

Technology-mediated engagement of people with visual impairments with nature

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ABSTRACT

Spending time in outdoor nature is beneficial for improving physical and mental wellbeing. However, despite the advancements in mobile technologies and the rise in physical health tracking apps and devices, people with visual impairments (VIPs) spend less time outdoors. This thesis explores the use of technology in mediating engagement of VIPs with outdoor nature. Through the use of qualitative research methods, an in-depth understanding of the experiences of VIPs in open natural spaces will be developed. These will inform the framing of the design of prototypes of technologies to encourage exploration and engagement with nature for VIPs to be developed through participatory design methods to develop.

Author Keywords

Assistive technologies; visual impairment; nature

ACM Classification Keywords

• Human-centered computing → Accessibility technologies; Accessibility systems and tools; • Applied computing → Psychology.

INTRODUCTION

There is growing evidence that spending time in outdoor natural environments such as parks and woodlands can have a positive impact on peoples' mental and physical wellbeing and improve symptoms of stress, anxiety, and depression [7, 25]. Recent research also suggests that the digital augmentation of natural environments can encourage exploration and learning [6, 8, 18] about plant and animal wildlife. However, the majority of existing HCI research on interaction with nature has focused on people without visual impairments. There is a need to understand how VIPs experience nature and how existing technologies and

infrastructure facilitate navigation, exploration, and overall experience of VIPs in nature.

My research explores the experiences of VIPs in outdoor natural environments including parks, woodlands, meadows, forests, and other open green spaces. I intend to use qualitative research methods to develop an in-depth understanding of the needs and experiences of VIPs in nature. I will focus on mapping the barriers that limit how VIPs learn about places to visit, plan their trip, and explore the natural environment. I will then use participatory design methods for co-creating high-fidelity prototypes of technological interventions to encourage exploration and engagement with nature.

In recent years, there has been a shift in HCI research towards the design of assistive technologies (AT) catering to the needs of people with disabilities. This has been evident in the growing number of submissions to leading conferences such as the ACM Computer-Human Interaction (CHI). For example, with a growing number of submissions related to accessibility and design of assistive technologies. According to the ACM digital library search, the number of submissions has more than doubled since 2010. Moreover, the steady growth in number of submissions to ASSETS in the past 5 years is indicative of the growing research in the accessibility space.

A vast majority of these papers focused on visual impairment, which is an area of growing interest in HCI. This has led to the development of various technologies to assist VIPs in activities of daily living (ADL) including accessing online content [19, 27], reading books [11, 21], and navigation [12–14]. However, little attention has been given to hedonic experiences and motivations of VIPs in the context of outdoor nature. This narrow focus of technology for VIPs calls for a better understanding of what VIPs need, their motivations, and experiences where exploration and enjoyment of the surrounding is the aim.

MOTIVATION AND PROBLEM STATEMENT

An estimated 285 million people live with visual impairment worldwide, of which 39 million are blind [26]. In the UK, there are 2 million people living with visual impairment of which approx. 330,000 are registered blind [9]. The rate of prevalence of visual impairment and blindness is increasing. In the last two decades, the number of blind people has increased 17.6% from 30.6 million in 1990 to 46 million in 2015 [4]. It is estimated that the number of people living with

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sight loss worldwide will triple due to population growth and aging. [10, 23].

Loss of vision affects people’s quality of life by limiting their ability to manage their daily activities. The impact of sight loss on people’s lives varies based on the severity of sight loss and the age of onset but mostly impacts the individual’s independence. The older blind population have the highest risk of losing independence and suffering from loneliness and depression as a result of sight loss [16, 22].

The absence of vision also limits a blind person’s ability to participate in leisure activities and affects quality of life. For many people who lose sight later in life, sight loss means being unable to continue enjoying participation in leisure activities. Open spaces such as parks are great for exploration, relaxation, socialising, and physical activity [2, 3, 15] but most of these places are not accessible for blind people due to lack of appropriate wayfinding signage, landmarks and cues to enable blind people to explore and in general lack of facilities to support the blind visitors in exploring open spaces [20, 24]. Research on exploration and participation of people with disabilities in leisure activities is limited and does not investigate exploration and open space experiences of blind people.

RESEARCH APPROACH AND METHODS

This research seeks to answer the main research question: How can technology encourage exploration and mediate engagement of VIPs with nature?

The research follows an exploratory approach to understanding the needs of VIPs and an inclusive and participatory approach to design and evaluation of prototypes to enhance VIPs’ park going experience. A summary of the research approach and the methods is given in Table 1.

Table 1: Research approach and methods

	Goal	Method
PHASE 1: UNDERSTANDING NEEDS	Exploring the use of technology by VIPs and opportunities for leisure	Online survey
	In-depth exploration of the experiences of VIPs in outdoor nature, their needs, barriers and strategies for overcoming these barriers	Semi-structured interviews Focus group
	Exploring and comparing the needs of VIP and non-VIPs when interacting with nature	Observation
PHASE 2: DESIGN	Design of technologies to encourage interaction and engagement with nature	Participatory design methods

DISSERTATION STATUS

I am currently approaching the end of my second year in a four-year doctoral program. Currently, I am conducting a focus group study with VIPs and habilitation specialists, and support workers. Next, I aim to conduct in-situ observations with VIPs and non-VIPs people in parks around London following which will lead to the end of phase one of my research. In phase two, I aim to use participatory design methods such as co-design workshops for generating ideas and co-creation of prototypes with VIPs and habilitation specialists. At the doctoral consortium I am particularly keen to gain insight into participatory design approaches which are applicable to and can be adapted to include VIPs.

PRELIMINARY RESULTS

The preliminary results from the interviews [1] and focus group [in preparation] are consistent with the existing reports in that VIPs experience a number of barriers [5, 17] when visiting parks. Specifically, access to information prior to visiting a park and safely whilst exploring the parks are not met with the existing services provided. Many of the VIPs interviewed use technology to navigate the built environment but find the technology to be limited in parks. Moreover, the results also suggest that there is a desire to explore nature in open spaces and that a need for contextual information about the plants and animal wildlife in the park, the historical context, and wayfinding information to enable exploration is needed.

INTENDED CONTRIBUTIONS

This research intends to make two main academic contributions.

1. An in-depth understanding of the experiences of VIPs in nature including the needs, barriers and affective interaction (emotional and sensory experiences) with the environment. This will be valuable contribution to HCI research and useful for the design of AT for VIPs.
2. The design of prototypes to encourage park exploration and engagement with nature. As there are currently no technologies that facilitate park going experience for VIPs, the design of technology as part of this thesis will be a novel contribution to HCI research.

SOCIAL IMPACT

The outcomes of my research will also include evaluation of the prototypes in parks around London which will be used by park visitors. It is my hope that my research will make a positive impact on the wellbeing of the VIP community in London and will encourage people to engage with nature.

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