Spatialization as a perceptual basis for information: how perception becomes a narrative

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ABSTRACT

According to enaction theory, information perception results from a coupling between the individual and data in the perceptual space. Consequently, the minimal condition of achieving perception is that there be something to act upon, i.e., a salience or a hook. Data emerge in the background and become preponderant. But, being at first only a sensation, these data can only be constituted as information if they persist in the perceptive field. One should be able to leave them and return to them in the logic of topological continuity, for example, association, similarity/dissimilarity, divergence, etc. Our hypothesis is that there are logics that transform these data into information. We posit that, in addition to being spatializing, they embody above all the perceptual gestures that make these data legible. Such is, for example, the status of the various supports that serve as structures of data inscription available on the digital applications: lists, tables, diagrams, and cartographies. Starting from sensorimotor theories, in connection with the enactive approach, we intend to establish the semiotic conditions of these supports as a perceptive basis of information.

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1. Introduction

Is semiotics condemned to spatiality? Yes, because it deals with signification, but it also deals or should deal, with meaning. Meaning, in reality, is only effective as a seizure, that is, as an activity. Even better, meaning is, above all, proper to the subject and the way he couples himself with his environment.

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The forms (Fontanille 2008) given to perceive – signs, texts, scenes, practices, supports, etc. – would be, thus, indeed, only that of the subject. Would be, in effect, only interfaces of interactions from which the subject's activity is supposed to unfold. Such is our hypothesis. It is an enactive hypothesis, one that posits signification and, in the long run, meaning, as first embodied, that is to say, primarily as being the result of a coupling between the world and the subject.

Enaction leads to the abandonment of any idea of representation of the world under the model of cognition (Varela, Thomson & Rosch 1993), that is to say, as a pure structure, material and outside of itself, whose states we will only have to activate in order to know it. So for the enactive approach, the world, as a given, is a whole that includes us entirely. And we only acquire knowledge of it through action and our interaction with the world. In short, it is how perception emerges, that is, as a mode of knowledge that is in question here.

For this approach, reducing perception to a strict sensory modality is impossible. It will produce provisional, even fleeting sensations, which, at best, would only be of interest as alerts to the possible presence of something. The central idea is that perception as a mode of knowledge is a mode of exploring the world, mediated by the knowledge of what we call sensorimotor contingencies. Any knowledge becomes possible only as a result or consequence of actions via which the subjects interact with the world, according to their experiences, intentions, capacities, etc. That is why we speak of enaction.

This happens in visual perception, as demonstrated by cognitive researchers Philipona and O'Regan (2005) in their study of the scope of these sensorimotor contingencies. In their experiments with sensory substitutions on blind people, they have shown that the distal perception we typically obtain through vision can also be obtained via a camera retransmitting on the skin with the help of tactile pecks of the objects in space. According to Philipona and O'Regan (2005):

> Visual sensation thus seems to be able to emerge from tactile stimulation in the same way as natural retinal stimulation from the moment the subject is confronted with a mode of interaction with his environment (which corresponds to) a law similar to that of the natural visual system. (cited in Pfaënder 2009: 72)

Our intervention aims to highlight the centrality of spatialization in this loop between sensation and action on the world. The initial question concerns the foundation of these sensorimotor contingencies. In the sensation/action loop (LeBlanc 2014), the subject acts on the world and obtains sensations, but the reverse is also possible. Therefore, we always hope that there are things in the world from which we will receive a sensation and on which we will act. Immediately afterward, the question is what these things are and to what extent they are supposed to solicit and alert the subject.

In the theory of enaction, we consider these things as data, in the sense of potentially perceptible objects of the world. In other words, we can explore them freely. Whether these data can be more or less localized is immaterial. However, it is always up to the subject to determine their presentation while interacting with the world. As such, they are perceived by the effect of stabilization, which makes them forms, in the sense that we speak of information or sketches, that is to say, following Husserl (1929), as "lived of consciousness" that we discover little by little. Something is formed, out of which can emerge knowledge and, in the long run, a stabilized sense, which is not there yet. To achieve this, there is a need for an interpretative gesture or an interpretative intention (which can be active or not). It is in this perspective that we place our intervention.

