

# Enabling Augmented Sense-Making (and Pure Experience) with Wearable Technology

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**Abstract.** The paper explores how a post-cognitive approach to human perception can help the design of wearable technologies that augment sense-making. This approach relies on the notion of *pure experience* to understand how we can make sense of the world without interpreting it, for example through our body, as claimed by phenomenology. In order to understand how to design wearable technologies for pure experience, we first held interviews with experts from different domains, all investigating how to express and recognise pure experience. Subsequently, we had a focus group with professional dancers: given their heightened sense of bodily cognition in their experience, we wanted to verify the extent to which the experts' practice could be claimed back into the dancers' experience. In this paper, we will present our preliminary findings.

**Keywords:** Augmented sense-making · Embodied cognition  
Wearable technology · Phenomenology · Dance · Pure experience

## 1 Introduction

Current wearable devices are mostly information appliances that are developed from a traditional cognitivist perspective that considers the computer user as an information processor [2]. Within this perspective, devices are seen as tools that mediate the experience through interaction with them.

Some scholars [4, 7] however express their concerns about this view because they claim that technology-as-a-tool mainly distracts users, who tend to focus more on the device itself than on the experience resulting from using it. When interacting with a technology allows users to experience the world without mediation, without interpretation, then such an interaction appears in its purest form: it is *pure experience*.

Several scholars refer to the role of the body in cognition and advocate for the need to design for the lived body and for being skilled in kinesthetic thinking and bodily intelligence [4, 7]. This seems particularly present in professional dancers [6]. Professional dancers indeed have developed something more than simple bodily or kinesthetic awareness: through their performance they “think feelingly” [5] and are aware of their perception that is influenced through action.

We claim that wearable technology can also help non-trained users develop this type of heightened embodied cognition and thus make way to achieve a state of pure experience, if this allows them to develop what we call *sense augmentation*. Subtle, intimate tactile qualities of interaction, which are hardly recognisable for bystanders or consciously unperceivable by the user concerned, can indeed have a significant effect on the value created while performing the interaction. Wearable technologies, by definition close to or on the body, do offer opportunities to explore these subtle, intimate qualities. In this paper, we precisely focus on the relation between augmented sense-making and movement, and its effect on a person's cognition.

This paper reports a preliminary study in which we explored how wearable devices that help users experience in this most basic and unspoiled way must be designed. This research is based on two approaches that are both a response to the information-processing and symbolic representation prevalent within cognitive sciences. The first is embodiment, a concept grounded in the phenomenology of Merleau-Ponty [8]. The second is enaction, which considers cognition as the result of a body in motion [11]. We will investigate how these approaches can be used in the design of artifacts that influence our perception at a phenomenological level. Our ultimate goal is to identify principles for the design of wearable technologies that heighten embodied cognition by providing new sensory stimuli that augment human perception. This augmented perception should such influence the sense-making process in order to reveal new pleasurable or surprising experiences.

In what follows, we will first give a clear definition of what pure experience is. In order to do so, we will have to explain also how pure experience relates to sense-making and enaction: we will discuss how sense-making is an important part of the enactive process of embodied interaction.

## 2 Why Pure Experience

Available interfaces, such as Kinect, Leap Motion, FitBit, and diverse mobile computing applications, enable the HCI community to explore embodied interaction, but they tend to create experiences that are designed from an instrumental viewpoint and ignore typical and personal bodily characteristics and knowledge from, e.g., embodied interaction. Information is presented in a way that distracts attention towards the experiences of others, ignoring the qualities of the individual's perception. We claim there is a need for attention for the individual user's interaction with the world and the subtle qualities hidden within the user experience as a result of that interaction. The intimate nature of wearable technology - intimate in that close to the body - offers opportunities for the technology to be transparent to the user and to provide unintended though meaningful experiences that go beyond those offered by more goal-directed, wearable, tools.

### 2.1 Pure Experience

The notion of pure experience is first introduced by James [1], who defines it as being "the immediate flux of life which furnishes the material to our later reflection". This

highly philosophical interpretation of a pre-cognitive state tries to help imagine that human sense-making of the world starts with the phenomenological encounter with its surroundings. And that the sense-making process consists of successive small encounters, that are influenced by preceding ones and together build up knowledge. Hence through embodiment and a sensorimotor confrontation with the world, humans make sense of that world and the interactions presented in it. This is what enaction, based on the phenomenology of perception, instigated by Merleau-Ponty [8], is about. This knowledge is not yet understandable in a rationalist sense, though it is already cognition. This is exactly the focus of our research: a low-level cognitive experience that is hard to imagine for non-experts and that is difficult to measure using currently available research methods.

Pure experience provides, together with enaction, the initial theoretical backdrop needed for designing interactions that focus on the primal encounter between the user and her environment.

## 2.2 Sense-Making

An important part of meaning making is the “role of goal-directed bodily activity” ([3], p.1). In their study, Froese and colleagues discuss the design of interfaces that “serve as a transparent medium for augmenting our natural skills of interaction *with* the world, instead of requiring conscious attention to the interface as an opaque object *in* the world” ([3], p.1). This is also enaction.

As mentioned above, enaction claims the centrality of the body in cognition. It is the movement of the body as a response to a stimulus that creates meaning. Meaning is constructed through our interaction with the world, directly or via an artifact, where our senses transfer phenomena to our body, our body responds to these phenomena and meaning gets constructed through this reciprocal interaction.

