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Title: Relational Space as a Framework for Design

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Abstract
Space and spatiality have been some of the biggest influences on HCI research. However, as technology increasingly moves into mobile contexts there has been a growing need to understand the sociological and cultural aspects of our connections to our environments. This paper presents a conceptual framework developed from the notion of 'relational space' from cultural geography. It discusses the ways this framework has helped us re- conceptualise the challenges and opportunities presented by space and spatiality. We do this through a discussion of a case study that investigates how knowledge and understanding are produced by staff at a national park.

Key words: relational space, cultural geography, interaction design

Author biographies
Chris Marmo is a PhD Candidate in the School of Mathematics and Geospatial Sciences at RMIT University, Australia. He has Bachelors degrees in Cognitive Science and Computer Science from La Trobe University, and has worked in the fields of User Experience and Interaction Design. His PhD is exploring the gaps between cultural geography and ubiquitous computing, working in partnership with Parks Victoria.

Introduction

As computing and technology moves 'into the world' (Dourish & Bell, 2011), the connections that people form to the environments they live, work and play within are of increasing interest to designers and technologists. Over the past decades, the practices of our everyday life have become increasingly coupled with technology, and that technology is increasingly finding its way into non- traditional, mobile contexts (Kitchin & Dodge, 2011). With technologies now regularly either *with* us or *around* us, these new mobile contexts raise a number of questions regarding our relationship to the spaces we live and move within, and the role technologies play within that relationship. Whether it be the investigation of the ways people navigate cities-based digital infrastructure, the ways in which spaces such as airports have become entirely contingent on the software that runs them (Kitchin & Dodge, 2011), or the role of mobile phones in bridging digital and social divides, gaining an understanding of technology's role in facilitating and producing understandings of space is of increasing importance.

Whilst there are still many challenges involved in the design of technologies that sit within these mobile contexts, we feel that the increased attention towards the cultural and sociological aspects of our connections to our environments (Brewer & Dourish, 2008; Bidwell & Browning, 2009) indicate that not all of these challenges are strictly technical. In this time of increasing 'messiness' in technology that resides 'in the world' (Dourish & Bell, 2011), we feel that providing a cultural and sociological exploration of the connections we form to our environments is an important contribution to make.

As such, this paper documents the early stages of a case study that uses the notion of 'relational space' – a concept borrowed from cultural geography that offers a means of examining the way understandings of an environment are *produced* – to investigate such connections. Based in a national park, our study shows how relational space was a useful frame through which to understand the social and cultural processes that occur within the park for the purpose of technology design.

The Affective Atlas Project

This research is being conducted under the umbrella of a larger research collaboration between Parks Victoria and RMIT University: the *Affective Atlas* project (Cartwright, et al., 2008). Parks Victoria is a state government body based in Victoria, Australia charged with managing the state's protected natural terrestrial and marine parks. The *Affective Atlas* project was designed as a cross- disciplinary investigation into the role of cartography and "web 2.0" technologies in this park management: it aimed to explore the implications of participatory web technologies on the design and formation of an 'affective atlas' to be used by Parks Victoria within their park management practice. 'Atlas' was used here in the broadest sense of the word, where

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geographically relevant information was to be mapped or visualised. The 'affective' moniker spoke to the types of information to be communicated through such an atlas – rather than simply representing contour lines or place names, it aimed to show a different perspective on the locations in the 'Atlas'. As such, the broader theoretical goals of the project span a number of areas; from exploring new ways of representing data about place where that data was obtained in a participatory, user-generated manner, through to understanding how more subjective, affective meaning could be 'captured' and represented. Parks Victoria is the industry partner on the 'Affective atlas' project. If the theoretical concerns of the project were with representing a certain kind of information, Parks Victoria's concerns are a step back from this: they want to explore ways of better utilising the 'knowledge' it and its staff have about the places they manage. Currently, valuable park specific knowledge, obtained by rangers through years of experience, is inaccessible to other rangers and vanishes completely when they move on. Beyond simply representing information, Parks Victoria were therefore concerned with gaining a better understanding of what their staff know about the parks they manage, and how they gain that knowledge.

Given these theoretical and practical interests, our research was founded on questions of environmental understanding. What and how do rangers learn about the parks they manage? And, how do they share and negotiate that knowledge? Beyond merely technical or representational concerns, we felt that these questions were integral to the success of the project, and we subsequently turned our attention to investigating the social and cultural aspects of environmental understanding. We did this by applying the concept of 'relational space' from cultural and human geography to the examination of national park management.

