

A Cognitive Analysis of the Perception of Shape and Motion Cooperation in Virtual Animations

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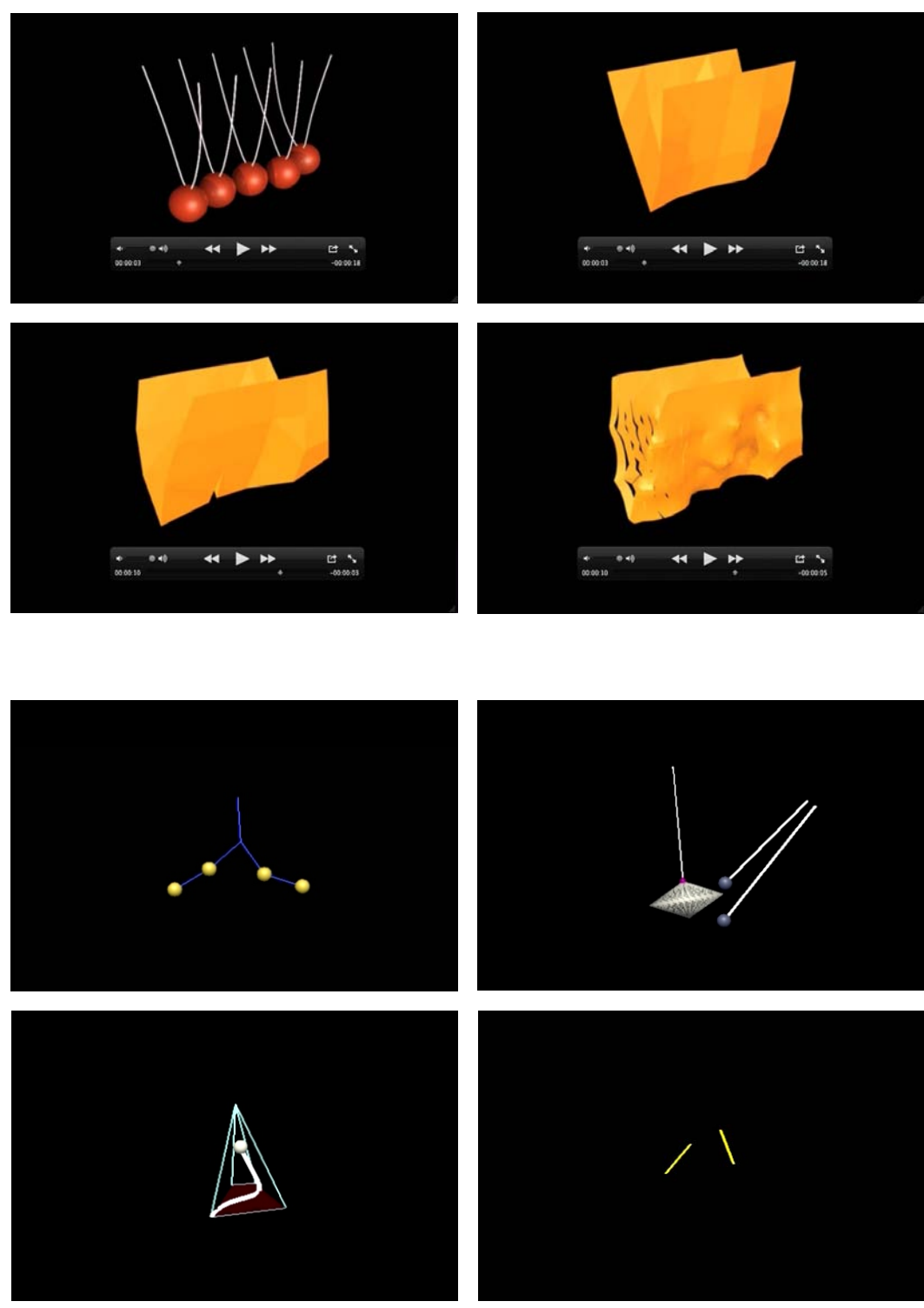
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Introduction

Computer animation software solutions usually allow separation between 3D shapes and motion. Our approach aims at:

- 1) Building animations first by **physical modeling of motion**, then by **mapping synthetic shapes on this movement**. We associate the motion which presents realistic and coherent dynamics, and various non-realistic shapes.
- 2) Studying the relevance of this new animation building process -that creates paradoxical and questioning animated pictures- in order to **understand perceptual and cognitive consequences**.



