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CSRP 593

November 2007

ISSN 1350-3162

Cognitive Science
Research Papers

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Abstract

The enactive approach to perception is generating an extensive amount of interest and debate in the cognitive sciences. One particularly contentious issue has been how best to characterize the perceptual experiences reported by subjects who have mastered the skillful use of a perceptual supplementation (PS) device. This paper argues that this issue cannot be resolved with the use of third-person methodologies alone, but that it requires the development of a phenomenological pragmatics. In particular, it is necessary that the experimenters become skillful in the use of PS devices themselves. The 'Enactive Torch' is proposed as an experimental platform which is cheap, non-intrusive and easy to replicate, so as to enable researchers to corroborate reported experiences with their own phenomenology more easily.

Keywords: enactive perception, perceptual supplementation, phenomenology, enactive torch.

This manuscript is a slightly extended version of a paper which originally appeared in: *Proc. of the 4th Int. Conf. on Enactive Interfaces*, Enactive/07, Nov. 2007, Grenoble, France: Association ACROE, pp. 105-108.

1. Introduction

The enactive approach to perception, which holds that perception consists in perceptually guided action, was first proposed by Varela and colleagues in the early 1990s as an important contribution to the embodied-embedded and dynamicist movement in the cognitive sciences (e.g. Varela, Thompson & Rosch 1991). Since its inception it has inspired a range of related approaches such as the sensorimotor contingencies approach (O'Regan & Noë 2001), Noë's (2004) enactive approach to perception, and the dynamic sensorimotor hypothesis (Hurley & Noë 2003). While there are certainly important differences between them (cf. Thompson 2005), we will refer to these approaches as "enactive" to the extent that their overall concern "is not to determine how some perceiver-independent world is to be recovered; it is, rather, to determine the common principles or lawful linkages between sensory and motor systems that explain how action can be perceptually guided in a perceiver-dependent world" (Varela, Thompson & Rosch 1991, p. 173).

One important source of evidence supporting this enactive approach to perception is the data generated by experiments with subjects who have mastered the skillful use of a "sensory substitution" device (cf. Bach-y-Rita *et al.* 1969). Such a human-machine interface, which for reasons given by Lenay and colleagues (2003) we prefer to call a *perceptual supplementation* (PS) device, is an innovative tool for investigating some of the fundamental mechanisms of perception. A PS device functions by making use of neural plasticity (Bach-y-Rita & Kercel 2003), namely the ability of the central nervous system to incorporate the device's feedback into the subject's sensorimotor exploration of the environment (Lenay *et al.* 2003). Such a PS device can provide an extremely rich experimental platform, one whose full potential still has to be explored.

1.1 The current debate about TVSS

The work with tactile-vision substitution systems (TVSS) originated in the early 1960s (e.g. Bach-y-Rita *et al.* 1969) and continues to be of great practical and theoretical importance in the cognitive sciences (cf. Bach-y-Rita & Kercel 2003). A blind (or blindfolded) user of a TVSS can successfully engage in tasks which normally require visual perception such as navigating novel environments, locating objects in space, reading text, as well as distinguishing between different persons based on their external appearance (Bach-y-Rita *et al*. 1969). Accordingly, research with TVSS has important practical implications for the development of better prosthetic visual systems.

Furthermore, such research provides significant empirical support for the enactive approach since it highlights the importance of action in perception (e.g. Noë 2004; Hurley & Noë 2003; Bach-y-Rita & Kercel 2003; O'Regan & Noë 2001). It has been observed that the capacity for action is needed for exercising the appropriate sensorimotor skills which are constitutive of our perceptual abilities (Bach-y-Rita *et al.* 1969). It is also necessary for the acquisition of these skills since "only through *self*-movement can one *test* and so *learn* the relevant patterns of sensorimotor dependence" (Noë 2004, p. 13).

Interestingly, a subject's mastery of skillfully using a TVSS device is often reported to result in the constitution of a specific spatial mode of perceptual awareness. However, there is little agreement about the best way to characterize the phenomenology of this perceptual modality (cf. Bach-y-Rita & Kercel 2003). Is it an extension to an existing modality such as touch (e.g. Block 2003; Prinz 2006) or vision (e.g. Noë 2004; O'Regan & Noë 2001; Hurley & Noë

2003)? Or is it, perhaps, the constitution of an entirely new perceptual modality (e.g. Lenay *et al.* 2003)?

