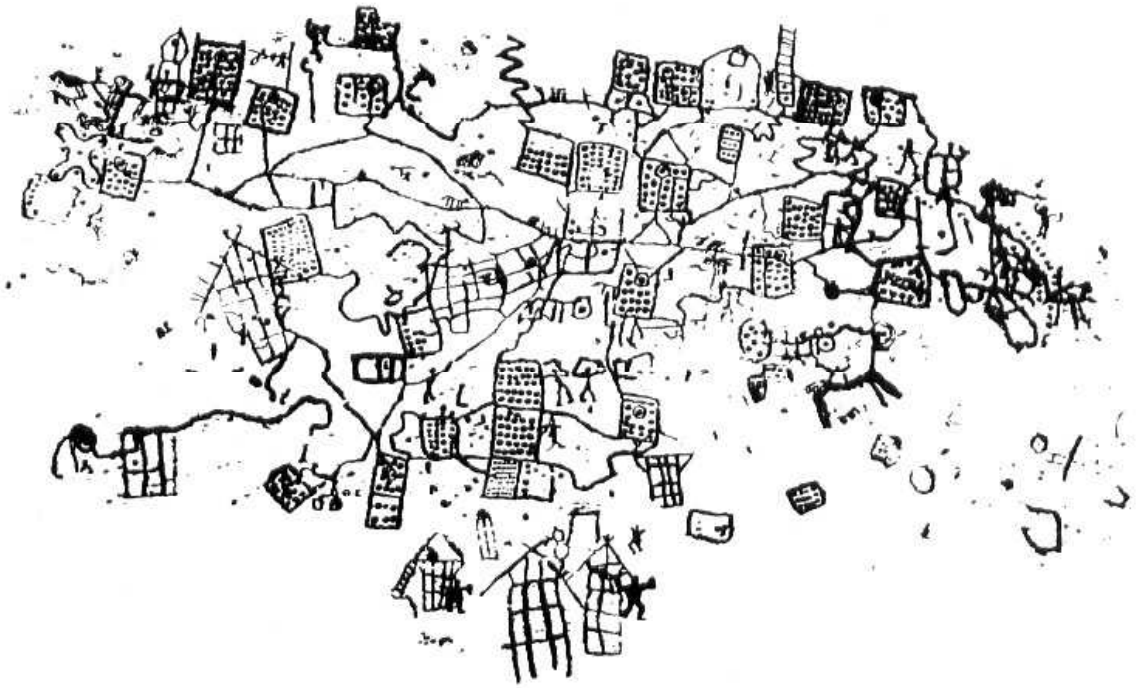
- A part of the information is implicitly embedded in the message and is meaningful only for experts in the domain
- Example: Arabian people are used to read from right to left
- Designers must take into account implicit information



# Tacit knowledge

- ***Tacit knowledge*** is knowledge that a person possesses and uses to carry out his/her tasks but that s/he is unable to express
- tacit knowledge and implicit information have to be embedded into the interactive system supporting users' work

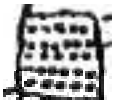
# A Camuni cadastral map (1500 BC)





# Users

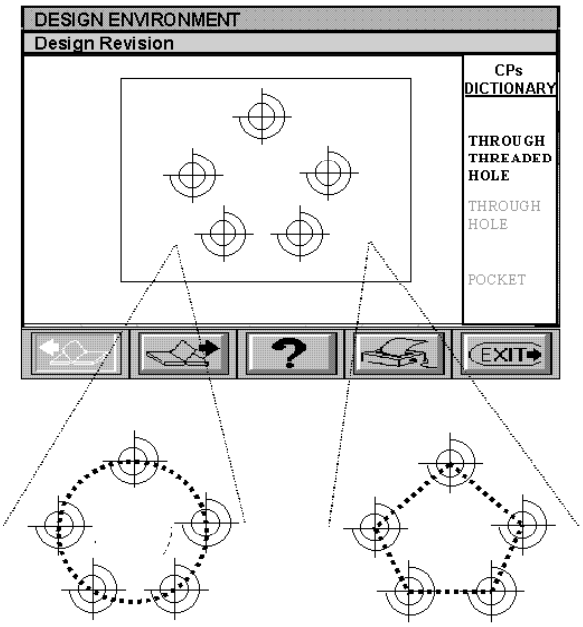
- Recognize functional or perceptual units
  the characteristic structures (CSs),
- Interpret (assign a meaning to ) CSs as characteristic patterns (CP)