Example:
A single movement is visualized as:

- 1) suspended cherries,
- 2) a double surface joined by their low side;
- 3) a double surface with one tearing;
- 4) a single surface with multiple tearings introduced by topological changes.

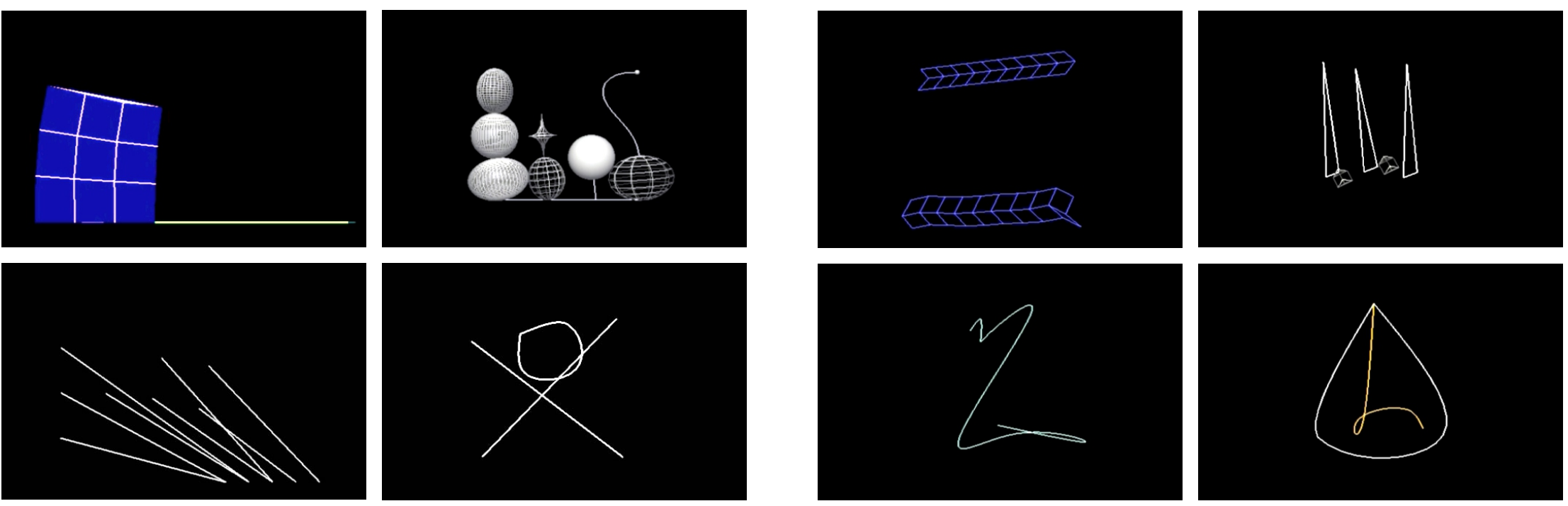
Animation building

1) First, the physical model is designed by creating structural components Masses and physical links interactions (linear or non linear elastic and viscous interactions between masses).

2) Second, the motions are coated either by using MIMESIS[1] shaping basic features or more complex shapes designed with MAYA.

Some videos can exhibit dynamic topological evolutions [2].

In coating, shapes can be as various as lines, surfaces, elementary volumes, or more complex representations such as garments with tearing.