The arguments are generally based on two sources of evidence: (i) the experimenter's descriptions of the *abilities* of the subjects who master the skillful use of the apparatus (e.g. to explore their environment while avoiding obstacles), and (ii) the experimenter's descriptions of the *verbal reports* which the subjects provide of their experience. Since both of these sources provide third-person data, this debate about the character of a subject's experience is consistent with one popular third-person approach to the scientific study of conscious experience, namely Dennett's *heterophenomenology* (cf. Dennett 2003; Dennett 1991).

1.2 Outline of the paper

In this context the aim of this paper is twofold: (i) to argue that the current debate in the literature provides a good example of why such a purely third-person approach is not sufficient to achieve clarity on these kinds of first-person issues, and (ii) that in order to promote a *phenomenological pragmatics* (cf. Depraz, Varela & Vermersch 2003; Varela 1997; Varela & Shear 1999) of enactive perception, namely a research program which goes beyond a purely third-person approach in a principled manner, PS devices need to be standardized and made readily available to the general research community.

Accordingly, the current third-person approach to the phenomenology of TVSS use is critically reviewed (section 2), the development of a first-person approach is motivated theoretically, and a design for a simple PS device that is cheap, non-intrusive and easily replicated is outlined (section 3).

2. A case study in heterophenomenology

2.1 An interpretational stalemate

One of the most contentious issues surrounding the enactive approach to perception is the question whether the experience constituted by the skillful use of a prosthetic visual system such as TVSS is actually *visual* in character (e.g. O'Regan & Noë 2001; Noë 2004; Prinz 2006; Block 2003; Bach-y-Rita & Kercel 2003). How should this be decided? There is general agreement that blind (or blindfolded) subjects must have some sort of *spatial awareness*, since they are able to navigate their environment (at least to some extent). However, since this is a matter of determining the characteristics of first-person phenomenology, Prinz (2006) makes the important point that a description of the subject's *abilities* is not sufficient evidence to settle this matter.

What about the published descriptions of the *verbal reports* provided by the subjects? One of the problems here is that they allow contradicting interpretations. Moreover, the reader of the literature generally has no access to the actual reports, but must base her interpretation on the descriptions provided by the experimenter. As an example consider the following account in an early seminal paper by Bach-y-Rita and colleagues: "our subjects spontaneously report the external localization of stimuli, in that sensory information seems to come from in front of the camera, rather than from the vibrotactors on their back" (Bach-y-Rita *et al.* 1969). O'Regan and Noë (2001) interpret such descriptions as evidence that the experience of the subjects is similar to vision, and Noë (2004, p. 27) claims that "it is reasonable to admit that the resulting experiences are, if not fully visual, then vision-like to some extent".

Block (2003), on the other hand, argues that "there is doubt as to whether the phenomenology of TVSS is exclusively visual" and that "perhaps TVSS is a case of spatial perception via tactile sensation". Similarly, Prinz (2006) seriously doubts whether subjects experience anything visual: "My best guess is that prosthetic vision devices simple allow subjects to make automatic inferences about where objects are located in space as a result of tactile information". Again, it appears that the published reports are not sufficient to settle this issue.

So far the problem of determining the qualitative nature of the experience associated with TVSS use has been limited to the interpretation of descriptions of behavioral or physiological data and verbal reports, and evidently without much success. Can this issue be resolved by these sources of evidence? This would seem to be the hope for anyone advocating a purely third-person approach to a science of human consciousness such as heterophenomenology. However, even if it is assumed that such an approach can be made internally consistent, an assumption which will be questioned below in section 2.2, there remains a practical problem. It is all too easy to be content with simple textual interpretation when the principled analysis of first-person experience is not assigned any explicit role (Varela 1997).

This seems to be the case in the current debate about the phenomenology of TVSS use, where a scientific investigation has slowly been turned into an open-ended debate about mere interpretations of interpretations. Indeed, there is no evidence that any of those involved in the debate have had experience with a TVSS themselves. In this respect Prinz (2006) has to be commended for at least making this issue explicit. He openly discloses that he has not used Bach-y-Rita's apparatus himself, and therefore admits being forced to venture a "best guess" on what its use could be like. It is doubtful that a consistently third-person approach could ever go beyond postulating such educated guesses while at the same time remaining true to its foundational principles.

