

Haptic Illusion as Intangible Add-on

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GARR The CreActive Network - Firenze, 30th of November 2016

Outline

Haptic Illusion

Interaction

Creative

Network

Haptics

...refers to the sense of Touch



Visual Feedback



90% of all information that comes to our brain is visual.



Up to **36,000** visual messages per hour may be received by the brain

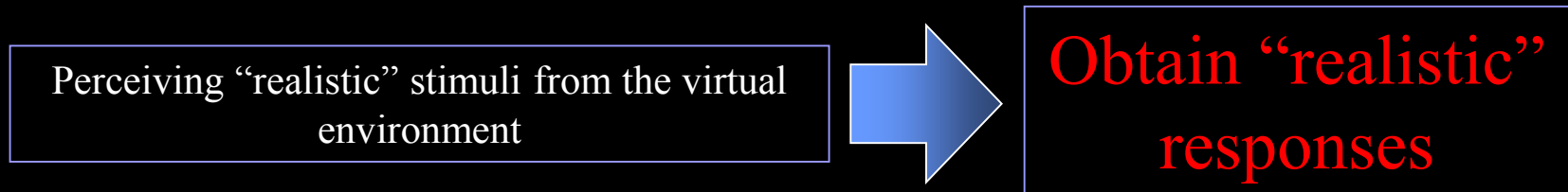
1996

Presence

The sense of **being there** (*in a virtual environment*), even when one is physically situated in another place (*lab*)

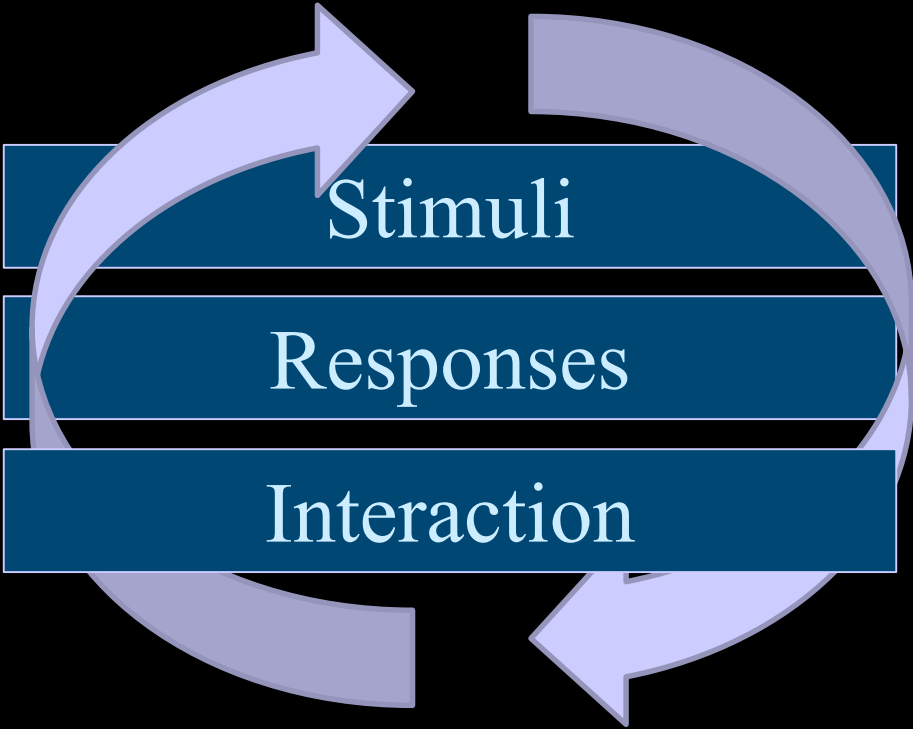
Held, R. M. and N. I. Durlach (1992). "Telepresence." *Presence: Teleoperators and Virtual Environments* 1(1): 109-112.

Sheridan, T. B. (1992). "Musings on Telepresence and Virtual Presence." *Presence: Teleoperators and Virtual Environments* 1(1): 120-126.