Spatialization becomes an issue when we question the principles guiding the interpretative actions and allowing to reach these forms as stabilizing effects. It is useless to propose that these forms are specific to each subject. Two persons are alerted by the same data. Still, they do not perceive the same form and, even less, do not bring the same interpretative tension to the fore, even if it is possible to somehow constrain the perception by guiding the perceptive actions. Due to the action/sensation loop, each subject always draws the contours of the form from the present data. From the outset, we leave behind any a priori reading that would like the data to be the manifestation of already constructed and pre-existing forms.

2. About meaning and salience: from Husserl

Let us take things from the beginning. Resorting to sensorimotor theory amounts to positing that the perception of information is constructed by the body of the subject acting in conjunction with its environment. According to Fabien Pfaënder (2009: 61), who wrote a thesis on this subject in 2009, and from whom we will borrow most of our arguments, this amounts to saying that "the perception of information is constructed through the environment [...]. In other words, in the environment, we find readable data structures from which it is possible to draw information." Result or resultant of the coupling between the individual and the data of the perceptive space, it is evident that these structures are all in the actions which determine them.

Nevertheless, the minimal condition of the action, points out Fabien Pfaënder (2009: 82), is that "the is in range something on which to act. A minimal structure of catch in the loop of action must be found somewhere in the loop of action/sensation. To paraphrase Husserl, one could say that all perception is the perception of something [...] Something emerges from the ambient noise which corresponds perceptually speaking to a hook."

The most heuristic term would be for us here that of salience.

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> The notion of salience, as we know, is, above all, linked to the emergence of a figure on a background. Resulting from the analysis of visual perception, this notion makes it possible to explain why we distinguish forms where one can only see noise. Applied to the perception of language, for example, this notion also offers many perspectives: why are certain linguistic elements understood and retained more easily than others? Why do certain discourse referents become preponderant and likely to be recalled by the simple mention of a pronoun? (Pfaënder 2009: 82)

So there is a background and potentially one or more multiple saliences. That is the issue. Fabien Pfaënder (2009) proposes the term "perceptual neutral" or "sensory neutral" to designate this background, out of which each component can become at any moment a hook or a salience, in this case through the effect of perceptual discontinuity. But for that to happen, this effect must last, i.e., be reversible. A sensation must be able to be found again. One should be able to leave and return to it, thus constituting a minimal sensorimotor loop. The sensorimotor loop allows the subject to reach this salience, i.e., a stable interpretative tension.

Conversely, it would only be a fleeting presentation, or we would face multiple variations. Thus, for example, if one notices a small pile of sand on a beach, one cannot return to it if one passes a finger on it. On the same beach, one can see a multiplicity of grains. Still, it is not possible by observing them to isolate a motive, in particular, if it is perfectly flat: in the one and the other case, there would not be stable discontinuities, but of the neutral.

We argue that a sensation is reversible, if it is possible by an action to find this sensation. For Fabien Pfaënder (2009), the interest of the reversibility viewed in this way is that when we say "to find," we do not speak precisely of the same sensation. And this is because enaction makes each sensation integrate the experience of the preceding sensations, which makes them different. In other words, with such reversibility, the interest of which is that it allows us to stabilize the action, we end up with a reference point, which would be the equivalent of a proto-spatialization. This is indeed the whole point of salience. So we will say that reversibility is the minimal condition for spatial perception.

But Fabien Pfaënder (2009) makes an additional point. If salience, as a discontinuity or reversible change, is punctual, it does not allow for efficient support of action, just a space can be built around the point, which does not lead to any cognitive consequence other than the sensation of a somewhere or a something. We should further problematize this salience to indicate a direction, confront one state of the world, then another and another, and so on. This displacement is, according to him, the basis of any understanding, i.e., of any signification that allows the play of the primary logical

principles of association, divergence, similarity, or dissimilarity, but also of opposition or difference. These principles enable salience to migrate towards constructing a space where one can come and go. This is the very foundation of reversible change. Fabien Pfaënder uses the figure of the line to formalize the possibility of these principles. He suggests that "the line allows one to move from an area A of perceptual space to an area B and back again, thus allowing the comparison of these two areas perceptually and cognitively" (Pfaënder 2009: 87).

Thus, the line is a sequence of reversible changes of the same nature, which we can explore from one direction to another. In other words, next to supporting an action like salience, the line simultaneously guides it by proposing a movement between these two zones. It is, therefore, an attractor. Not only does it suggest a structure, but it also guides the actions throughout this structure.

