

How to measure tactile perception : a case study on automotive fabrics

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Perception et Human Factors

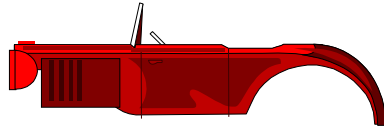
A search for understanding and analysing the comfort of cars

The judgment of car comfort goes through sensory information and its cognitive integration, either consciously or not

- **Our objective :**
to take sensory properties of car components into account in the vehicle's life, meaning from conception to specification

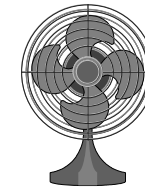
SIGHT

Shape
Appearance
Colour
Equipment



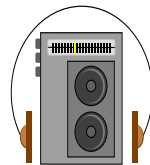
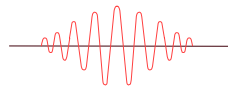
TOUCH KINESTHESIA

Seat fabrics
Door panels
Dashboards
Vibration



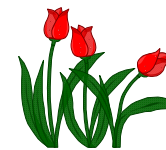
AUDITION

Opening & closing doors
Road and wheels
Commands (windows..)
Engine



OLFACTION

Cabin materials
Outside / inside



Tactile perception

- **Methodology transferred from food industry : sensory profile**
 - Panel : 12 sensory experts
 - Protocol :
 - List of descriptors obtained by consensus
 - Training with references from the product space



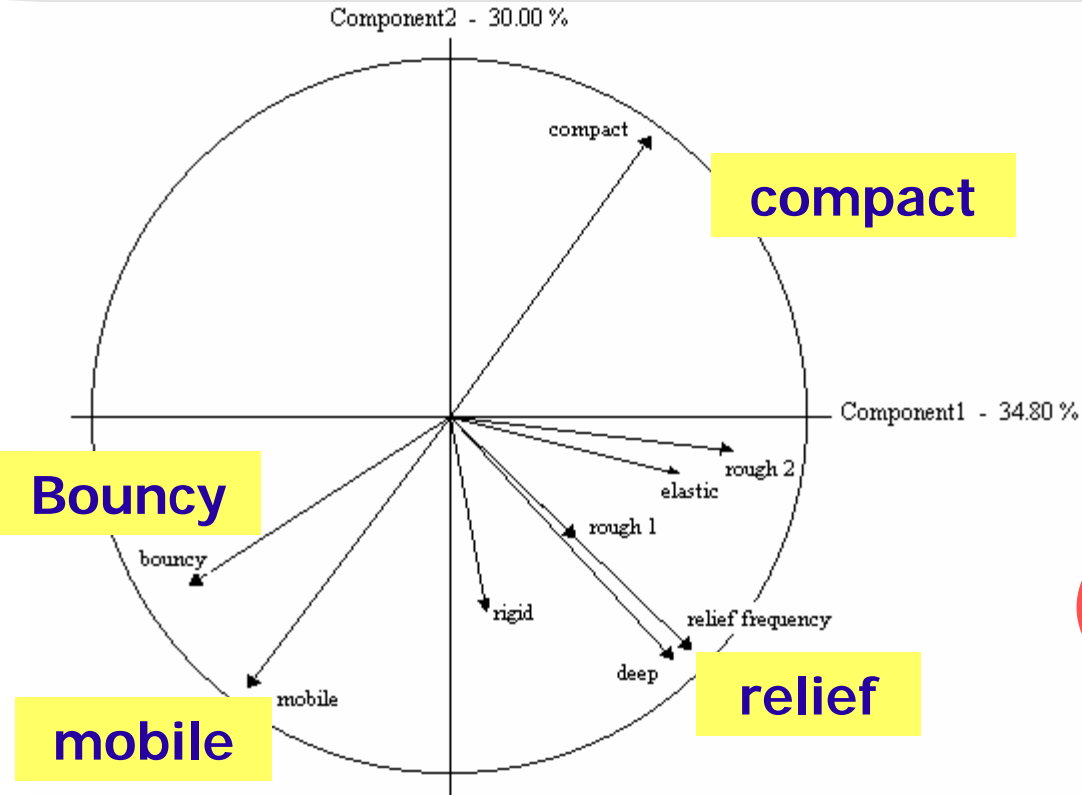
- Evaluations : blind testing, 3 replicates
- **Some specificities**
 - Precise gesture for each descriptor



- **Application for automotive fabrics**
 - 14 fabrics : velvet-like in a A4 format
 - Sensory profiling