Psychocognitive experiments

Methods & approach

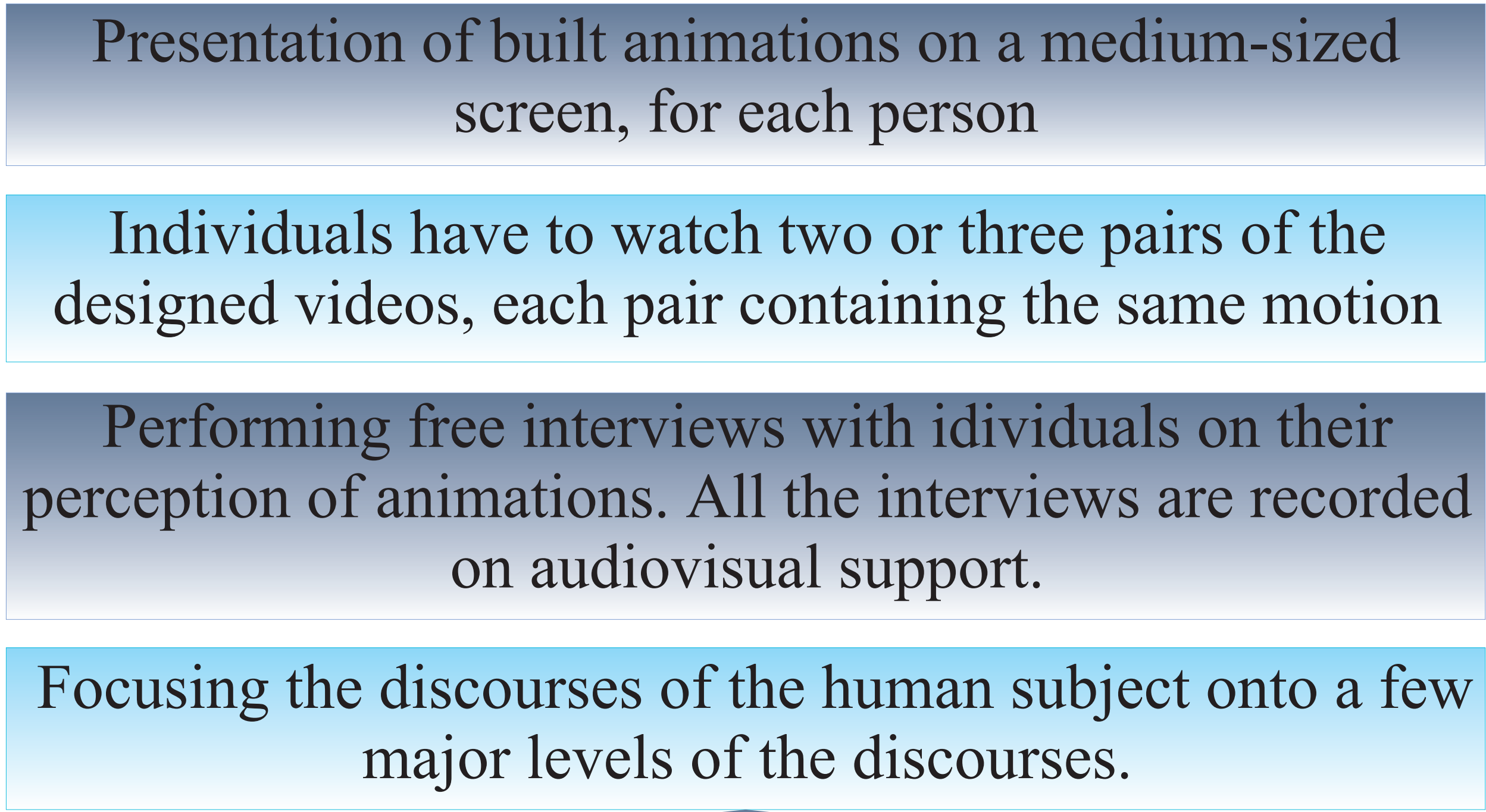
Our study lies in "**oriented exploratory domain**". It uses:

Qualitative research methods, particularly approaches to subjective viewpoints [3]. This method includes:

- 1) A data collection technique: **semi-structured interviews** and narrative interviews [3].
- 2) An interpretation method: **content analysis method** [4].