We understand this part of the line even better as an attractor when we imagine the constraints accompanying its exploration. For a topological exploration, for example, this can be done by continuous tracking or small movements to avoid taking one's eyes off it. It is thus maintained as an invariant through identical actions. Conversely, it is also possible that the subject leaves the line. For example, Fabien Pfaënder (2009) presents the case of a conversation at a social cocktail party:

> If one follows a conversation at a social cocktail party, and the conversation pauses, the gesture of listening, the dynamic of following the conversation is interrupted, generating a perceptual void, which plunges one back into the discomfort of the space to be explored that the line and its attractive power made it possible to avoid. (Pfaënder 2009: 91)

But it is the same in the other perceptive modalities. The stake is that of the place of the line as a guide of the actions. We need a perceptual gesture to prolong it; otherwise, we fall back and sink into a perceptual void. There are several possibilities in this respect:

– The line (of the conversation) is interrupted and does not resume. The action is discontinued, and the subject falls into a perceptual void. Subsequently, an essential part of the exploration could be devoted to finding new hooks. For the perceptual gesture, the most economic attitude would be to return to the line one has just left and start again in another direction, hoping to find something else. In general, it is better to stick to the perceptual void.

– The line crosses another line almost orthogonally. The inertia of the tracking action makes the exploration continue in the direction of the tracked line. If the line continues, the action will tend to pursue this line. If, on the other hand, the line does not continue, the exploration stops quickly, and it is then necessary to return to the line left to resume one of the two possible orthogonal lines.

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– The line crosses another line tangentially. At this point, there may be ambiguity, depending on the slope of the tangent. It is then possible that one passes from one line to the other without realizing it. This can be disorienting, introducing bias and randomness into the feeling of guidance. We could resolve the ambiguity by using another line.

– The line stops and then starts again. In this case, the notion of gesture takes on its whole meaning. The inertia of the gesture pushes it to continue in the same direction. This is called the situation of good continuation.

For the continuation, these possibilities expressed thus in perceptive terms of line following can find an echo at first sight in the Gestalt theory by highlighting the importance of the gestural dynamics for the constitution and the structuring of the perceived space. This is, for example, what explains phenomena such as optical illusions. It would then be a question of associations. However, this would reduce perception to simple phenomena of the subject's attention, as if it were a question of restoring prior arrangements of objects. The demonstration we develop with the support of Fabien Pfaënder's (2009) proposals is much more complex.

3. Some perceptual constraints of spatialization

Taking support on the sensorimotor loop, the facts of spatialization do not proceed from the subject's attention. Instead, it is a dynamic perception that proposes as an analytical grid the lines and perceptual gestures they generate. It is thus necessary to understand how these lines form the basis of spatial perception.

Everything depends on the questions that interest the subject in his environment. In any case, everything that supports a path becomes important when reading spatial inscriptions. The stake consists in analyzing first these spatial inscriptions using the perceptual bases that structure them as guides or constraints for their capture:

1) perceptual neutrality;

2) the non-reversible change, that is to say, any discontinuity inside the perceptual neutral which is not yet a hook ;

3) the hook, i.e., the reversible change

4) and the line as an attractor.

It is through these perceptual bases that perception transforms into a narrative.

By way of illustration, let us refer to three configurations of these spatial inscriptions among those retained by Fabien Pfaënder (2009), that is to say, three constraints that lead to three narrative possibilities: the list, the first primary structure of inscription of spatialization, the table and the diagram.

3.1. **The list**

As a structure of inscribing spatialization, the list, at first sight, puts in the same space elements that belong to the same set and have the same nature without any necessary relation between them – for example, a shopping list or a list of things to do. There is, therefore, as a bonus, a principle of homogeneity. This very fact also generates a reading order. As a presentation, the items or elements in a list are always situated in an implicit hierarchy due to their order of succession. We can reinforce this hierarchy or try to smooth it out, as in the case of the round lists generally used to anonymize the agreed signatures of a document. Such a reading would then be of the order of the Gestalt, obeying only the logic of the presentation.

