classical and quantum computing. If a quantum computer can outdo **any** classical computer on one problem, we have quantum supremacy, even if classical computers could be at least as good as quantum ones in solving many (most?) other problems. *Quantum supremacy, if achieved, won't make classical computing obsolete.* A hybrid approach combining quantum and classical computing could be a better strategy in solving some (many) difficult problems.[16]

Many important theoretical and experimental results have been obtained, so the field captured the interest and imagination of the large public and media, and not surprisingly, unfounded claims about the power of quantum computing and its applications have proliferated.

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A promising perspective in *searching for information*. "Horizon 2020"

Marcin Sobieszczanski

Navigation as a metaphor. Navigation is not only one of the biggest factors for the extent of culture, but also a cognitive achievement, constantly varying, which the field of travel/transportation shares with domain of the knowledge acquisition. The Californian anthropologist Edwin Hutchins[1] makes the cruising activity, held on the basis of the Bristish neuroscientist David Marr's theory of vision, the central axis of his theory of culture and communication. In this same perspective, we further assume that the cognitive models successfully applying to the situation of the visual wandering and acting in geographical space, can be, mutatis mutandis, a common epistemological basis for the search about the information in the individual immersive computerised environments and in the networks connecting multiple devices of this type.[2] In addition, these models remain valid both in the case of modal media with visual dominance and for multimodal media.

Wandering in the environment currently has three types of modelling:

- The modelling of neural processing of the retinal image from real scenes, by the neuronal cells in the visual cortex, and the Anterior Inferotemporal Cortex (AIT) and Inferotemporal Cortex (PIT).[3]
- The modelling of enactive dimension in the process of vision, combining research on the neurophysiology of vision, the cognitive praxis of active extraction of the environmental information from the stream of the retinal image, during the process of upholding of the programmed path (the *cap*) and the guidance comportments.[4]
- The modelling of various environmental affordances in terms of 3D rendering of real environments.[5]

Specifically, with reference to the work passed in 2009 by joint team of Boston University, Department of Cognitive and Neural Systems and the Center for Adaptive Systems / Center of Excellence for Learning in Education, Science and Technology,[6] we see as main axis the common research on the *immersive interface* and *networking architecture*, the American psychologist James Gibson's inspired models,[7] commonly used in navigation systems, especially in the situations where environmental information from natural scenes, striking the moving subject, is rich and structured.

"Warren, Kay, Zosh, Duchon, and Sahuc (2001)[8] have shown that humans can make use of both strategies and suggest that, in featureless environments where heading is hard to estimate, egocentric goal position information is used, but in richer environments, heading is used."[9]

Three types of models are used in this framework:

- Differential motion models,[10]
- Decomposition models,[11]
- Template models.[12]

Transposing models

But to translate these results valuable for the individual subject that is immerged in a real or artificial visual scene, in the terms of "navigation" in information networks, it must have a vision of the networking architectures that is both: spatial and cognitive. Indeed, these architectures, as they were already considered in the pioneering work of the physicist and mathematician Paul Baran,[13] are not only the "eloquent furnishings" of geometric figures.

They are schematic representations of different conditions of collective access to the knowledge of the object with a *floating* location. They make explicit, in each place of the relational tissue, when the object of knowledge is there, the informative possibilities available to the individual subject from its epistemological scope and referred to the presence of the co-agents with the same "interest." The

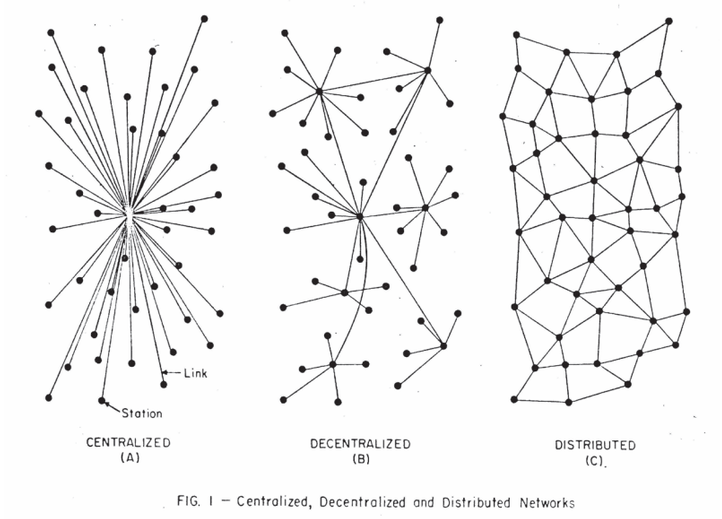

FIG. 1 — Centralized, Decentralized and Distributed Networks

From Paul Baran, September 1962, "On Distributed Communications Networks", The RAND Corporation, Santa Monica, California, P2626. https://www.rand.org/content/dam/rand/pubs/papers/2005/P2626.pdf