Descriptor	Definition	Gesture
Rigid	Which can not be easily fold	Folding with the hand at the centre of the fabric
Relief (depth)	Which presents a deep relief	Small movements with the fingertips, no pressure
Relief (frequency)	Frequency of repetition of the pattern	Small movements with the fingertips, no pressure
Rough	Which presents a rough, dry touch	Movements with the hand, no pressure
Bouncy	Which comes back to its initial form after pressure	Vertical pressure with the fingertips
Mobile	Which presents fibres that can move under the fingers	Small movements with the fingertips, pressure
Compact	Which presents few spacing between fibres	Small movements with the fingertips, pressure

- 14 hours of training
- 3 replicates



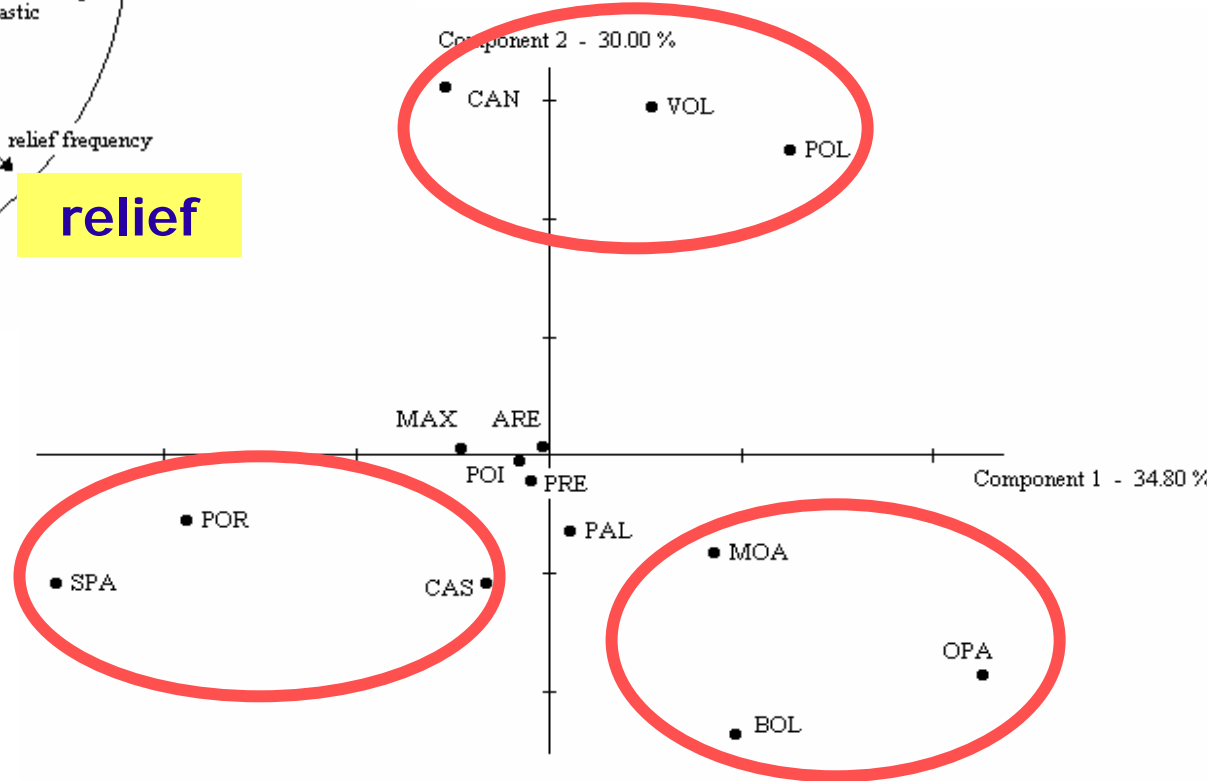
compact

Bouncy

mobile

relief

PCA 1 - 2 map



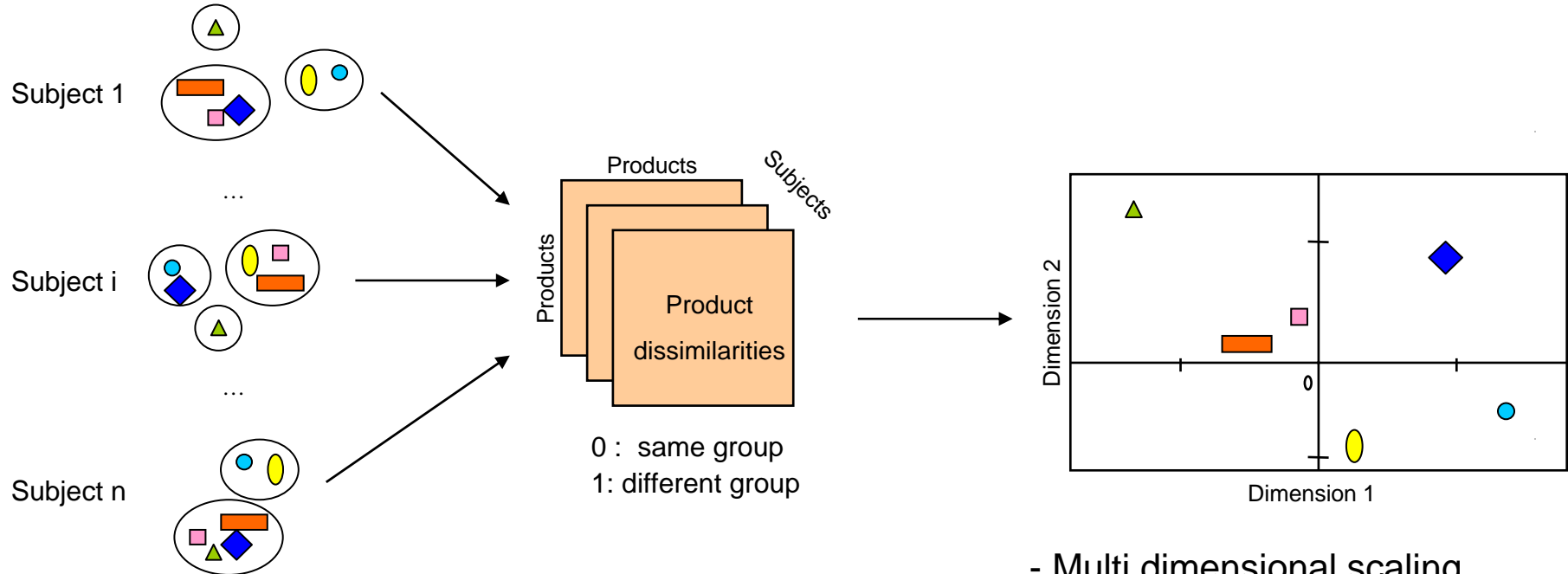
- **Sensory profile : an accurate descriptive method**
 - Good panel performance
 - Fine product discrimination
- **However**
 - requires a long training period, especially for large sets of products
 - not appropriate for all type of applications (heterogeneous or complex objects)

→ an other approach has been tested in order to rapidly characterize large sets : the free sorting task

Free sorting task

Coll. with ENITIAA, Adriant

- « Sort the products according to their similarities » « then describe the resulting groups »