Things unfold differently if we consider the list from an enactive perspective, i.e., by considering the sensory-motor loop. Everything starts from the logic of organization that presides over the inscription of the list:

> The list implies discontinuity and not continuity. It presupposes a certain material arrangement, a certain spatial disposition; it can be read in different directions, laterally, vertically, from top to bottom, as well as from left to right, or vice versa; it has a beginning and an end marked by a limit, an edge, just like a piece of cloth. (Goody 1978: 143)

According to Goody (1998), these boundaries are not only high and low; they are the boundaries between the perceptual void and the perceptually salient features that make up the list. By varying these boundaries and the overall shape of the list, we can obtain different types of lists whose perception changes and thus the interpretation.

The first example to consider, the most common one found today, is the list of search engines. These lists are similar whatever the search engine, with the common characteristic of being arranged vertically. According to Fabien Pfaënder (2009), it is possible to attribute this characteristic to a cultural habitus, but this would be going too fast since the reading of the contents of these textual lists is horizontal. Now, if the global list were in the same direction, we would be in a situation where we would be guided perceptively to read the complete line, at least from the beginning, until the end of the screen. In any case, the guidance would push to this action, which would be painful, with the risk of being constrained by perceptually neutral or, at best, non-reversible changes. The choice of the vertical layout has a perceptual explanation (Pfaënder 2009). The idea is to break the horizontal reading gesture by a radically different direction for the global direction of the list. Thus, when the list is vertical, we can emphasize its composition in distinct elements by highlighting the salient features), but by forming a homogeneous whole (i.e., by implementing a line as an attractor). For example, we play with sizes, colors, font sizes, graphic data, line breaks, and graphic

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blocks on Google lists. These games provide highlights that allow us to change the reading rhythm or focus on this type of specific information, depending on the targeted perceptual gain. One can also play with the location of the support. In this case, studies have shown that on a list produced by a search engine, whatever the page, only the first three blocks of lines are optimally viewed. In other words, for an advertiser, for example, it seems more interesting to be visible in these positions just after page 1 than to appear in the 6th or 8th position on this page.

3.2. **The table**

The table is a spatial structure that combines elements whose organizing principle in rows and columns makes it possible to achieve data groups in two dimensions. First, the play of their juxtaposition and the gesture of reading, which guides the perception, induces logical relations. These relations can be of order, similarity, or dissimilarity. The interpretation, that is to say, the narrative of the painting, is born from its course. For this, the rows and columns for rectangular pictures, and the meridians and parallels for circular pictures, must follow two directions as far apart as possible.

Furthermore, the relationships within a given direction of rows or columns must all be of the same type, with the same difference; otherwise, we would contradict the organizing principle of the table. In other words, by spatializing in the form of a table, we force data to respect this organization. This is, therefore, what we must take care of.

The work maintains the term that verifies the differences between the two directions. To do this, the terms must be compared two by two by a back-and-forth effect, which makes it possible to check the coherence of a row or a column by straight-line movements. A table is not simply the boxes placed next to each other but a homogeneous space construction. We find the double meaning of the line very concretely, both as inscription (the squares, as a hook to perceive: this is a painting) and as gesture (as a homogeneous construction when we consider the enactive perspective). This leads to a very constrained analytical reading: the relations that the columns induce are a powerful perceptual and cognitive grouping principle.

The illustrations used by Fabien Pfaënder (2009) induce a multicultural and historical reading of paintings. According to him, paintings are multicultural and enjoy a high degree of historical exploitation, so we find traces in various civilizations or practices. Simply taking the case of paintings with classical lines and orthogonal columns, these are read reasonably from the edges, as it is difficult to find one's way once inside. The edges constitute more stable and comfortable reference points than the core or the lines. The opposite happens with hemispherical or semi-hemispherical boards. The latter direct all reading actions at an equal distance from the center or directly toward the center of the painting, which is of crucial importance. Such is the perceptual principle. Paintings inscribe spatialization in fundamentally analytical ways, and this constrains the perceptual gesture, i.e., the interpretative activity. It is the same for the various other forms of paintings. The calendar, or

in this case, the Aztec calendar, when they are read as paintings. But as we know, it is mainly about the diagram, which can also be considered a primary structure, even if it can be seen as one of the concrete manifestations of the picture.

