
Peripheral Interaction: Shaping the Research and Design Space

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Abstract

In everyday life, we are able to perform various activities simultaneously without consciously paying attention to them. For example, we can easily read a newspaper while drinking coffee. This latter activity takes place in our background or *periphery* of attention. Contrarily, interactions with computing technology usually require focused attention. With interactive technologies becoming increasingly present in the everyday environment, it is essential to explore how these technologies could be developed such that people can interact with them both in the focus and in the periphery of attention. This upcoming field of *Peripheral Interaction* aims to fluently embed interactive technology into everyday life. This workshop brings together researchers and practitioners from different disciplines to share research and design work and to further shape the field of *Peripheral Interaction*.

Author Keywords

Peripheral interaction; human attention; trained routines; calm technology; ambient information; interaction design.

ACM Classification Keywords

H.5.2. Information interfaces and presentation: User interfaces, Interaction styles, User-centered design.

Introduction

The presence of computing technologies in everything we do has rapidly increased over the past decades.

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These technologies are often equipped with user interfaces such as keyboards and touchscreens, which typically require focused attention during interaction. Along with the many opportunities that come with this development, it also raises a challenge in the integration of technologies in our everyday routines. To address this challenge, several researchers [9,11,12] have been inspired by the observation that many interactions with the physical world take place in the background or *periphery* of attention. For example, we can easily tie our shoelaces while having a conversation or be aware of the approximate time while reading a book. These peripheral activities are performed in parallel to a different main activity.

The approach of employing the periphery of attention in human-computer interaction has been explored under various terms such as *calm technology* [12], *ambient information systems* [11] and *peripheral displays* [9]. While the majority of earlier work focused on background *perception* of information, we see an upcoming interest in background *interaction* with computing technology [2,3,5,6,10]. This workshop explores *Peripheral Interaction*, a direction which broadens the field by not only aiming to employ the *perceptual* periphery, but also to enable users to *physically interact* with the digital world in their periphery. Similar to everyday actions, Peripheral Interactions occur outside the focus of attention and fluently blend into everyday life.

This workshop follows up on a previous workshop [4], which focused on defining peripheral interaction and its key elements. These discussions raised opportunities to explore combinations of peripheral perception and action, to explore peripheral interfaces that frequently

shift between focus and periphery and to question whether everything could potentially be a Peripheral Interaction. Having established a common ground and understanding of Peripheral Interaction, the follow-up workshop focuses on how to operationalize Peripheral Interaction. By bringing together a variety of researchers and practitioners from a diversity of fields (e.g. computer science, interaction design, arts, psychology, product design, social science), we aim to further shape the field, work towards shared insights and yield future research and design on Peripheral Interaction. We invite people who see a challenge in better fitting interactive technologies into everyday life, whether or not their current work addresses Peripheral Interaction or related topics. More specifically, the workshop addresses the following questions:

How to operationalize Peripheral Interaction?

In recent years, a few interactive systems have been proposed in research literature, exploring physical interaction with computing technology outside the focus of attention. These systems were developed for various contexts such as the office [3,5,6], the home [10], the classroom [1,2], the car [4], and for interaction on the move [7,8]. This work furthermore explores several interaction styles, such as tangible interaction [3,5,6,10], gestures [4,6,7] and wearable devices [1,8]. While the body of related work is diverse, each of these examples can be seen as an initial exploration of Peripheral Interaction in the particular application area or with the particular interaction style under investigation. By bringing together a varying group of participants from both research and practice, we aim to discuss if and why particular application areas or interaction styles may be more suitable for Peripheral Interaction. This way, we hope to find connecting fields

of research in order to broaden and at the same time specify the scope of Peripheral Interaction research.

How to integrate peripheral action and perception?

While the majority of related work explored either *perception* of or physical *interaction* with digital information in the periphery, the combination of peripheral action and perception is relatively underexplored. Based on discussions at the preceding workshop [4], we see major potential in this combination. Peripheral feedback or feedforward [13] could for example support physical interactions in shifting to the periphery. Or physical interactions could be utilized to explore different layers in peripheral displays, which could increase their bandwidth. In this workshop, we will share and discuss theory on and examples of (potential) combinations of peripheral action and perception through presentations and demonstrations of participants. Additionally, we will moderate hands-on activities in which participants will conceptualize new interactive systems that explore variations of peripheral interfaces.

How to facilitate shifts between center and periphery?

The vision of employing the periphery of attention in interaction with technology was first introduced over 20 years ago, and indicated that such technology “engages both the center and periphery of our attention, and in fact moves back and forth between the two” [12:79]. While many researchers focus their studies on having perceptions or interactions take place in the periphery, it is often the moments when interactions shift between periphery and focus of attention, which are most beneficial to the user. Some literature is available on how to facilitate such shifts in peripheral displays [9], but this cannot easily be translated to physical

Peripheral Interactions. Taking the participants’ own experiences and examples as a starting point, the workshop will discuss strategies to facilitate interfaces in shifting between focus and periphery of attention.

Workshop Goals

The workshop has the following main goals. (1) To build a community of researchers and practitioners with diverse backgrounds who are directly or indirectly working on Peripheral Interaction. (2) To share and discuss examples of Peripheral Interaction, in order to identify the scope of the research area. (3) To explore, hands-on, how various interaction styles, perceptual modalities and combinations of these can benefit Peripheral Interaction in order to connect different areas of research. (4) To build a classification and framework to guide research on Peripheral Interaction.

Structure of the Workshop

Before the workshop: Potential participants submit a four-page position paper, directly or indirectly addressing the topic and goals of this workshop. Everyone is asked to include a description of their work and its relation to Peripheral Interaction. If feasible, participants may bring a demonstrator or video of their work, though this is by no means a requirement.

During the workshop: The workshop will start off with short, two-minute presentations of all participants, addressing points for discussion around Peripheral Interaction. Following, a “speed-date” session will be organized in which all participants informally get to know each other in short, two person conversations, by discussing the topics raised in the presentations. Before lunch, there will be a keynote of Albrecht Schmidt, who will share insights on creating seamless transitions between central and peripheral user interfaces. In the

afternoon, the participants will engage in hands-on design-research activities in smaller groups. First they will develop conceptual designs, which explore various application areas, interaction styles and combinations of action and perception. Reflecting on these activities, the developed concepts will be enacted and experienced by all participants after a break, to elicit discussion on their success and the factors that contributed to this. The workshop will be wrapped-up by summarizing preliminary results related to the questions laid out above. The workshop is intended to lay the foundations for the operationalization of Peripheral Interaction and lead to future collaborations such as follow-up events and shared publications.

After the workshop: All accepted submissions will be included in dedicated workshop proceedings, published as technical report and on the workshop's webpage. This webpage will summarize outcomes of the workshop and host a blog on Peripheral Interaction, allowing participants to be involved in a community on Peripheral Interaction after the workshop. Provided that the quality of submissions allows it, we aim to set up a special issue on Peripheral Interaction, for which all participants will be invited to submit.

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