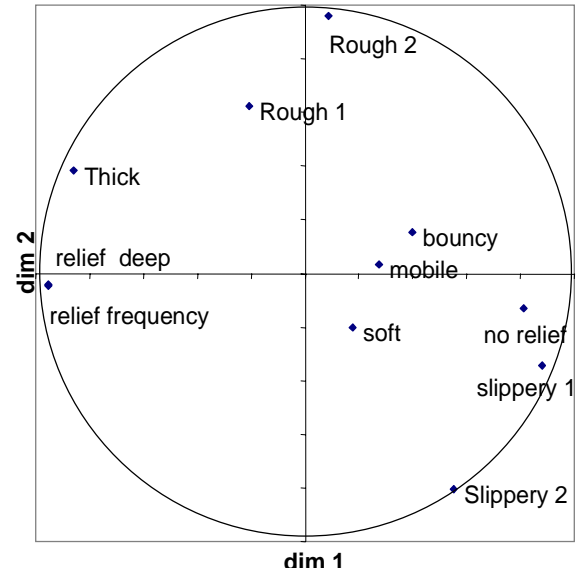
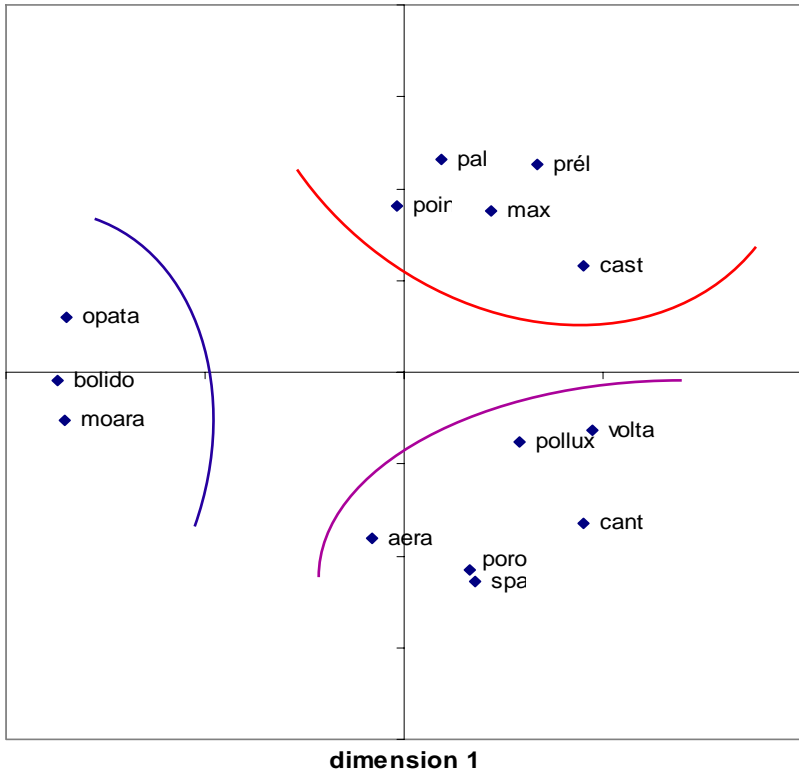