This personal meaning-creation takes on a central role in this research. The goal of this study is precisely to help identify how to design artifacts that address our perception and cognition at the level of personal meaning-making through sensorimotor coupling. This should provide room for a more phenomenological level of perception. These newly designed technological products, if transparent to the user and not requiring conscious attention, promise to offer people the ability to perceive new phenomena, and consequently the possibility to develop a new, or augmented, sense of the world. We call this *augmented sense-making*.

## 3 Our Approach

We held a series of semi-structured in-depth interviews with experts, all focusing on the lived body but from different perspectives, in order to identify what elements or principles these expert professionals consider important when designing wearable technology from the perspective of pure experience in order to augment sense-making. Subsequently, we critically discussed the outcome of these interviews with a group of six professional dancers in a focus group session.

### 3.1 The Experts' Interviews

The interview experts are Marloeke van der Vlugt, a Dutch artist and researcher, Antal Ruhl, a lecturer in multimedia design, Tom Froese, associate professor and one of the researchers investigating the so-called enactive torch, and Pierre Lévy, assistant professor and expert into Kansei research. The interviews followed a predefined guide an interview guide and focused on topics such as intimate and wearable technology, pure experience, meaning and sense-making, senses and augmented sense-making.

Our experts seem to convene that:

- Pure experience can be considered as a naïve state of perception, something that is felt or lived and that can be expressed immediately without going through any rational thinking.
- Only trained people, like dancers, are able to recognise their phenomenological experience, because they have learned to express such experience physically in a more intuitive and immediate way than through thinking. Dancers are trained to be aware of their body and of their extensive sensory perception and to identify what sensory stimuli come from the outside world. They know how to communicate their individual phenomenological experience to the audience, through dance.

Our experts recognize two ways to augment sense-making: (1) enhancing what one can sense through the use of technology (as in [3]), or (2) improving one's sensory awareness through training, as dancers do. A nice example of a device that provides sensory augmentation related to a "forgotten" sense is the feelSpace belt [9] that constantly points at magnetic North by way of a built-in compass and vibration motors mounted on a belt around the waist. An in-depth systematic study of long-term use of this belt [9] shows how the spatial perception of the wearer is changed, even when she is not using the belt anymore.

### 3.2 The Focus Group

The focus group discussion took place in a room at the premises of dance company De Stilte in Breda. All six participants, aged 21 to 27, male and female, and the facilitator sat around a large table. Several questions were asked according to a focus group topic guide. The topics covered issues regarding the creation of meaning, perceiving "the invisible", the language of expression, and role of garments during performance and training. Due to technical issues, we could not carry out an experiment with the dancers wearing a specific wearable device. So, the participants' replies are mainly drawn from memory instead of from lived experiences.

Among other findings, the dancers turn out to possess an outstanding way to express their embodied interaction with each other and their environment. But, when it comes to expressing their phenomenological experience in specific situations verbally, even their vocabulary seems to be limited. As with non-trained people, during our conversation they were rationalising their felt experiences and started "thinking" about how they experienced it, instead of expressing directly what they had experienced. This is also a sign that the focus group was not the ideal method to understand lived experiences: the dancers had indeed difficulties understanding what we meant with our questions and could not always refer to the same phenomenon.

## 4 Preliminary Findings

Our preliminary findings, based on the insights gained through the expert interviews and the focus group session presented above, are that wearable technologies that augment sense-making should:

*Support augmentation:* wearable technology should augment, and not substitute, an existing sense, or trigger a supposedly latent sense that we unlearned through evolution, such as a sense of direction.

*Be transparent:* the interface of such wearable technology should be transparent to the user, non-intrusive, non-distracting. The focus is the primal experience they enhance, not their appearance or the social interaction they may facilitate.

*Allow for sensorimotor integration:* to emphasise how our bodily movements influence our ways of being and thinking, the body and our sensory appreciations should both play a central role in the design of wearable technology. As in [10], unconscious perception of touch and movement is important.

*Facilitate an intimate experience:* The body itself is the main interface for acquiring knowledge. Additionally, wearable technology should leave room for internal reflection on both external stimuli and personal phenomenological experiences.

*Awake:* wearable technology is designed to awaken pre-cognitive awareness.

## 5 Discussion and Next Steps

The findings reported in the previous section are based on a preliminary analysis of dancers' experience. It is debatable whether the focus on dancers is not too narrow and can potentially hinder understanding how untrained users could experience and perceive the world in this heightened way. Opening up the target group becomes a necessary next step. Moreover, we need to further extend empirical research on existing wearable technology to see whether our current findings can be mapped onto them.

In order to achieve this, we are setting up experiments bringing together trained dancers and interaction design students. Our goal is to capture pure experience data, through these experiments, for further analysis and to inspire design students through their encounter with dancers and the exchange of individual experiences. These experiments will be conducted using a selection of existing sense-augmenting devices, such as a compass belt similar to the feelSpace belt [9] mentioned earlier.

With the outcome of these experiments, we will design a concept for a sense-augmenting wearable device inspired by the notion of pure experience and complying with the principles just described.

## 6 Concluding Remarks

Our endeavor to design wearable technology from the perspective of pure experience is not an easy process. But, the enthusiastic responses of experts in the field of related domains, such as phenomenology and embodied interaction, and the genuine interest and valuable insights offered by the experts and dancers we interviewed did convince us that this is something worth doing. The dancers we contacted indicated their willingness to participate in further studies where they will try out any novel wearable device we might develop.

**Acknowledgments.** We wish to thank the dancers and artistic director Jack Timmermans of de Stijle, Tom Froese, Marloeke van der Vlugt, Pierre Lévy and Antal Ruhl.

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