networking architectures build or regulate the conditions of access to the information of each agent, depending on the location of target and the situations of others. In this sense, for an individual subject, both are crucial: the position of object knowledge and the position of co-agents. This latter is the cognitive condition of arrival of the "motor resonance" pronounced by the neuroscientists Julie Grèzes, Jorge L. Armony, James Rowe and Richard E. Passingham,[14] the neurophysiological mechanism that influences the perception of the target based on the perception of perceptual behaviour of co-agents. The cognitive aspect of networking architectures envisaged by the mathematicians Pierre Rosenstiehl and Jean Petitot in the 1970s was built on this principle.[15]

Searching for information

We can talk about different types of information searches:

- Natural research (observation / monitoring or "displacement") a-medial,
- Medial research,
- Natural searches including medial information.

The search for information is more or less aware and expert activity. Depending on the degree of awareness and expertise, the information seeker uses the sensory natural ways or turn himself to the sources of information intended for informational purposes and articulate in media. To return to our metaphor, navigator explorers or a controllers of river traffic using all means of the direct observation, but according to their expertise, once they see the deficiency of phenomenological information they recourse to information contained in medial media (navigation tables, flows tables, traffic diaries, *etc.*) by the users whose situation relating to the object of knowledge can be described as the "expert" of the situation. The relevance of the valuable information is then established in the intersection of two sources: environmental and medial. But this is valid only for the discovery of virgin and unknown lands… It is clear that the elements of the medial information are widely distributed in the environment powered by humans work and that the researcher found the information either directly, as in the case of the signalling where he uses his language and symbolic skills, or indirectly when he uses his abilities to infer from a human reality.

The media as an environment

The human place the media in his environment but in reverse he also creates media that become reality. The computerized media, especially information and Web-type services networks present a large amount of sensory data that at the side of the classical medial information are the new source of medial information characterized by artificial reproduction of the natural phenomenality. This process, called "environmentalisation" forces the media industries to undertake the partial "re-analogisation" of the digital. It is described, among others, in the last book of the undersigned,[16] in connection with the historical trends of development of the input / output computer devices. This same process is suggested as an interpretative hypothesis of different vectors of the current development of the Web. If this hypothesis is verified, the Web will grow not only as a social information service but also as an anthropic environment with immersive sensory, mixing natural and medial elements. Information research in such information environment will be analogous like the looking for information in the environment including as the feedback the consequences caused by human creativity in the natural environment.

Project of the empirical research. Practical arrangements

An empirical research protocol will be proposed to the GIPSA-lab team "Grenoble Images Parole Signal Automatique" (CNRS / University of Grenoble) and especially to researchers Marco Congedo and Alexander Barachant, specialized in the measurement and interpretation of brain activity during individual and collective performance of different cognitive tasks.

Empirical goal

The research aims to demonstrate that the brain activity of subjects engaged in the information searches on the networks of terminals with rich sensory interface, particularly tablets and smartphones with 3D, tactile, surround, olfactory devices and with sensors of presences, and other peripheral devices, obeys the same rules as the activity of a subject when searching for information within the natural environment.

Double model of the information environment

In order to offer a relevant experimental protocol we will develop a model of a fragment of reality combining structural / local *causal ontologies* with *sensory affordances* allowing the subject to undertake various cognitive actions related to the fragment of the real dynamics chosen by the experimenter. These ontologies will model primarily spatial and processual aspects of the environment and will be responsible for understanding the reality presented, while their expression in terms of affordances lets to hire the processes of spatial orientation, of causal anticipation and of memorizing.

Conversion of the model to the service of "immersive Web"

This dual model will then be recorded as digital data nourishing a Web service accessible remotely through the consultation stations, tablets and smartphones, featuring different sensory devices in the industrial version or as prototypes.