Experimental protocol

Animations are the perceptual material used in interviews.



Interviews

10 subjects, 29 animations and 14 hours of interviews.

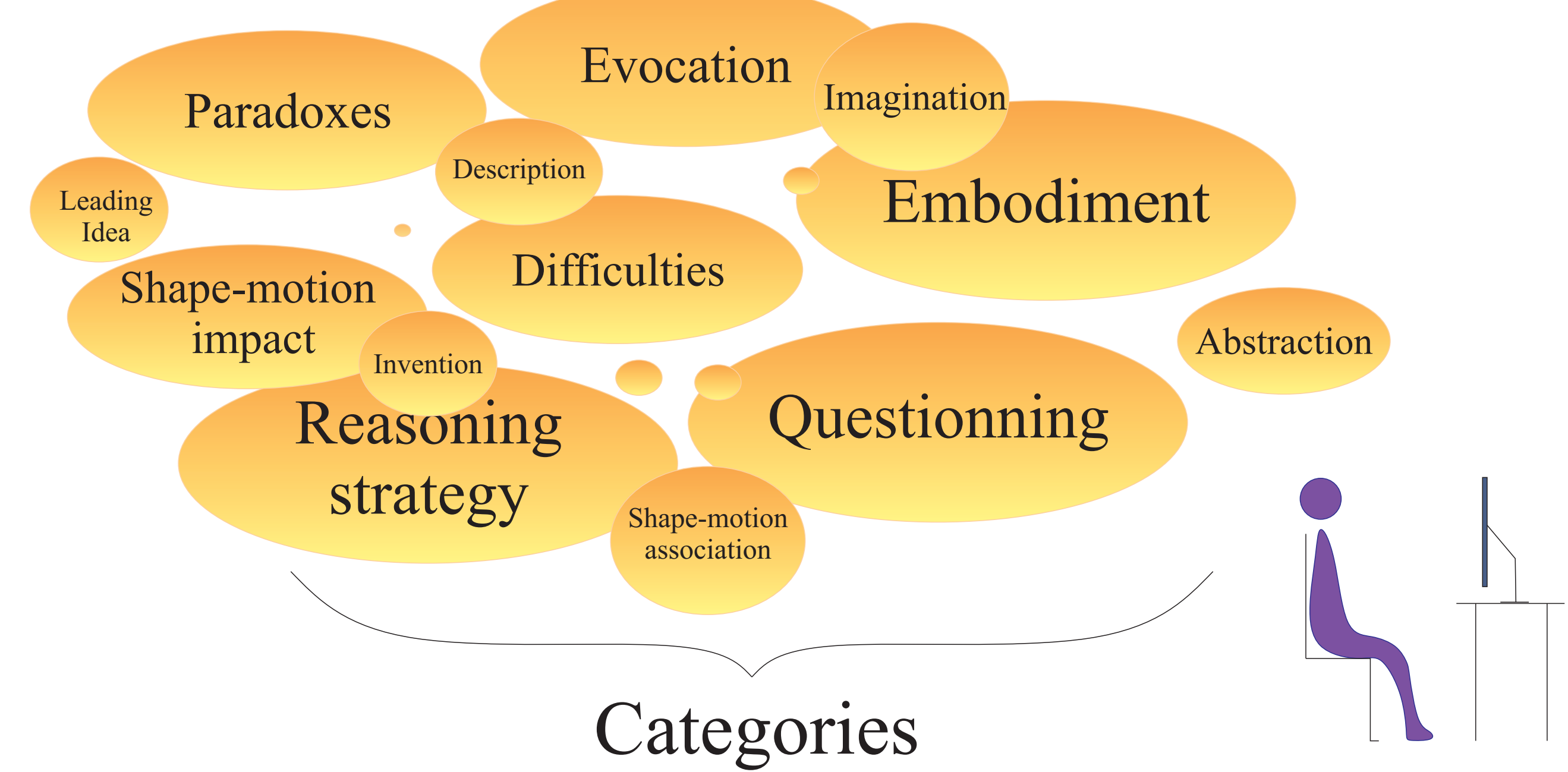
- Subjects were chosen from **different social categories** and from 22 to 43 years old.
- Subjects are stimulated by an interviewer in order to **express their perception** about what they see.
- The interviewer, in a **neutral attitude**, aims at obtaining **the richest discourses** material on each expected level.