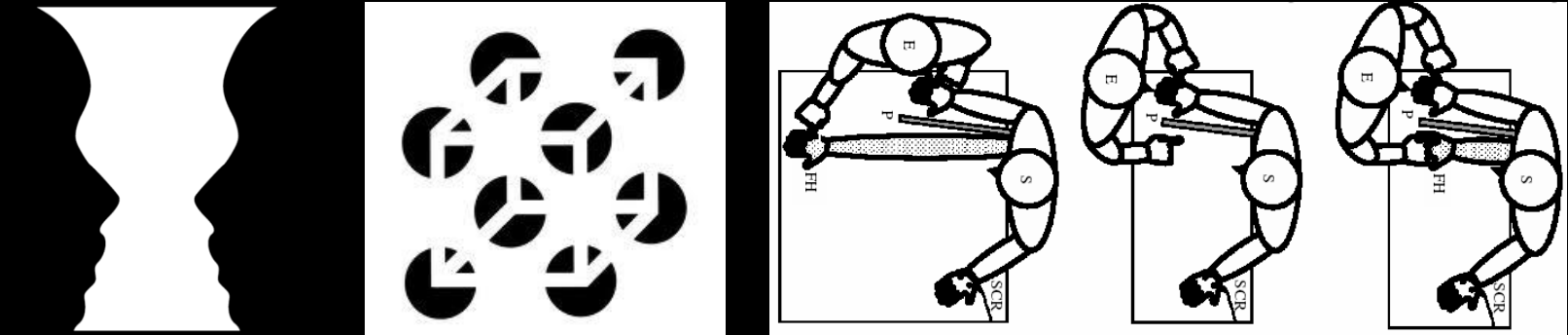
"Presence occurs when there is a successful substitution of real sensory data by computer generated sensory data, and . . . the person responds to the virtual stimuli as if they were real"

(inter) Action



Obtain “realistic”
responses

(Haptic) Illusions



Botvinick, M. & Cohen, J. “Rubber hands 'feel' touch that eyes see “ - Nature, 1998, 391, 756-756

Armel, K. & Ramachandran, V. “Projecting sensations to external objects: evidence from skin conductance response “ - Proceedings of the Royal Society, B, Biological Sciences, 2003, 270, 1499-506

Shown that is possible to transfer the touch perception of our own hand (if hidden) to a rubber one (visible) or a real one (but not our)

?? Haptic Illusion ??

Can we produce haptic feedback only providing the visual one ?
Maybe not in every applications, but ...

We want to verify if the haptic feedback is a component present in only graphical VR applications, when the situation induces the user to interact physically with the virtual objects

Can we touch something that isn't even "there" ?

Can we feel a surface that doesn't exist ?

Can we react to a no-existent environment ?

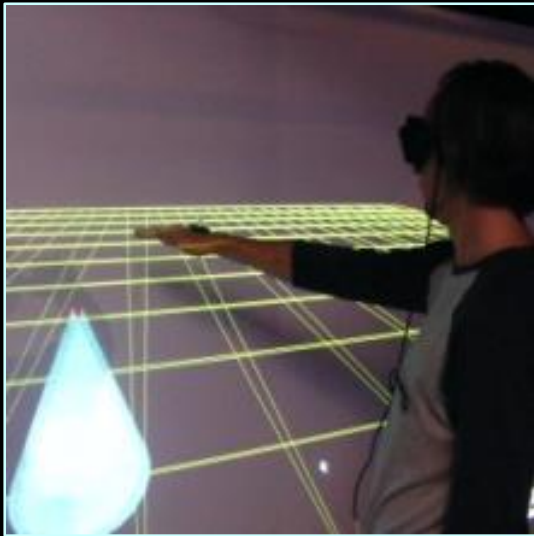
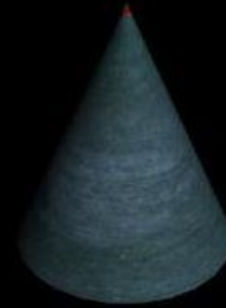
Q 1

To what extent could
visual and proprioceptive
information
be used to give
the illusion of haptic effects ?