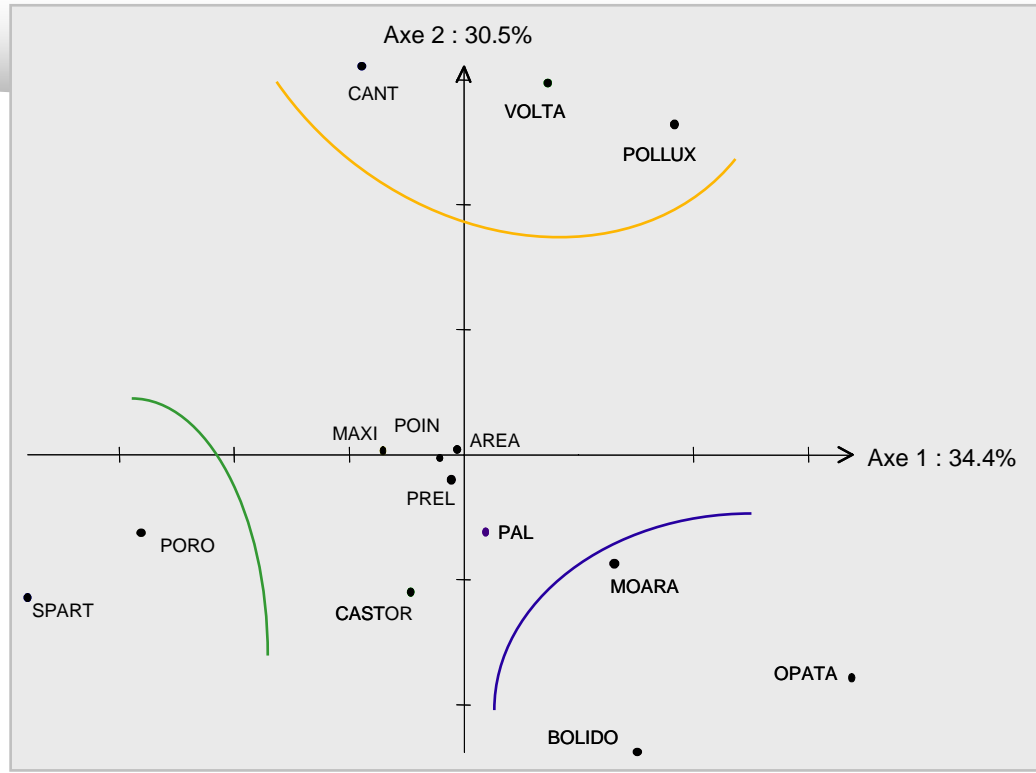
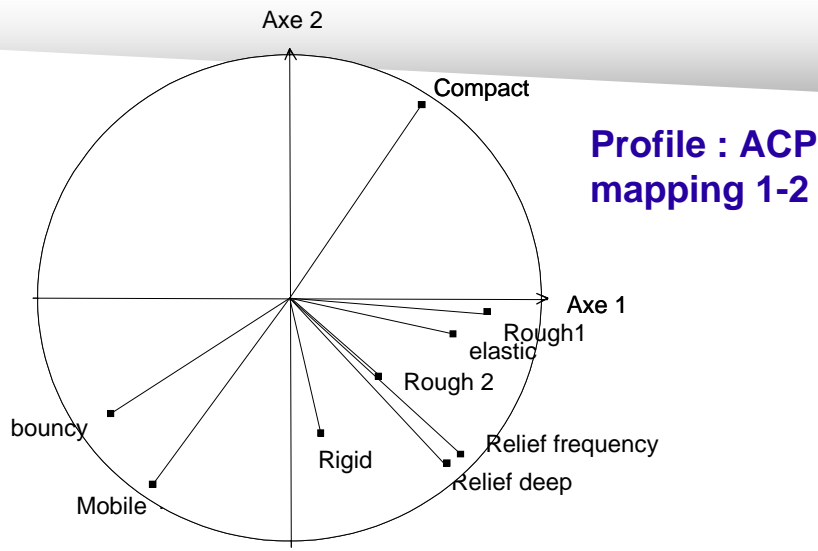