Perceptual and Cognitive Analysis

The full **text transcriptions** of the recordings constitute the main **material to be analyzed**.

Categorization

- The first and the main step of the analysis is the **categorization process**: Defining a set of concepts that categorize the speech enable to retrieve **the cognitive process of exploration, the embodiment, and the impact of shape and motion** on the perception. In this work, **categories are the cognitive behavioral markers in the speech**.



Annotation & instantiation

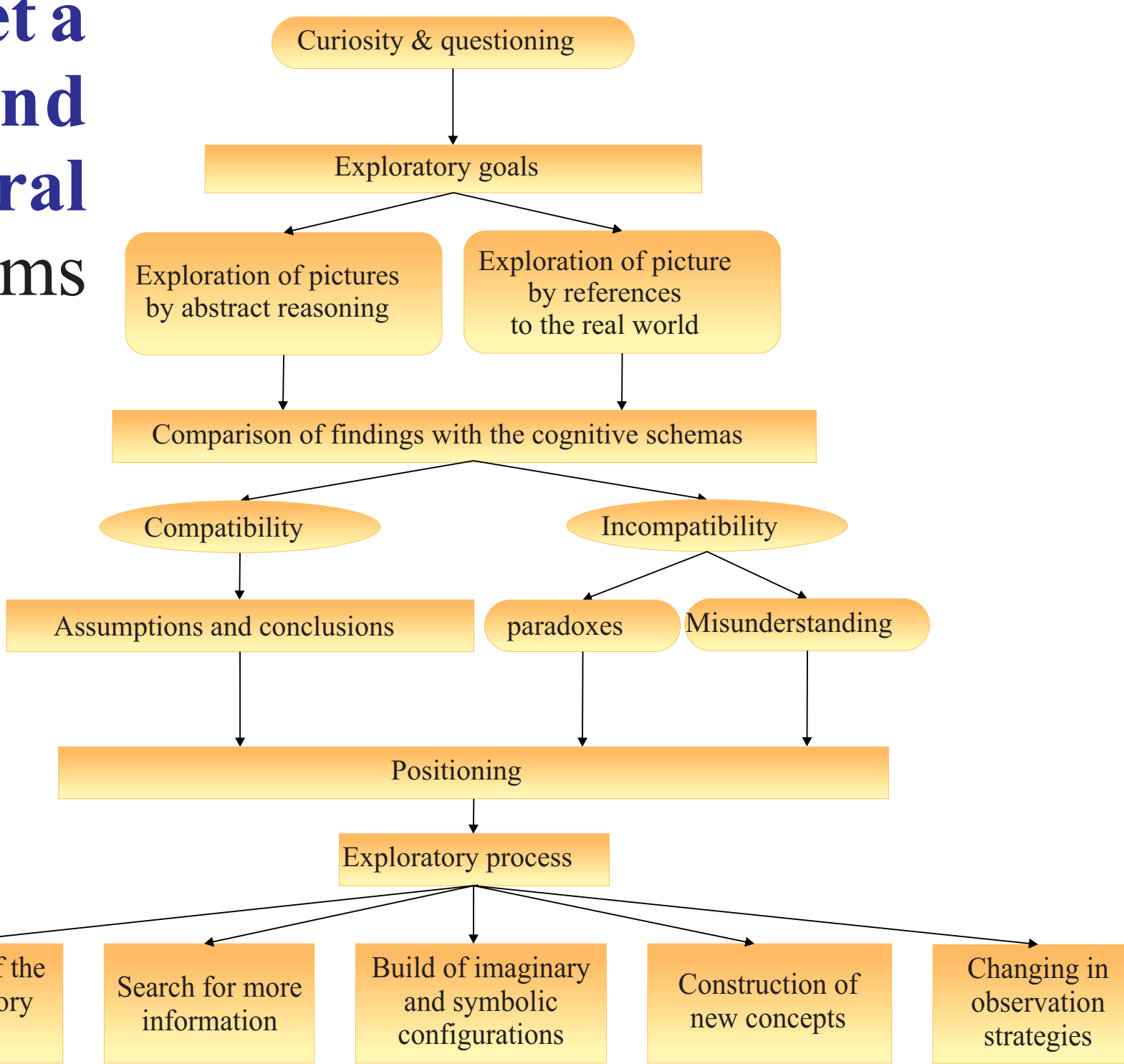
- The annotation of texts is based on the established categories. It is seeking of parts of speech reflecting the categories of cognitive behavior. Sometimes more cognitive behaviors are described in the speech, this leads to consider new categories. This approach of categories extension is called **the grounded theory approach** [5].
- We consider the instantiation of categories the parts of speech that corresponds to these categories.
- The interpretation of instantiated categories for each person allows to establish its exploratory process and its degree of Embodiment.