Our study in based in Wilson's Promontory National Park (the 'park'), one of the most iconic and highly frequented parks in Australia.

Space and Technology

Our project aims to investigate the relationship between Space, technology and environmental understanding. Space and spatiality, whilst not always explicitly stated, have been some of the major influences on Human-Computer Interaction (HCI) research – whether that be in reference to digital environments as "mirror *worlds*" (Gelernter, 1991), media or collaboration *spaces* (Greenhalgh & Benford, 1995), or as evident in the number of other spatial metaphors in use, such as "*desktop*", "discussion *forum*", "data *warehouse*" or "co- *presence*" (Harrison & Dourish, 1996) and "co-*location*" (Zhao, 2008). However, beyond being a source of convenient metaphors to be emulated in the virtual, space and spatiality have generally been treated as a source of problems to be solved through technical solutions.

At the root of this positivistic approach to Space is the definition of it as an abstract container within which actions occur and objects reside (Thrift, 2003). Within this, it is often viewed either as a Cartesian plane within which to locate people or things, or as the stage on which more interesting social processes play out (see concepts of 'place', Harrison & Dourish, 1996). Through our research, we have found that Space and spatiality are commonly framed as problematic in three main ways. Before moving on to a discussion of our approach to Space when designing systems within the Affective Atlas project, we will discuss this traditioanlly problematic notion of Space briefly now.

Space as an inconvenient source of disconnection

By limiting its view of Space to one of an abstract container within which objects exist and actions occur, HCI has often positioned Space as a stage that keeps people, information and objects inconveniently separate across physical and temporal distances. Researchers have attempted to solve the problems of *disconnection* - between groups of people, and people and information - through various forms of *transduction*; that is, an act of compression that aims to overcome physical and temporal distances (Belloti & Bly, 1996), and where technology is seen as a way of bridging those distances by creating visual and acoustic links between geographically split locations (Bly, Harrison & Irwin, 1993).

Space as devoid of meaning

As computing has become increasingly mobile, the kinds of problems posed by Space have similarly shifted in focus to the relationship between people and the spaces they move within. Rather than focusing on bridging physical or temporal gaps between people or information, systems such as WebPark (Raper, 2007) address spatial concerns in a way more aptly described as *augmentation*. Systems such as this aim to solve a different kind of *disconnection* - one where people are separated from meaningful social context. Here, the locations people move within are seen as devoid of any meaning intrinsically, or are treated only as context to meaning that is elsewhere - typically in databases containing geographically tagged content. As such, these systems aim to solve this by *augmenting* space with computationalised information in the hope that it provides that missing social context to locations. In these solutions, space is, at best, viewed as a computational black spot upon which socially meaningful information (as deemed by the designers) can be *augmented*.

Space as meaningful, but not meaningful enough

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In examples where Space has been recognised as meaningful, it is often positioned as not being meaningful *enough*. WebPark (Raper, 2007), whilst mainly aiming to augment a natural environment with information from formal guides and accounts from other tourists, also aims to *expose* social context and meaning that is 'in place' but not visible to its users. Here, Space is treated as being somewhat devoid of information - through footprints, broken twigs, or wear along walking trails. However, by offering visualisations of aggregated information such as walking speeds and visitor frequency - purported to expose the popularity and accessibility of trails - Space is treated as not being informative enough. Through the use of this and other systems, researchers involved with WebPark and its ilk purport that the system leaves and exposes social traces in physical space that would not otherwise be visible.

Singular versus Relational Space

Within the Affective Atlas project, we have attempted to take a non-problematic approach to notions of Space and spatiality. To do this, we have applied relational notions of Space from human and cultural geography to the design of technology systems. Whilst these problematic approaches to *transducing*, *augmenting* and *exposing* Space in HCI have been fruitful in a number of ways (the success of GPS navigation is a good example), they can also be seen to impoverish space itself. At the core of these attitudes is the view of Space that is an abstract container that only houses interesting phenomena, is not meaningful in its own right, or simply not meaningful enough. However, it is well acknowledged in cultural geography that, rather than being the stage for more interesting phenomena and interactions to take place, Space is the *product* of these interactions (Thrift, 2003). Instead of being conceived of as a singular, abstract and static stage, cultural geographers consider space as pluralistic, dynamic and grounded in the processes that produce it (Ibid.). As these networks shift and change, they continue to produce their spaces.