- Multi dimensional scaling
- Correlation with attributes to interpret the sensory map

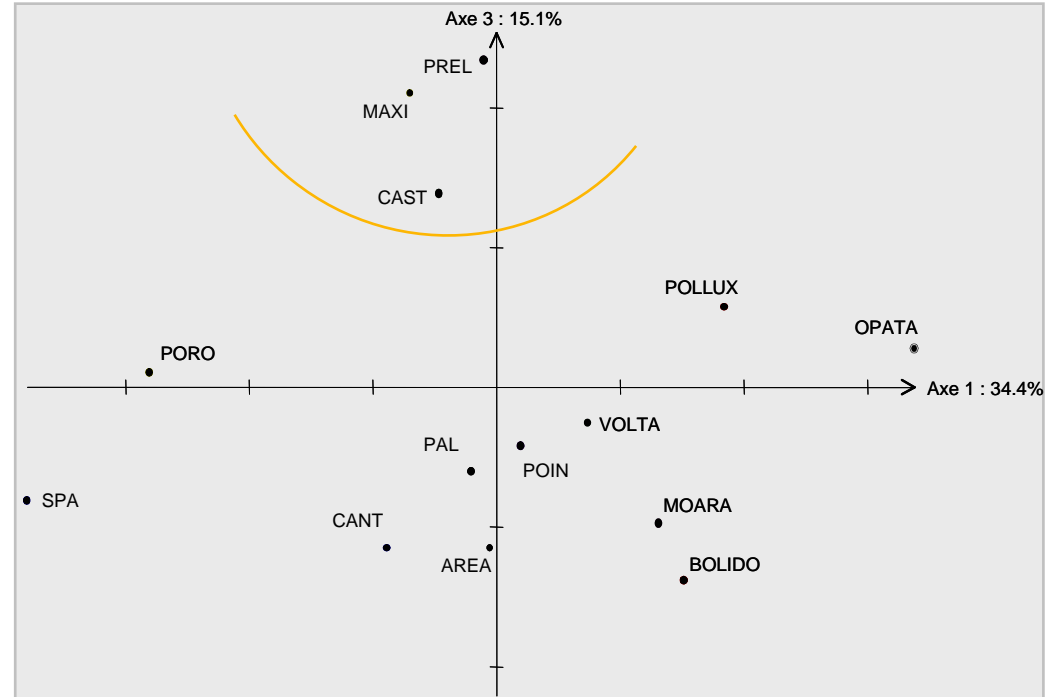
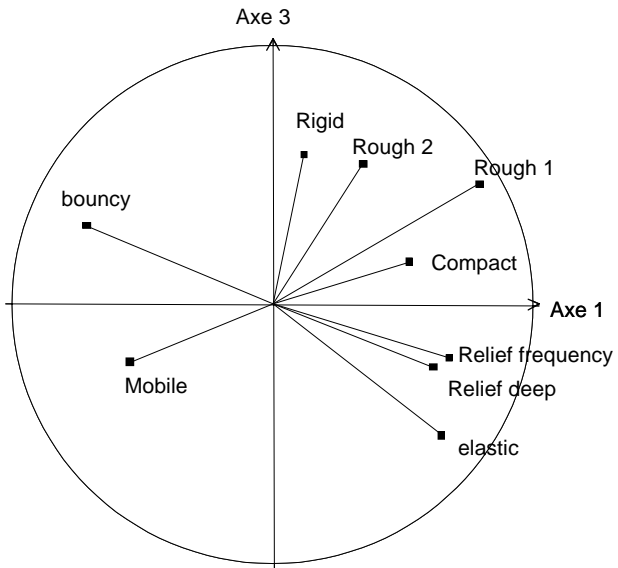
Free sorting task

- **Method based on categorization process**
 - **Compare to profile, this method is :**
 - more simple
 - faster
 - **The results obtained**
 - are qualitative, not quantitative
 - Do they provide an accurate characterization?
- ➔ **Application to the characterization of the 14 velvet fabrics**