Experimental results

Observations of global common behaviors

I. Common behavior for all participants.

- All participants were highly interested and considered animations as **"intriguing"**.
- The animations aroused interrogations that evolve into goals.
- From interrogations, **participants set a hypothetic plausible scene and attempted to recognize it by several manners**. This observation confirms results presented in [6].



II. Two common exploratory behaviors:

- 1) Seeking real objects and situations similar to the animation observed.
- 2) Exploration of pictures by abstract reasoning.

III. Two common stages of cognitive behavior:

- 1) Finding: where the subjects construct an idea of an inferred scene that possibly corresponds to the observed video, from the description, the evocation and imagination.
- 2) Comparison with cognitive schemas: in this step the person confronts the idea built during the stage of finding with personal knowledge schemas acquired in its past life. It is closely linked with an assessment of this comparison which can be "compatibility" or "incompatibility" with the seen scene of the built idea.

IV. Exploratory process:

The assessment of the cognitive comparison leads to make assumptions or to face paradoxes and/or misunderstanding. This stage leads to **take a position** (ex: tolerated or not the paradoxes) **which evolves into a decision-making: the exploratory process**.

Roles of shape and motion in the perceptual and cognitive processes:

The coherence of the motion is more pointed out when the shape is less figurative	When shapes are more figurative, they are chosen preferably to support evocation
The motion is used as a source of evocation and imagination when its coherence is noticed.	Sometimes, shapes are perceived preferably when they are moving
When focus is put on motion, it triggers several emotional and aesthetic feelings	The focus on the shape may be linked to its nature and not necessarily to its figurative power
Interest in abstract shapes increases when motion is less coherent or has apparent irregularities	The shape can be judged in its function to serve the motion

- 1) Persons do not necessarily distinguish explicitly the respective influence of both modalities on what they perceive. **The shape and the motion are components that have an equivalent role in the perception of moving pictures**, they are both involved in the perception mechanism. Nevertheless, **they exert their influences in different registers and with different degrees of focus**.
- 2) The focus on motion and the abstract reasoning allow participants to get closer to the actual process of construction of the animations.

References

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