Q 2

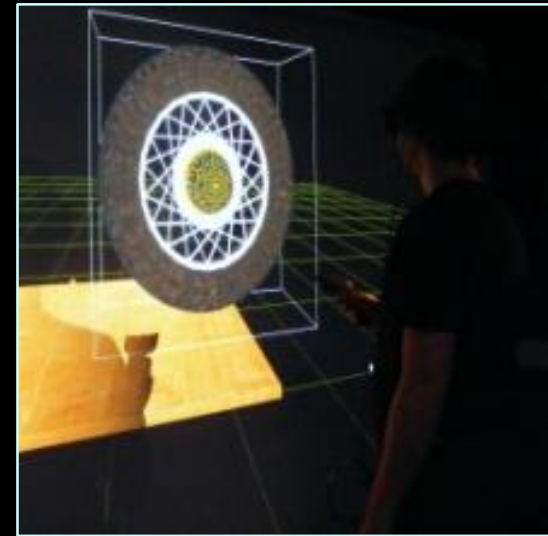
Can we consider haptic illusion as a possible add-on for systems where dataflow is an issue?

Studies



I see and I touch a virtual object
✓ Purely visual feedback

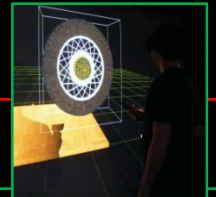
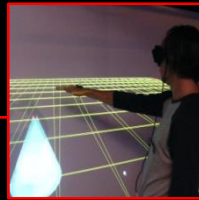
I grab and I lift a virtual object
✓ EMG



“Touching Sharp Virtual Objects Produces a Haptic Illusion”, Andrea Brogni, Darwin Caldwell and Mel Slater - HCI 2011 (International Conference on Human-Computer Interaction) – Orlando, USA, July 2011.

Results

- ✓ Subjectively people distinguish between the smoothness / sharpness properties of simple geometric virtual objects
- ✓ There is also some evidence that this occurs at physiological level
- ✓ The illusion of "touching" a virtual object seems to work for simple geometrical objects
- ✓ Our brain seems able to fill in missing information on the sensory channels, when only visual feedback is provided



- ✓ During specific task, involving physical aspects of the environment, users in IVE base their actions on the experiences they had in real life
- ✓ The mental model of the real counterpart of the virtual object drives our perception during the interaction

They said ...

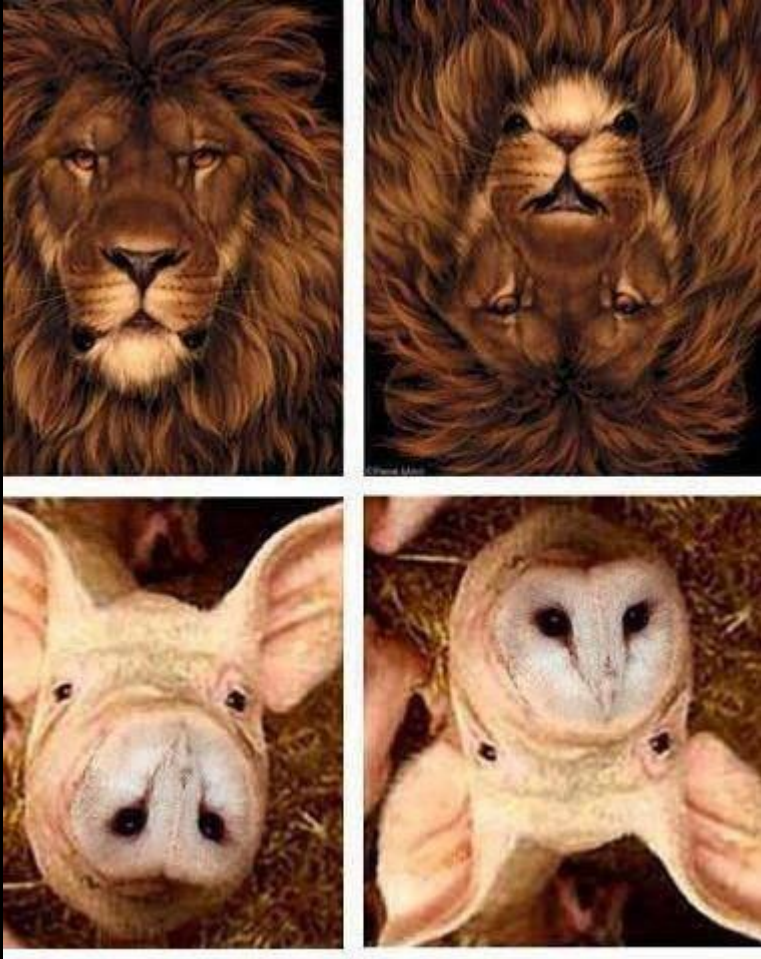
“How did you make it ? I was feeling the material !”

