What Can We Expect from Navigating?
Exploring Navigation, Wearables and Data Through Critical Design Concepts

Abstract
What is it to navigate or to be navigated? How, and through what, is information communicated to us? Do our interactions with space need to be limited to when we are moving through it? This paper describes a collection of design concepts generated as part of the initial stages of a research project that combines a critical design mindset and research through design process to explore these types of questions. The project seeks to problematise and diversify the discussion and understanding around pedestrian navigation, wearable technology, crowdsourcing and human data interaction. The goal is to develop one of the concepts using research through design as part of PhD research studies, leading to possible future applications.

Author Keywords
Critical Design; Pedestrian Navigation; Wearable Technology; Human Data Interaction; Crowdsourcing

CSS Concepts
• Human-centered computing~Interaction devices

Introduction
Navigation, from the Latin navigatio, can be understood as meaning voyaging or journeying i.e. having elements of the experiential, not simply moving from
one point to another. *Navigatio Sancti Brendani Abbatis* (The Voyage of Saint Brendan the Abbot), for example, is a collection of mediaeval stories and adventures of a travelling Irish monk [16]. However, as our knowledge of the world has become ever more detailed, the way we see navigation and how we navigate ourselves has become more rigid. Even ‘getting lost’ and experiencing ‘serendipitous moments’ are seen as formulaic, able to be created with data [12,18]. Technological elements such as wearables, crowdsourcing and geographic information systems (GIS) are predominantly used to confirm and reinforce this approach to navigation.

What if these technological elements could instead be used to challenge and explore these conventions? What if the resulting concepts could be used to study alternative experiences in navigation? To conduct this form of research, a design approach that is explorative, conceptual and that asks ‘what if?’ questions is required. Critical design, a facet of critical practice [24], is an area of the design discipline which aims to challenge a topic’s orthodoxy (such as science, technology and society) and the designed objects within it by using design methods and artefacts. In this context, critical design has facilitated the creation of concepts that sit on the edge of what is accepted as a navigational tool and experience. This paper presents some of the results of this work-in-progress design stage in the form of three areas of interest, describing related concepts and detailing how one concept will be used in a research through design (RtD) PhD project. By describing these concepts, this paper seeks to disseminate the notions explored in this process in order to create debate around what experiences we expect from the artefacts that navigate us.

**Pedestrian Navigation Research**

Pedestrian navigation (much like vehicular, cyclist, etc.) is a rich and complex subject that spans many disciplines including psychology, design and anthropology. Many streams of research seek to expand upon what is possible from a technological and experiential basis. There is a predominant focus on the optimisation and refinement of systems that provide ‘A to B’ navigation through ‘turn-by-turn’ navigational instructions with screen-based mediums. Whilst the research is integral to the field, it is often critiqued by academics, proposing more explorative forms of navigation (e.g. [20,21,25,31]). However, their ‘critical’ work mainly remains within the confines of what is easily identifiable as navigation apps or wearables and does not use the mindsets and methods typically seen in critical design. This presents an opportunity for research to be conducted with these methods.

**A Critical Design Exploration**

Pedestrian navigation is a prime area for problematisation. To facilitate this, a design exploration [7] with a critical design mindset was conducted at the start of a PhD project and in parallel with the literature review. This design exploration sought to engage with navigation and its connected topics, including wearable technology, crowdsourcing, GIS/mapping, and data visualisation, to discover how these could be disrupted. A key consideration when creating the critical designs was the balance of provocative or unexpected uses of technology and defamiliarization. If the concepts were too unfamiliar it ran the risk of disengaging its intended audience, too familiar and they would accept it with little or no reflection [19]. Various designs were generated using methods such as ludic design [8] and post-optimal design and user-unfriendliness [6]. A
workbook [9] was used to store and communicate ideas through ambiguous and abstract images. These images were then interpreted into potential design concepts, some of which will be discussed below.

**Three Areas of Interest**

After reviewing and discussing the workbook and design work, several recurring ‘themes’ or ‘areas’ of interest were identified. For the purpose of this paper, only three areas, and promising related concepts, will be detailed below. These areas are ‘Navigating and Experiencing the Intangible’, ‘Influencing Navigation’ and ‘A Data Hungry Home’.

**Area 1 – Navigating and Experiencing the Intangible**

We navigate through a multitude of phenomena daily (e.g. global warming, pollution, WIFI/mobile signals and litter) without being able to truly feel or quantify them. Projects have sought to engage and sense phenomena including radio waves [13] and Wi-Fi [4], permitting a new experience when moving through space. This has the potential to change traversal decisions based on the new information. Perhaps if we sense WiFi through vibration we might change where we choose to walk. The concepts in this area include ‘Future Sea Walking’ and ‘Constricting Shirt’. Future Sea Walking (Figure 1) is a large wearable device that provides its wearer with the experience of walking in the sea of the future. It does so by using GPS, sea water (in a container), pipes, valves and computer models of future (raised) sea levels. Once the user steps into the future sea, the water will be released at the corresponding depth on the trousers. As the user walks further ‘out to sea’, so the higher valves release water. Constricting Shirt is designed to enhance the experience of moving through polluted space in a mildly unpleasant way. This is done by slightly restraining its user’s breathing in relation to the pollution in the vicinity. The wearable could use a particulate sensor and ‘exaggerate’ the impact of the pollutants on the respiratory system by tightening straps or inflating bands around the torso.