We believe that by examining the nature and type of Spaces within which technology resides - that is, the relational forces that *produce* them - HCI may be able to take a different approach to examining the relationship between People, Space and Technology. In the context of the Affective Atlas project, this has meant investigating the social processes that occur in and around the case study area at Wilson's Promontory National Park.

Relational Space as a Frame for Design

Through a series of qualitative methods borrowed from the social sciences, a multi-sited ethnographic study was conducted in order to reveal the kinds of interactions and processes that combine to *produce* the spaces of a National Park. The data from derived from these methods – a series of semi-structured interviews, along with photographic and audio data that was geo-tagged and time-stamped – was analysed using relational notions of Space from human and cultural geography. In this way, Relational Space was used as a framework for analysis that allowed us to consider a non-problematic notion of Space, and its role in the design of technology for use in the National Park. Before moving on to a discussion of the implications of this data, it is necessary to more closely define Space, and how it has been used in this project. In doing so, this section will outline the framework for analysis that was used in the Affective Atlas project.

'Space' is the "fundamental stuff" of cultural geography (Thrift, 2003, p. 85). Within this discipline, Space is considered the product of complex social, political and temporal interactions that is in a constant state of remaking and becoming (Kitchin & Dodge, 2011). Rather than viewing it as a static, singular and abstract container within which more interesting social phenema occur, it is viewed as the result of these phenomena; the result of "bringing things into alignment" by different networks, flows and processes (Thrift, 2003). To study Space then is to examine not *what space is* but *how space becomes*.
Relational theories of Space were derived out of a recognition that the positivistic approaches to spatial understanding - such as those present in much of HCI's work dealing with spatiality - were seen to be devoid of any social meaning or intent, and ignored much of the embodied, lived experience of being-in-the-world (de Certeau, 1984). According to sociologists and geographers such as Urry (2007) and Giddens (1984), theories that reduce space to a series of computational models overlook much of how we understand the world. By focusing on the ways in which space *becomes*, relational space has provided sociologists and cultural geographers a frame through which to examine particular *ways of understanding* that are tied up in our interactions with each other and our environment. We believe these frames may also be useful for HCI and particularly the *Affective Atlas* project. Relational theorists typically discuss four main categories of space, and we used these as our framework for analysing the qualitative data collected in the park. These categories are present below.

Networked Space

This is the most common conceptualisation of relational space (Thrift, 2003). Within *networked* accounts, Space is viewed as something that emerges from *networks* of complex relationships. Rather than simply referring to a social network or a technology network derived from software and infrastructure, 'network' is used here to describe more abstract phenomena comprising sets of institutions, knowledge practices and artefacts (Thrift, 2003). *Networked space* takes on different forms depending on the actors involved, and the examination of different actors is therefore an examination of different types of Space. Within the Affective Atlas project, the notion of *networked space* has guided investigations into the interactions different groups of staff have with each

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other, across different locations. Similarly, it has looked at how various landscapes of the park become actors in these networks in their own right – where the park is treated as an important interactant in the construction of knowledge about the case study site.

Flow Space

Otherwise known as mobility (Urry, 2007), *flow space* describes the space that is produced from the flows of people, information and goods. Rather than concentrating on the boundaries, origins or endpoints of the bounded spaces prevalent in networked space, it treats movement itself as the unit of analysis, where these flows produce space in their own right. By following the flows and people and information across the dispersed geographical locations within Parks Victoria, we were able to more closely examine the importance of staff's physical location in the formation of their identity within the organisation, where their most regular workplace became an index to a set of stereotypical work practices and experiences they were assumed to possess. Similarly, notions of *flow space* highlighted the importance of movement within the park, where the daily practices of staff, and the paths they take through the park, were shown to be meaningful and important sites of knowledge for these staff.