2.2 The third-person approach presupposes first-person data

Is a purely heterophenomenological approach even possible in the first place? It has been pointed out by Gallagher (1997) that any such third-person study of consciousness is not entirely free of phenomenological elements. We similarly claim that such studies are implicitly based on the first-person experience of the investigator herself in two fundamental ways: (i) first-person experience *in general* is presupposed by any (theoretical) activity, and (ii) first-person experience of the *particular* experiential phenomenon being investigated is presupposed by any meaningful interpretation of the third-person data.

Presupposition (i) is basically a reformulation of the irreducibility of consciousness as the necessary background which frames all of our activities (Varela, Thompson & Rosch 1991, p. 9-12). In this context it means that rejecting the existence of first-person experience in the researcher outright makes any attempt to understand first-person experience intrinsically self-refuting. It eliminates that which affords the possibility of the attempt itself – the authentic nature of awareness and purpose. Moreover, even if the investigator were such a hypothetical disembodied and purely rational intellect she could only (if it all) wonder why the objects under study make certain sound patterns and move in a particular way. It is because of *our own* first-person experience of being conscious subjects that it is possible for us to even conceive of investigating how other subjects undergo a certain experience and pick out the relevant third-person data. For a more detailed argument along these lines see Jonas (1966, pp. 127-134).

This kind of self-refutation would also be a problem for Dennett's heterophenomenology if it consistently applied the *intentional stance* to all conscious subjects including the researchers themselves. The investigator and the other 'subjects' would then be turned into objects that behave *as if* they were subjects but which would be considered as nothing more than "theorists' fictions" (Dennett 2003). Of course, this problem can be avoided by exempting the researcher from applying the intentional stance to herself. Still, this concession is a first step toward a full blown phenomenological approach. The question is then not whether first-person experience plays a role *per se*, but rather *what kind* of role it plays. This brings us to presupposition (ii).

The debate about the experience associated with skillful TVSS use has generally not been informed by personal experience with the device by any of those involved in the dispute. Nevertheless, the arguments are clearly based on some aspects of their first-person experience of perception. How else is it possible to argue about whether the TVSS experience might be vision-like and or a form of spatial perception via tactile sensation? A strict heterophenomenology would be like demanding that only congenitally blind researchers can investigate the phenomenology of vision. It is clear that they would be immensely aided in their task if they themselves had experience of what having vision is like. Similarly, Dennett (2003) concedes that "it has always been good practice for scientists" to try out their own experimental apparatus. However, as soon as this has been explicitly recognized, the natural question is: why not also provide them with a more principled manner of corroborating verbal reports with their own experience? Hence, this second concession opens the door for acknowledging the importance of a full blown *phenomenological pragmatics* (cf. Depraz, Varela & Vermersch 2003).

Of course, this kind of first-person approach to the scientific study of consciousness also acknowledges the importance of third-person data. Indeed, the goal of this change in perspective is the establishment of a relationship of *generative mutual constraints* between phenomenology and cognitive science (e.g. Varela 1997; Gallagher 1997). In this manner the research community is explicitly encouraged to bring all available sources of evidence to bear on the problem of consciousness.

3. Toward a phenomenological pragmatics

3.1 First-person methodology

The existence of first-person experience in the researcher is a legitimate source of additional evidence which not only needs to be explicitly acknowledged but also practically cultivated (Varela & Shear 1999). It carries with it the responsibility of making a concerted effort to engage in disciplined training to describe experience accurately (Varela 1997). Moreover, undergoing appropriate guidance will also enable researchers to become more skilled at obtaining the relevant phenomenological descriptions of untrained subjects as well (Petitmengin 2006). This kind of 'second-person' approach is in stark contrast to heterophenomenology, which explicitly rejects communication in favor of detached interpretation and thereby diminishes its means for clarification of meaning (Gallagher 1997). That such training not only enhances the ability to describe one's experience accurately but also changes the experience itself is not a problem but actually an inherent necessity. Indeed, only by attending more closely to one's experience, and thereby undergoing a different kind

of experience, can one describe it more accurately (Petitmengin 2006). The original experience is not lost – it is just brought into focus.

The biggest hurdle toward the establishment of such a phenomenological pragmatics is that it requires some radical re-learning from the research community (Varela 1997). This is an important topic but beyond the scope of this paper (cf. Varela & Shear 1999). What is significant in this context is that researchers must be able to train in the use of a PS device. This is also important for the insertion of the subject into a world of shared meaning (Lenay *et al.* 2003) on the basis of a relationship of mutual trust (Petitmengin 2006). Unfortunately, such an endeavor is often impractical when dealing with expensive and complex commercial products. A better starting point would be a cheap PS device which is effortlessly replicated, simple to learn and use, non-intrusive, and for which the design can easily be made available to the general research community. Such a PS device is the Enactive Torch (ET).

