Multimodality and enaction

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There exist several understanding and practices of multimodality that depend on the context. From these, how can we revisit the notion of multimodality in the context of "Enactive systems", "Enactive Interfaces", Enactive Interaction" "Enactive Knowledge" mediated by contemporary technological instruments and tools to analyze or to produce multimodal events?

Before the arrival of electricity, sensory phenomena were only produced directly by physical mechanical and optical objects. These phenomena – acoustical, optical, mechanical – were directly sensed by the human sensory channels.

Along with the arrival of electricity – and its more recent use in computers -, the notion of signal, derived from the design of electrical sensors and actuators, appears. Electrical signals, acquired by sensors (microphones, videos cameras, sensors of mechanical phenomena such as forces, positions, velocity, etc…) or returned by actuators (loudspeakers, video displays, mechanical motors, etc…) aim at transducing sensory phenomena (acoustical pressures, optical flow, etc…) into electrical representations.

Such technological shifts produced an epistemological breakthrough.

Sensory events acquired by sensors or returned by actuators can be artificially superimposed before being sensed by the human sensory apparatus. Such dissociation / re - association was not possible before the arrival of the notions of signal, i.e. of the electrical representation (or transduction). It allows to create novel sensible associations such as in cinema and video arts. From a research point of view, it allows to explore experimentally, in a larger domain, what are the properties of the human sensory apparatus, extending widely human knowledge.

In such contexts, multimodality is used and understood as a post-superposition of sensory signals that can be objectively produced separately, i.e. by objective different objects or means. Most psychological experiments on multimodality, most Human-Computer multimodal interfaces, and most tools that create new signals (as for example, through sound and image synthesis), are related to this type of methodology.

One of the main consequences is that such reconstructed situations are a priori not ecological, nor enactive. From an ecological point of view, having in mind that the sensory phenomena perceived by humans are necessarily produced by a physical object, the multisensory events produced by an object are not independent. They are correlated by the physical properties of the object that produces all of them: sound, images, visual motions, mechanical effects (forces, deformations, etc…). Subsequent fundamental questions could be: How and why the artificial reconstruction of multisensory events can address validly the human perception and cognition, and consequently the cognitive categorization process, built throughout all the experiences of the interaction between humans and the physical world?

The perceivable phenomena produced by a real object are not separable in the absence of specific sensing technologies. They are also holistic means to identify objects and are holistically linked to human actions. From an enactive point of view, if we want to be able to recover the genuine correlation between sensory phenomena produced by a real object in the context of electrical and digital technologies, then it is necessary to re-built this correlation artificially by implementing specific computer models, specific algorithms and specific inputs-outputs (sensors-actuators) relationships. In this direction, [Luciani, 1993] [Cadoz et al., 1984] developed the concept of integral or complete represen-

tation of instrumental situations with the computer.

In the context of Enactive Interfaces, the search for the recovery of interaction through a genuine sensory modalities, likely as in the real world, corresponds to a truly fundamental paradigm shift from *"multi-modality to multisensoriality"* [Luciani, 2002]:

- from the sensory signals synthesis and recombination – in other words according to a signal-based approach as mainly developed since the 50's until now.
- to the simulation of the underlying cause - in other words according to an object-based approach as started in virtual reality approach [Krueger, 1983] and continued with the instrumental paradigm approach.

References

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