12 panelists realized a free sorting task with 3 replicates



Profile : ACP mapping 1-3



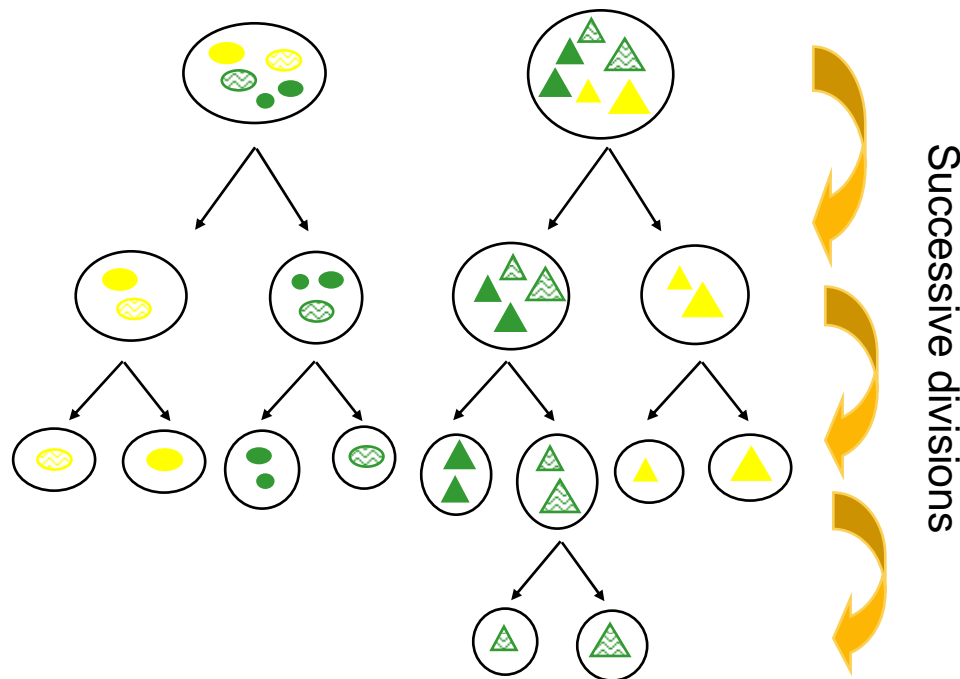
Free sorting task

- **The perceptual spaces obtained are close (NRV = 5)**
- **However :**
 - the product discrimination appears less accurate with the free sorting
- **Could this limitation be overcome using new sorting instructions ?**

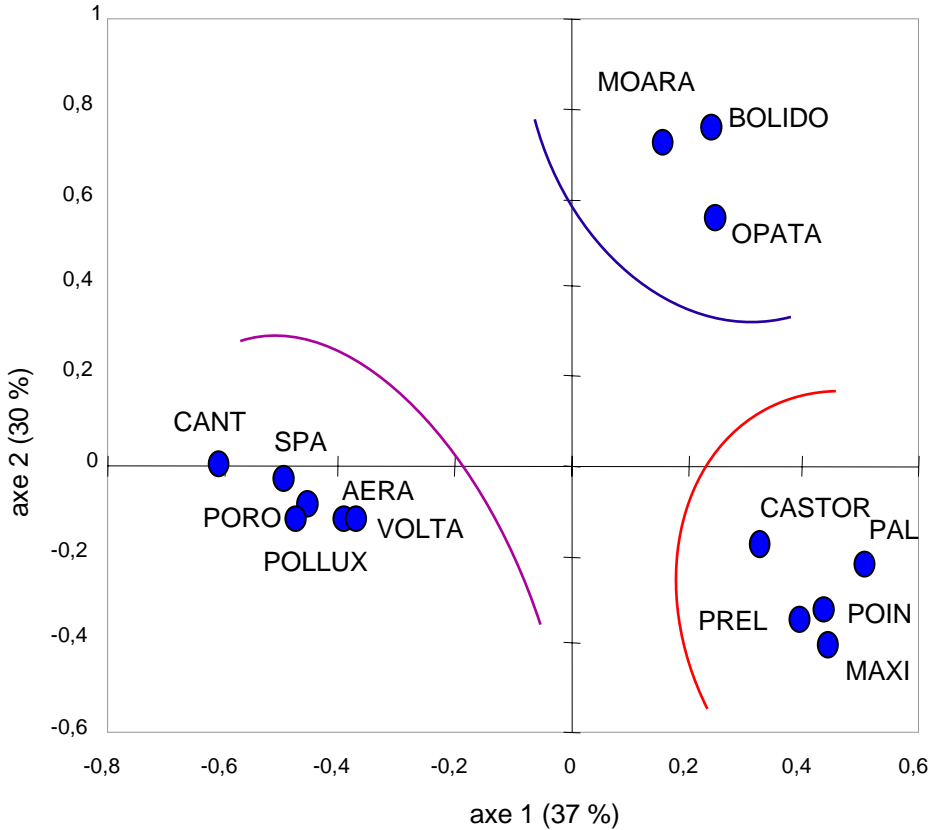
Hierarchical sorting task

Coll. with CESG (J. Jaffre, D. Valentin)