3.2 The Enactive Torch

The ET provides the subject with one continuous channel of vibro-tactile feedback to the hand, where the strength of stimulation depends on the distance to the object which is currently pointed at. As shown in Fig. 1, the ET also contains a servo-motor for rotary displacement and audio hardware to which the output may be routed if the researcher desires. The design is based on an earlier PS device, the Haptic Torch, which has been successfully used by blind subjects to navigate simple environments (cf. Spiers & Harwin 2004; Spiers 2004). Its practical advantage over a traditional cane is that it avoids the potential intrusiveness of direct contact and thus encourages more wide ranging exploratory movements, especially in social contexts. This is important considering the role of action in the deployment of such a new mode of perception (Lenay *et al.* 2003).

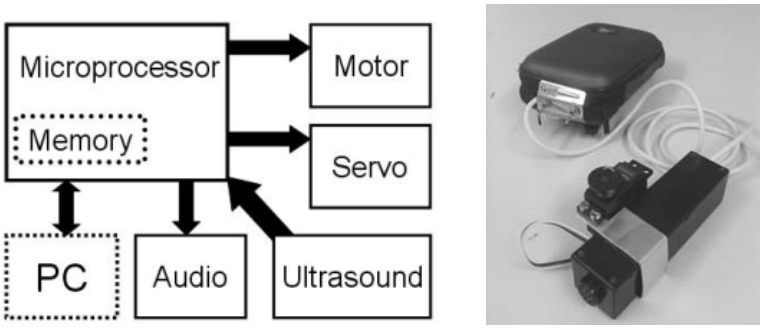

Figure 1. A schematic of the Enactive Torch (left) and an image of a recent experimental prototype (right).

Almost immediately a subject can use the ET to detect obstacles, and after a little training (ca. 10 minutes) has no problem of locating relatively 'invisible' objects, such as a lamppost, in space. Moreover, it has been experienced by one of us that already after around 1 hour of practice with using the vibro-tactile output, certain salient features of the environment, such as corners and open doors, take on a distinctive perceptual pattern which could be described as 'touching objects out there'. It is worth emphasizing that appropriate sensorimotor action can thus give rise to perceptual resolutions that significantly exceed those of single-point stimulation. During the learning process a subject's experience of the ET shifts from, using Heidegger's (1927) terminology, a more "present-to-hand" to a more "ready-to-hand" attitude. This change in experience leads to a 'feeling of the macroscopic texture of the

world' which coincides with a sensation of resistance in the wrist when sweeping across nearby external objects. While these descriptions provide an interesting starting point, more phenomenological research is clearly needed.

The ET can also be used for a more general investigation into the claims and principles of enactive perception. We hypothesize that severing the causal relationship between action and tactile sensation when using the ET, for example by playing back a recording of a previous trial, will prevent the constitution of such an experience of spatial exteriority. We expect that under that kind of condition subjects will be unable to make sense of their surroundings, even though the 'information' that is potentially provided by the tactile sensations will be the same as before. Initial trials with short training times (ca. 30 minutes) have indicated this to be the case. These results are in accordance with the claim of the enactive approach that perceiving is not about the passive recovery of a perceiver-independent world, but rather consists in perceptually guided action. The ET thus provides the means to establish a mutually informing relationship with a study in the phenomenology of the senses (e.g. Jonas 1966, pp. 135-152).

These early results are comparable to those obtained with a similar PS device by Lenay and colleagues (2003). This suggests that the constituted perceptual modality is relatively independent from the particular kind of hardware implementation and more dependent on the type of sensorimotor coupling which it makes available to the user. Such intersubjective validation provides further support for the enactive approach. In general, the establishment of a phenomenological pragmatics of enactive perception would be immensely aided by the creation of a common web repository where the research community can post transcriptions of verbal reports as well as technical diagrams of the PS devices used. This is particularly important as the experiential data is related to the technology used (Lenay *et al.* 2003).

4. Conclusions

The ongoing establishment of a successful research program within the framework of enactive perception requires that we move beyond making use of a purely third-person methodology. In particular, we need to promote a phenomenological pragmatics in which researchers are trained in describing their own experiences as well as being themselves skillful in the use of perceptual supplementation devices. Initial trials with the Enactive Torch indicate that this device could provide an appropriate starting point for this endeavor.

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