

### **ADAPT** Artificial Development Approach to Presence Technology

### IST-2001-37173 Venice, May 5<sup>th</sup>, 2003



### Consortium



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#### We wish to... ...understand the *process* of building a coherent representation of visual, auditory, and haptic sensations

 $\textbf{process} \rightarrow \textbf{development}$ 

#### Perhaps, once we "know" how it works, we can "ask" a machine to use this knowledge to elicit the sense of presence





### **Two-pronged** approach



Study how the developing brain does it
Implement a "similar" process in an artificial system





Learning by doing: modeling  $\rightarrow$  abstract principles  $\rightarrow$  build new devices





# Some of the questions asked...



#### **THEORY:**

- what is a representation, and what is it made of? What our phenomenal experience of presence consists of?

### **ROBOTICS:**

- how can we possibly embed the sense of presence in a machine?

### **DEVELOPMENT:**

- how does the developing brain build such a representation?

### **KNOWLEDGE:**

- can we use this knowledge to artificially elicit the sense of presence in humans?





## Experimentally



#### Experiments with young infants

- First year of life
- A window into the building of "unified representation"

#### Robots as demonstrators

- Easy to take apart, analyze, dissect, etc.
- Change body morphology









## **Scientific prospect**



### Layering and stages

- Body image: distinguishing our own body from the environment
- Interacting with objects: multi-sensory representation
- Categorization/recognition, learning object affordances
- Interpreting others/object interaction: imitation
- Exploration and imitation

### Intentionality

 Answering to questions about the nature of "representation" and first person feeling of "being there"

### Morphology





### **Experiments**



- Learning object affordances and representation via manipulation



Unity of senses at birth?



vision  $\rightarrow$  touch

touch  $\rightarrow$  vision





#### **Contributions** (still more questions than answers)



#### Theory of the sense of "being there"

 How do we attach meaning to situations, object, etc? How the neural activity of millions of cells is integrated into a coherent percept? Can we formulate a theory based on intentionality?

### Embodiment, body morphology

– How much is it important? Which is the influence of body shape to development of meaning?

#### Coherent representation

 Purely sensorial or perhaps sensori-motor? Inter-modal transfer of information. Categorization?

#### Exploration for learning

 How do children explore the environment? Which strategies are used to visuohaptically explore objects?