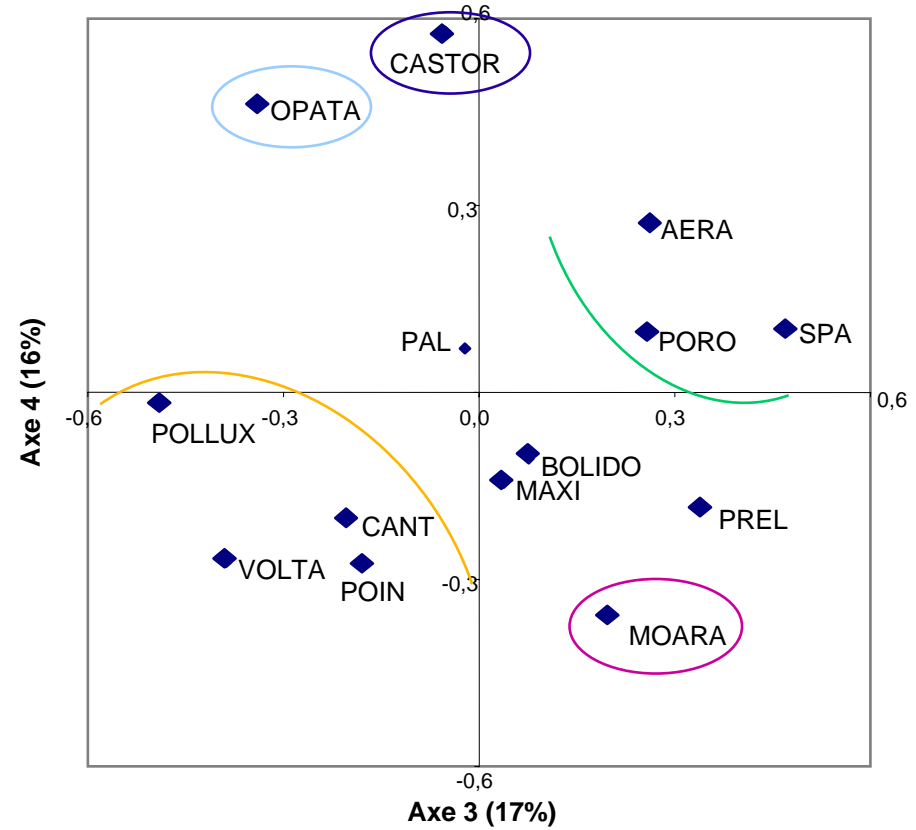
- “Sort the products according to their similarities. Start with 2 groups according to a chosen criteria and carry on the division until you find no more differences between samples”