3.3. **The diagram**

The diagram differs from the table and the list by not containing any logic that presides over its inscription, allowing greater freedom of reading. It is enough to establish relationships between data, according to an ad hoc criterion, to make a diagram. As regards their presentation, whatever the form, we read diagrams in two orthogonal directions for bar charts and from the center outwards for pie charts. But the other difference between the list and the chart is the type of reading it allows. Where the table mainly gives rise to an analytical reading, the diagram also has a synoptic reading gesture. Thus, one can access the value of a specific data item, as with the table and its difference from the locally associated data. Still, one can also access the overall form of the data, depending on what is being sought. This is what the different types of diagrams that we can imagine show. For example, bar charts have a planar implementation that makes it easy to read them analytically, like a table. But even if this is possible, synoptic reading is less obvious. Through its form, the diagram is supported by a linear reminder that guides us in two directions, with the obvious risk of seeing each data item divided and subdivided into smaller data items, and so on. This is part of its very essence, as the relations between data are the first thing to count, which is relatively weak. Reading guides can be quickly disseminated to give rise to only fleeting salient points. If we look closely, this is how many economic reports are read as soon as the data are written in diagrams.

However, pie charts work differently. Implementing this form of diagram offers a reading of the complete division of a data set. The circle implies completeness, indicating that there can be no other possible divisions. Consequently, analytical reading is impoverished because the angle forming the value of individual data is not easily measured. On the other hand, comparisons between areas are effective. And there are many different types of diagrams, including graphs and maps.

4. Conclusion

This rather introductive study, based on the sensorimotor approach and loop, this rather introductive study aims to interrogate the perceptual bases presiding over the inscription of data spatialization as information. Starting from the perceptual neutral, the salience, the spatial attractors, and the lines, as a minimal guide that organizes the perceptual gesture, we find a certain number of primary structures which, by their implementation, appear as the translation of constraints that accompany the data entry, the list, the table, and the diagram. From the point of view of their inscription, these

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constraints, however strong, are never manifest from the start. They operate only at a meta-level; in other words, as an integrated discipline which, without intervening directly in the content of a story, for example, affects its form nevertheless. We propose to call such a way of operating 'in-discipline.' Through some perceptual act, a sensation, the subject isolates a salience, which induces an orientation. It is this act that converts perception into information.

Implications

Although speaking of narrative, it is evident that what is in question here is no longer the content of the discourse, in Hjemslev's sense of the term, i.e., the semantic signified. It is not this signified that concerns the semiosis. To grasp a narrative is not simply to access a story's content as one could understand it. Instead, it primarily involves revealing a particular capacity of the subject or the addressee in connection with a discursive heterogeneity perceived as a mass of data. In the framework of pure content, the subject or addressee is only an observer who receives the narrative or the story as it unfolds. In this case, however, he becomes an 'experiencer'. To perceive data is to be affected by it and subjected to orientations. These orientations serve as a basis for the constraints that we establish here.

Thus, we must consider these constraints as the narrative's order or path. The addressee – for example, a reader – is strongly influenced by this order which, in the end, becomes the narrative background: heterogeneous data, which becomes a list, or the same data taken as a diagram or a table. But it will never be the same story for one reader or another. Of course, this would be an opportunity to introduce the idea of "task" as one of the components of the Person-Artefact-Task triptych proposed by Finneran and Zhang (2003) to justify the conditions intended to accompany the experience of flow. The task, they argue, "can influence the occurrence of flow. Whereas a goal-directed task – like searching for information on a brand's website – has utilitarian benefits, situational involvement, and instrumental orientation, an experiential task – such as entertainment – involves undirected search and has hedonic benefits, ritual involvement, and enduring involvement" (Finneran and Zhang 2003).

In sum, we can introduce here the concept of diegesis, taken as one of the modalities through which a story is formed. But this definition needs to be sufficiently stabilized. We suggest not going further with it at the moment.

Returning to our purpose, albeit briefly, one initial question we posed concerned the moment when the hook or the salience constitutes itself. A hook or salience constitutes itself when something reversible occurs, that is, when the perception of something becomes stable. We registered this stabilization as a proto-spatialization. Setting forth from a perceptual perspective, we argued that this is the first step that permits us to talk about

all the constraints we isolated as the basis from which the perception could become a narrative. These constraints work in the background, i.e., as modifying filters or what Oana Culache and Daniel Rareș Obadă (2014) call "resources suited," with an obvious spatial effect. They can segment the data, highlight it, veil it, magnify it, etc. This is why they are fundamental to converting data into information and narratives.

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