PREFACE

Designing for Peripheral Interaction: Seamlessly Integrating Interactive Technology in Everyday Life

In everyday life we easily perform various activities without focused attention. For example, we can tie our shoelaces or know what the weather is like without consciously thinking about it. These activities are performed in our periphery of attention while they may also shift to the center of attention when relevant. Contrarily, interactive devices such as smartphones usually require focused attention for interaction. Since such devices are becoming omnipresent in our daily lives, we need to explore how to design technology such that it can engage both the focus and periphery of attention. This direction, which we call "peripheral interaction", aims to seamlessly embed computing technology into everyday life.

Routines in our everyday lives often facilitate for people to participate in several activities and events at the same time. For example, when in a conversation we can focus our attention on listening to our conversational partner, while at the same time drinking coffee from a cup, seeing a person enter the room, and hearing music playing on the radio. These latter activities can take place in our background or *periphery* of attention: we only focus attention on a specific actity when this is needed. For example, when the coffee cup is very full, we will shortly focus our attention on drinking to avoid spilling. When in the periphery, such activities require minimum attentional resources, while they may also easily shift to the center of attention when relevant or desired. This everyday scenario is quite different from the way we interact with computational devices, such as smart phones and tablet computers. Typically, these devices demand our full and undivided attention. As computing technology is becoming ubiquitious, through dedicated devices and integrated in objects and the environment, their demands can compete with each other for our undivided attention, overwhelm us and distrupt rather than enhance our everyday routines.

Inspired by the way we easily shift our attentional focus between different everyday activities, various researchers considered employing the periphery of attention in interaction with technology. This direction has been explored under terms such as *calm technology* [1], which shifts between center and periphery of attention, *ambient information systems* [2] and *peripheral displays* [3], which we are aware of but do not need to focus on. The majority of this work focuses on presenting information subtly such that people can *perceive* it in their periphery of attention. We also see an upcoming interest in interactive systems that people can *physically interact* with in their periphery of attention [4–7]. In our everyday routines, both perceptions and physical action engage the periphery of attention. We therefore believe that to fluently embed interactive technology in everyday life, it is important to facilitate both peripheral perception and peripheral physical interaction.

Computers are becoming truly ubiquitous in everyday life. For people to function without being overloaded with information and interaction possibilities, certain interactions with computing technologies should not concern our focus of attention.

This special issue centers around 'peripheral interaction', an umbrella term to encompass both perception of and interaction with computing technology which can shift between people's center and periphery of attention. Similar to everyday activities such as hearing background music and drinking from coffee cups, peripheral interactions with computers start and end outside the focus of attention and fluently blends into everyday life routines.

In the first paper in this issue, Andrii Matviienko, Maria Rauschenberger, Vanessa Cobus, Janko Timmermann, Jutta Fortmann, Andreas Löcken, Heiko Müller, Christoph Trappe, Wilko Heuten and Susanne Boll address peripheral information systems which make use of light to present meaningful information. Based on an analysis of 72 ambient lighting systems they draw a classification which can inspire design and research on interactive systems which use this increasingly ubiquitous medium, to display information for peripheral perception.

The second paper, by Florian Güldenpfennig, Roman Ganhör and Geraldine Fitzpatrick, focused on the evaluation of peripheral interaction. They present and evaluate a method for unobtrusively logging whether people looked at, and thus potentially focused their attention on, interactive devices. This approach, called Trackaware, can help researchers in evaluating peripheral interaction designs while being deployed in the real context of use.

In the third paper, Frank Bolton, Shahram Jalaliniy and Thomas Pederson explore the suitability of thermohaptics for peripheral interaction. They position their work by presenting insights on interruption management, human attention capabilities and wearable devices. In a preliminary study they present there initial wrist-worn prototype and first findings of the suitability of thermohaptics for notifying users in a less disruptive – hence peripheral – way.

The fourth paper, by John NA Brown, Jorge Oliveira and Saskia Bakker, studies how a famous psychological phenomenon, the cocktail party effect, might be exploited for peripheral perception. Can a loved one's voice simplify notification? Their preliminary evaluation, enlisted surface EEG measurements to detect brain wave activity of people subjected to these ringtones. The data indicates loved one's voices in a ringtone are treated differently allowing them to pop from periphery to center of attention in ways that other notifiers might not.

This issue brings a sampling of fresh work in the broad emerging field of peripheral interaction. The combination of the work presented provides insight into alternative styles of human-computer interaction which are suitable for peripheral interaction. Examples include leveraging human thermohaptic sensing capabilities and making use of lighting systems or ubiquituous programmable smart-phone ringtones, to present unobtrusive information. Additionally, the issue highlights the challenges of – but also the strong need for suitable methodology for – empirical evaluation of peripheral interaction designs. By binding design and research work on peripheral interaction, this issue aims to contribute to and inspire a widened academic discussion on peripheral interaction and its value for embedding HCI in everyday life.

We see the peripheral interaction paradigm as part of the solution to the dangers of multitasking and cognitive overloading. In our everyday routines, we are able to do many things in our periphery of attention, while also focusing on activities when needed. The roles of peripheral activity in everyday life are complex but important: with computers becoming ubiquitous, exploring peripheral interaction is an important

step towards seamlessly integrating such technology in everyday life. We hope this special issue encourages more people in the HCI community to incorporate peripheral interaction into their work to make a calmer and more productive world. The papers presented in this issue are not a review of a mature field, but a glimmer of the breadth of value of peripheral interaction.

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