Hierarchical sorting task

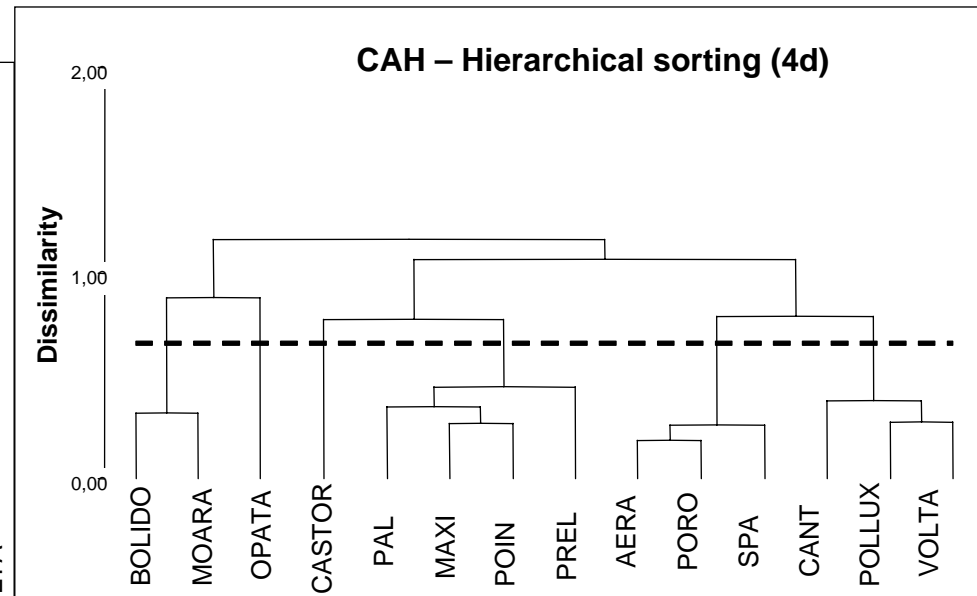
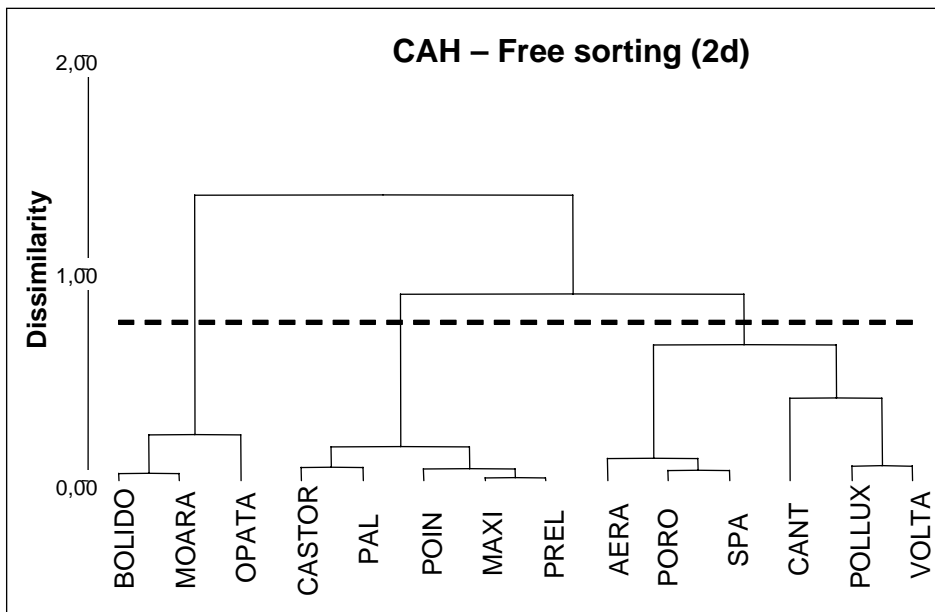
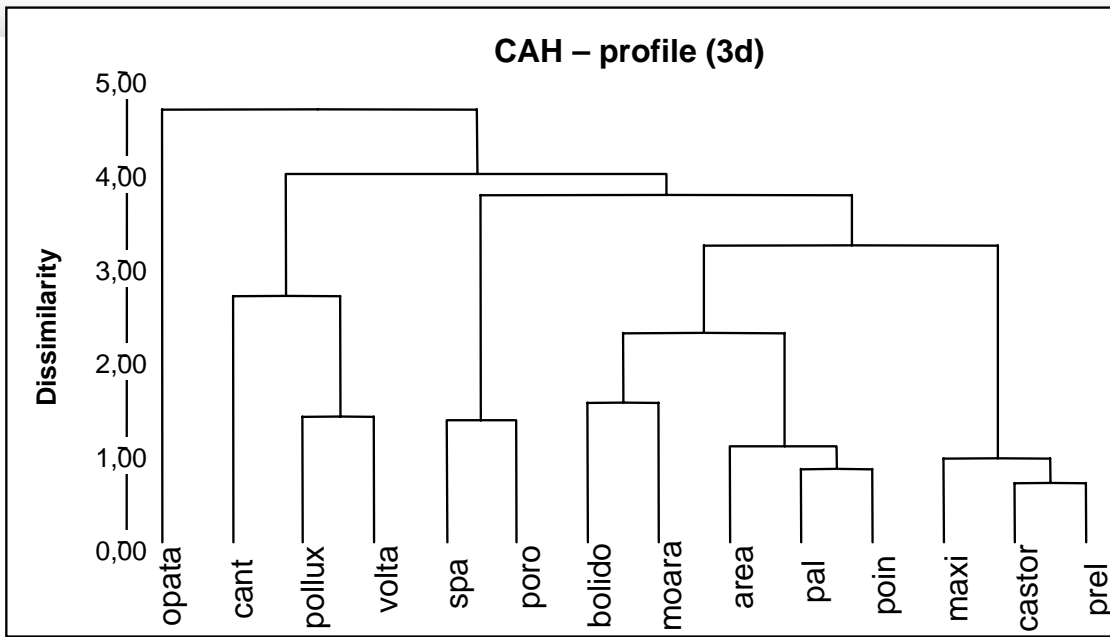


MDS, mapping 1-2



MDS, mapping 3-4





Conclusions

- **Both spaces obtained with free and hierarchical sorting are close from the profile (NRV = 5 and 7.58)**
 - Depending on the objectives of the study, the sorting task can be used to characterize products
- **Comparison of the sorting instructions :**
 - Better discrimination with the hierarchical sorting
- **Perspectives**
 - Improvement in the hierarchical instructions