“The sphere was soft and smooth, and I felt my hand falling down when it disappeared”

“The blue side of the objects was cold”

“I didn't get any sensation, a part of a bit of discomfort when I have approached the scissors facing me with the sharp end”

Brain Adaptation



So what?

Haptic Illusion

Our brain uses top down prior expectations to automatically fill in missing information

Increase the perceptions of the user and save the complexity of the system

Reduce the amount of data to stream

Better use of the bandwidth

Network



What for?

Not THE solution

An option

An aspect to consider

Intangible Add-on

Possible Applications

- Shared environments and applications
- Systems where data streaming is a constrain
- Systems where interaction and perception are part of the game
- Systems that do not require strong and realistic haptic feedback

Showrooms

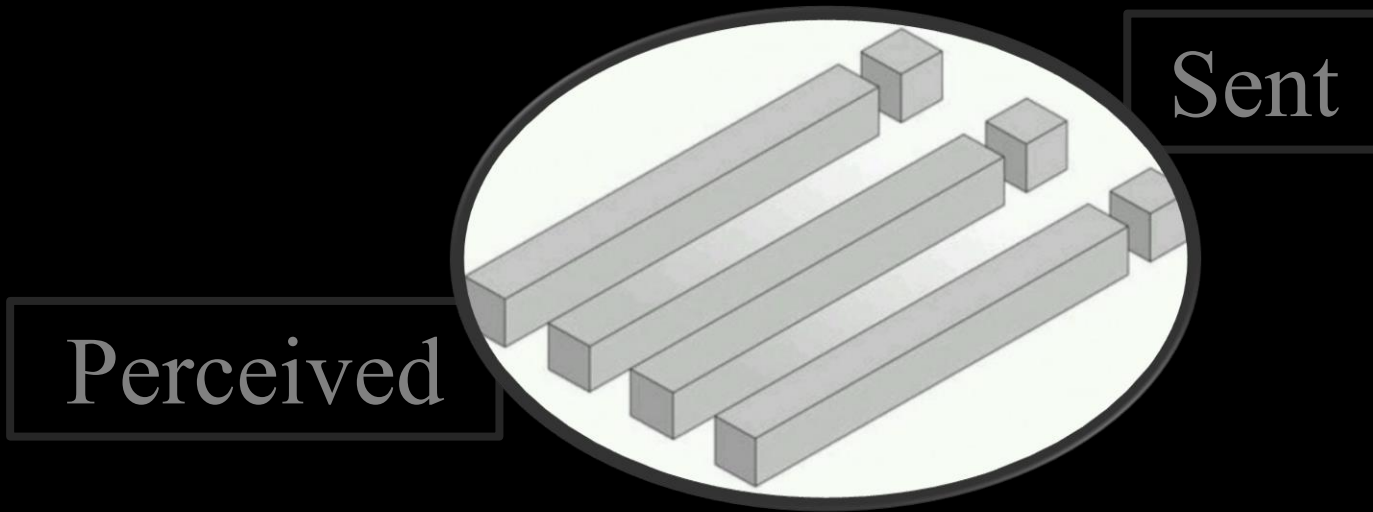
Virtual prototyping

3D data representation

Virtual museums

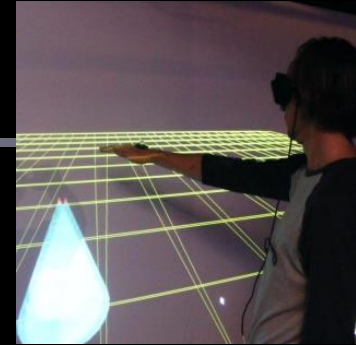
Creative Network Systems

Incitement



When you design, double check your
illusory strategy!

Thanks



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