Empirical method

The subjects equipped with portable brain sensors perform different recognition tasks through the real environment and through the service Web supposed to represent it by a rich sensory interface. They will act in a first series of experiments solitarily (individual protocol) and then in a second collectively, in real co-presence (group protocol), to finish in a third set by the collective action in the co-presence mediated by the sensory interfaces interconnected to enable monitoring of the behaviour of co-agents by sharing computerized sensory information (remote collective protocol). The investigator will record the brain activity of the participants successively in the three stages of the experiment.

Results interpretation

Taking advantage of different methods of mathematical interpretation of EEG data, especially the *kernel analysis*,[17] the experimenter tries to define in the brain activity of the subjects different wave phenomena, dependent on different "meaning effects" appeared in crucial moments of the spatial cognition (attention capture, find, object recognition, recognition of process and its causal consequences, anticipating "real" phase and in its three versions

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Une transcendance démembrée ? De la Sémiophysique à la Divine Comédie I

Bruno Pinchard

Le mathématicien et épistémologue René Thom est au centre de cet essai, même si Aristote en est le terme commun. René Thom (1923-2002) n'est pas seulement l'auteur de la célèbre Théorie des sept catastrophes élémentaires, c'est-à-dire de processus géométriques continus qui conditionnent des phénomènes discontinus comme les formes. Élève d'Henri Cartan (1904-2008, particulièrement orienté en topologie algébrique), il est d'abord le mathématicien qui a obtenu en 1958 la médaille Fields pour ses travaux de topologie différentielle. Après la notoriété mondiale obtenue par la théorie des catastrophes, en ce qu'elle pouvait s'étendre à tous les domaines du savoir comme une authentique science interdisciplinaire ou analogique, Thom a développé une œuvre de réflexion sur les mathématiques et la science moderne qui l'ont amené à une nouvelle lecture d'Aristote considéré comme penseur du continu. J'ai rencontré René Thom en 1988. Il cherchait un aristotélicien pour échanger avec lui et je venais de publier un travail sur l'analogie dans la scolastique classique. J'ai formulé des objections à son dernier livre auxquelles il a répondu, publiant questions et réponses dans l'édition de 1992, Esquisse d'une Sémiophysique, *et il a fourni une Postface à ma thèse d'État sous le titre* La Transcendance démembrée. *Depuis lors, je n'ai cessé de travailler autour de son œuvre et dans la suite de ses incitations libératrices.*

Thom prétendait que les conversations que nous avons eues ensemble entre 1988 et 2002, date de sa mort, continuaient les dialogues du mathématicien Évariste Galois et de Gérard de Nerval à la prison Sainte Pélagie après les événements de 1830. Pour ma part, je me suis plus senti dans la position du jeune écrivain et poète Johan Eckermann face à Goethe. Il reste que nous avons tenté une pensée commune dans le moment de formulation ultime de la « Sémiophysique » et de l'entreprise héroïque d'axiomatisation de l'aristotélisme à partir de la topologie moderne[1]. Néanmoins, si Aristote fut le premier prétexte de notre rencontre, nous avons étendu nos intérêts communs à bien d'autres aspects de la philosophie, avec Malebranche, Leibniz, d'abord, en particulier lors des enseignements sur les « formes substantielles » que j'ai pu donner, grâce à la générosité du mathématicien Jean Petitot, à EHESS, et auxquelles Thom assistait toujours, mais plus loin encore, et jusque lors d'une maladie ultime très handicapante, sur l'humanisme et la Renaissance, sur les solides platoniciens, sur la sphère, et finalement sur la vie et la mort.
J'en ai rendu compte dans divers écrits, en particulier dans mon *Tombeau de Thom*, publié il y a seulement quelques années par Louis-José Lestocart[2]. Cette rencontre a déterminé l'ensemble de mon travail intellectuel et a constitué un encouragement inestimable, au temps où, de son côté, le philosophe André Robinet publiait son *Architectonique disjonctive* plaçant Leibniz entre aristotélisme et atomisme, et où marxisme et déconstruction régnaient sans partage sur l'Université. Elle m'a permis de mettre ma pensée sous le signe des lois profondes de la nature, me libérant alors de l'approche phénoménologique de la philosophie qui aura dominé presque complètement ma génération. Je dois une telle chance au mathématicien Pierre Lochak qui m'a fait rencontrer Thom, à son père Georges, physicien chez qui j'ai fait les premières lectures, et à tous ceux qui ont accepté mon ignorance des mathématiques transcendantes au sein des cénacles les