 → *man* ,  → *House (hut)* ,  → *Tilled field*

- Compose CP into more complex CPs by grouping CSs
  and deriving a new meaning

 → *village* , ……

# Variety of interpretations



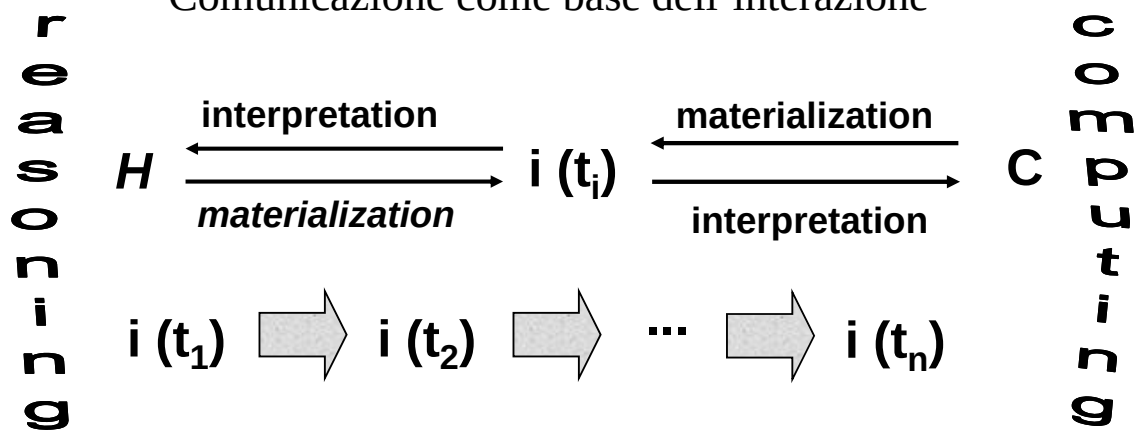

In different context
and /or
pursuing different goals
a same user
interprets the document
differently

Different users may have
different interpretations
pursuing the same goal in
the same context



# Il Modello PCL
# (Pictorial Computing Laboratory)

Comunicazione come base dell'interazione




the image **materializes** the meaning intended by the sender
and must be **interpreted** by the receiver

# In una macchina moderna...

Azione, Calcolo, Reazione, Ragionamento → sequenza di messaggi

$i(t_0)$ $i(t_1)$ $i(t_n)$


*Create...* *…in this place* *…and link to a ≠ cell class*

L'uomo esegue l'azione in relazione alle ***strutture*** da lui ***riconoscibili*** nel messaggio presente, modificando così il messaggio

L'azione è interpretata dal calcolatore in relazione alle ***strutture conosciute*** dalla macchina nel messaggio

Il ***significato dell'azione*** è valutato mediante il calcolo; il risultato permette di calcolare la reazione della macchina (eseguita dagli strumenti di output)

Il calcolatore produce la reazione modificando le ***strutture conosciute*** dal calcolatore nel messaggio



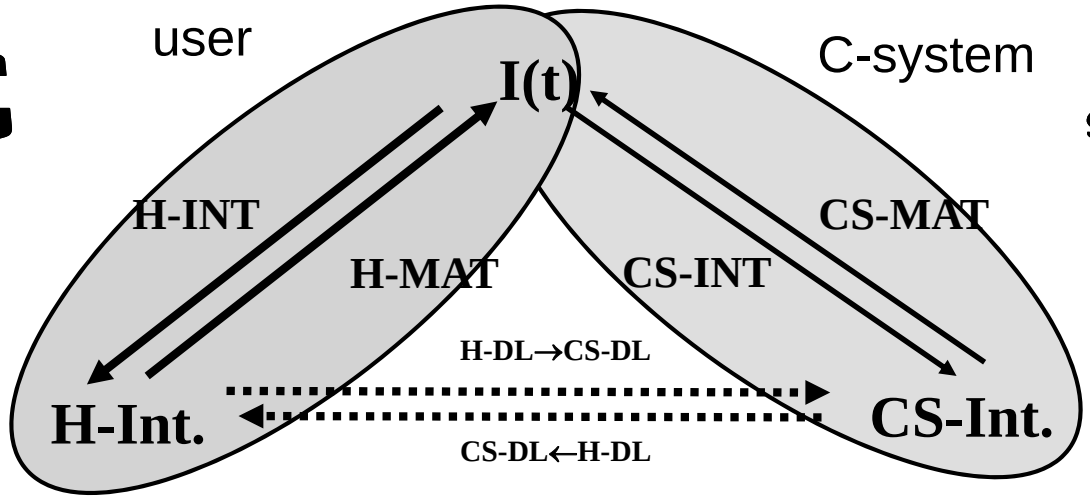
# Due interpretazioni

**per ogni messaggio ed azione**

reasoning

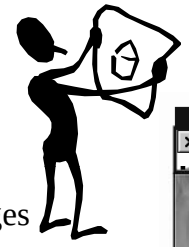
Human **materialization** → / ← **interpretation** **I(t)** **interpretation** → / ← **materialization** C-System

computing



# The interpretation-materialization process between the human and the machine

**HUMAN**

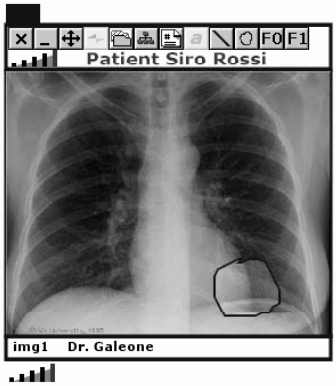


**interprets** images

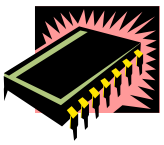
a) recognizing *characteristic structures* (CSs)