**Area 2 – Influencing Navigation**

Data, such as social media activity or location tagging, can be used to influence direction and path structure (e.g. [1,26,29,32]). However, approaches that engage with environmental or in-situ social phenomena are relatively lacking. In this vein, concepts such as ‘Va au Vent’ and ‘Excuse me!’ were created. Va au Vent (go with the wind), is a trackable object that can cover a large distance in the wind (Figure 2). The user would release (preferably on a windy day) and then locate it with a corresponding tracker and repeat as desired. Excuse me! plays on people’s tendency to apologise for situations such as bumping into or being bumped into. This concept consists of a wearable that has some contextual understanding and alters an aspect of its user’s navigational plan (path, destination, transport mode, etc.) when it picks up words such as ‘excuse me’, ‘sorry’ or ‘pardon’. Both concepts put part of the navigational control in the hands of uncontrollable and unpredictable aspects of life.

**Area 3 – A Data Hungry Home**

In-home artefacts that collect and interact with data from indoors or outside and display it have been explored before. These devices [2,10,11,15] seek to contextualise the home in relation to its unique physical location in lieu of acquiring generic information that is widely available (such as national television) [11].
concepts such as ‘Plant Hostage Taker’ and ‘Colour Collector’ were created. These concepts seek to explore novel ways of ‘feeding’ these ‘hungry’ devices by ‘foraging’ for data from the outside world. Plant Hostage Taker (Figure 3) presents a peculiar interaction where a house plant is taken hostage by a device that withholds sunlight. The user must ‘navigate’ themselves sufficiently for the device to open itself. Colour collector combines wearable technology with in-home data visualisation devices. The wearable (Figure 4) is composed of passive data collection (humidity, temperature, pressure, altitude, etc.) and an environment engagement device (in this case a colour sensor). It is designed to enhance its user’s ability to interact with an environment, influencing how they choose to navigate through space [27]. The in-home device, called a Periplus (Figure 5) displays the data in an indirect manner that approaches data physicalisation, casual visualisation and ambient displays [14,30,33] in lieu of a screen. The Periplus was inspired by works that seek to visualise natural data through technological means (e.g. [5]). The user can navigate with the ability to engage with the outside in an alternate manner and is able to plan and execute their navigation with questions such as “what will my house look like when I get back?”.

Catalysing Design Research Studies

The use of critical design has led to discursive and occasionally absurd concepts around the topic of pedestrian navigation. Developing an idea and generating models or prototypes for the purposes of demonstration and dissemination in a ‘showroom’ [22] would be a valid next step. However, the work is part of a RtD process that seeks to develop a selected concept. Of the concepts, Colour Collector represents a navigational system that could benefit a user before, during and after navigation and posits a relationship between the house and the outside that is mediated by its occupants. It can also be used for opportunistic crowdsensing (a form of passive crowdsourcing) [23] and aligns well with gamification [17]. Gamified crowdsourcing incentives have yet to explore the use of physical outcomes, favouring instead virtual rewards [28]. As such the Colour Collector has been selected for use in a descriptive study [3]. The study will be conducted as a comparison of typical crowdsourcing systems with the Colour Collector in order to determine if it could be a valid incentive mechanism and/or attract individuals to crowdsourcing. It will also be interesting to consider how Colour Collector contributes to the spectrum of approaches in exploratory navigation and how users will build a relationship with the Periplus as it becomes “part of the furniture” [10:3456].

Conclusion

This paper has presented critical design concepts created from the generative stages of a work-in-progress design research project. None of the concepts propose a solution to a problem. They instead pose questions around assumptions of navigational experiences the artefacts we use to facilitate them. Can we navigate through future seas? Where will we end up if we let external phenomena guide us? How will people move through space if they are doing so to harvest data for an in-home product or to save a plant? Furthermore, a design has been selected to be part of a research study to potentially advance understanding around wearables, crowdsourcing and data interaction. This additionally demonstrates that critical practice is not only useful as a stand-alone process but as a generative tool in other design processes.
Acknowledgements
The research is being conducted with the funding and support of the EPSRC Centre for Doctoral Training in Embedded Intelligence (under grant reference EP/L014998/1), Loughborough University and Ordnance Survey. The authors would like to extend their thanks to the reviewers of this paper for their feedback and advice which was key to the refinement of the paper.

References