b) associating to the CSs a meaning, defining *characteristic patterns* CPs

**materializes** his/her intention acting on a CS using the input devices (*activities)*




**MACHINE**



**interprets** streams of input events

a) relating them with its CPs

b) computing the response to human *activities*

**materializes** the results using the output devices



# Further phenomenon affecting HCI

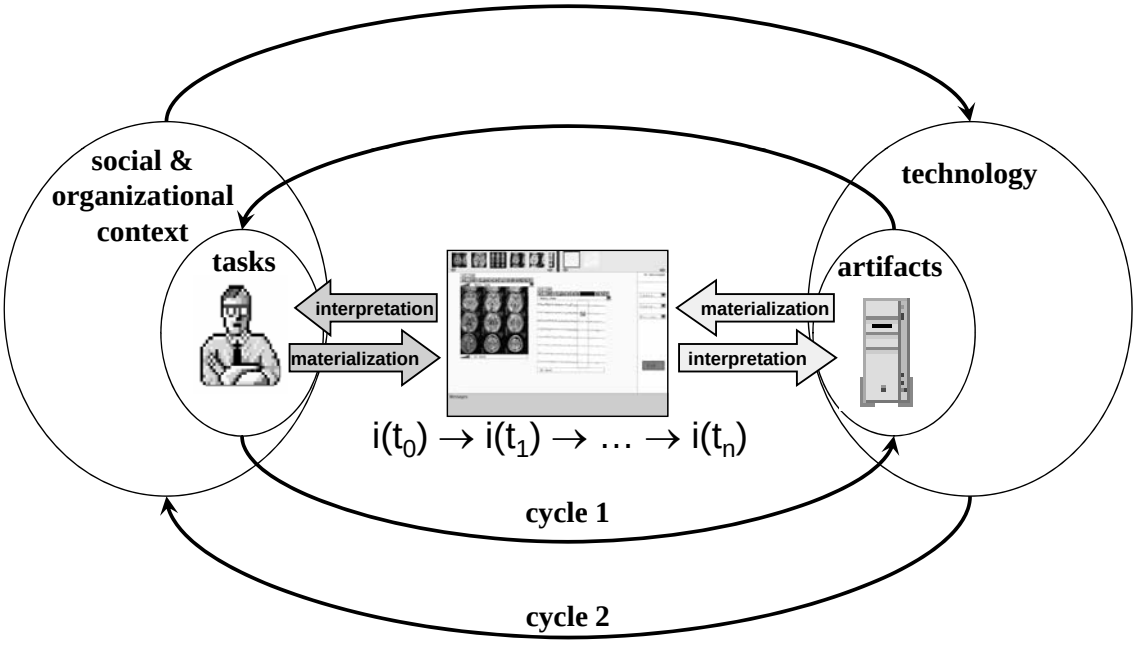
- **Co-evolution of users and systems**

  "Using the system changes the users, and as they change they will use the system in new ways"

  Nielsen 1993

  "The individual is a moving target. Design for the individual of today and the design will be wrong tomorrow […]. This is because as individuals gain proficiency in usage, they need different interfaces then were required when they were beginners"

# Interaction and Co-Evolution (ICE) model




Inspired by [Bourguin et al. 2001][Carroll and Rosson 1992]



# Domain-expert users

- A special category of end-users
- Experts in a specific domain, not necessarily experts in computer science, who use computer environments to perform their daily tasks
- Medical doctors, mechanical engineers, geologists, ...

# How to support domain-experts

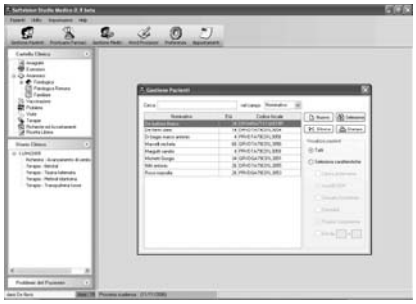
- Recognize that experts develop their own ***languages*** and ***notations*** to reason on problems and communicate solutions
- Recognize ***user diversity*** within the same community
- ***Design environments*** that:
  - allow domain experts to interact through their visual notations and with tools familiar to them
  - make abstract Computer Science concepts concrete to users and allow users to follow their learning and reasoning strategies
  - permit user-system co-evolution



# "one size fits all" Vs "one-task"

general purpose tools

- Too difficult to use, to learn and too complex
- General purpose tools are not suitable for end-users



one-task tools

- Very few functionalities: only the needed ones
- Easy to use

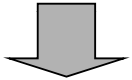
Tools supporting a limited set of tasks

few functionalities aimed at accomplishing the tasks for a specific purpose or for a specific user community

# Human-computer co-evolution

"Using the system changes the users, and as they change they will use the system in new ways"

Nielsen 1993



- Interactive systems are anymore a monolithic piece of software

  Interactive systems must be designed to evolve as evolving user needs might require

- Allowing end-users to personalize and evolve at run time their own software environments ➔ End User Development