Temporal Space

Time and space, whilst often treated as separate entities in HCI, are viewed as the same entity in relational space. If relational spaces are in a constant state of becoming, then time is the vehicle driving this production. Instead of thinking of space and time as a dichotomy, it is more useful to consider Space as a space- time entity that is indivisibly both spatial and temporal (Urry, 1985). Spaces should not be understood as 'slices through time', but rather as intrinsically tied up in temporality (ibid.). Theorists such as Massey (1995) argue that space is equally produced from the histories that coalesce to construct their present. She states that "the past is present [in space] in a variety of ways" (ibid., p. 186) - reference to the ways in which spatial properties such as buildings, place names and mythologies influence our understanding of the present. Within the park, the historical significance of landscapes in the park was a key ingredient in our research. Through qualitative data recorded at locations, the role of the park as a site of stories became apparent. Through the sharing and telling of stories about important experiences or observations the occurred in places, staff made places meaningful to the extent that place names were indexical to certain important events or ecological concerns.

Embodied Space

Often referred to as 'place' within cultural geography (Thrift, 2003), embodied space refers to the lived, felt experience of an environment. Whereas 'place' in HCI has often been used to refer to the realm of social activity (Harrison & Dourish, 1996), it is used in human geography to refer to the perspective of an environment from a combination of embodied movements, senses and emotions (Tuan, 1977). Theories of embodiment have helped HCI avoid dichotomising the mind, body and environment (Dourish, 2001) - within human geography, it has had similar effects (Tuan, 1977). *Embodied space* brings the focus back from something 'out there', external to our bodies, to what individuals actually experience, and how these experiences are selected, shaped and coloured by what we can sense, feel and know (Greenbie, 1981). This notion of space was particularly useful as a framework for analysis when investigating the affect of a flood that occurred in the park in early 2011. We investigated the *affective space* of the park, and explored the way that personal connections to the park, formed through intimate knowledge of them, led recovery efforts.

Relational Space and The *Affective Atlas* project

These four ways of conceptualising relational space have provided the *Affective Atlas* project with a framework to examine the way the spaces of a National Park are *produced*. The following examples show how we have begun to think of the park and Parks Victoria as a result. Whilst we have touched on some of these in the previous section, we will now expand upon the themes the emerged from our research. Each of these has provided inspirations for the design of systems whose aim is to reside in the interactions that already occur between park staff and aspects of the park itself.

The Park is many spaces

The notion of *networked space* suggests that the concept of the 'park' is produced out of numerous networks that each have their own perspectives of it. Within these networks, the park means different things to different people. Two examples out of many highlight how the park is a place in which to set up monitoring experiments for scientists in the city office, or a place of personal connections to symbolic places for staff in the park itself. If each network produces its own perspectives and knowledge of the park, rather than being purely separated by geographical or temporal distances, staff within the organisation can be seen as disconnected by their role within the organisation, their training, or their past experiences. Technical approaches to disconnection have typically focused on *transducing* space across physical and temporal distance. The concept of networked space though has led us to consider bridging the gaps between distances in *practice* and *experience*. As such, we have begun to think about ways of encouraging the spaces of different networks to discover and understand each other. To move away from the problematisation of disconnection, we have also begun to consider how technology can be used to foster the development of these individual networked spaces: whether they are spaces of scientific enquiry, or spaces of personal experience.

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The Park is historical

The notion of *temporality* has given us a way of considering concerns within the organisation relating to cultural heritage, historical data and personal recollections within the park. Indigenous cultural heritage is a key management area for the organisation, and they are actively working to incorporate historical practices with current understandings of environmental management, whilst simultaneously preserving places of historical significance. Over the last 100 years, the organisation has also collected its own historical data – including records of fire behaviour and flood recoveries, changes in vegetation and landscape over time. Coupled with the many years of personal experience staff have within a park, a key challenge for Parks Victoria is in understanding the ways in which the 'past' - in its many different forms - can be incorporated into current practice. The Affective Atlas project has therefore begun to investigate the ways in which technology can provide these various histories an alternative way of 'coalescing in the present' (Massey, 1995).

Place names are sites of knowing

As information, stories and recollections about places flow within and between networks of staff, place names become an *index* to knowledge. Whereas HCI has often looked towards *augmenting* locations with socially meaningful context, we have investigated the way that locations - in the form of place names - are already meaningful when embedded within the flows of communication within the organisation. We found that during emergency events, place names become sites of understanding that shift and evolve as rangers add to and appropriate meaning from them. Building on Bidwell & Browning's (2009) notion of *indexicality*, we have begun to investigate ways that place names can both evolve from and be embedded within narrative technologies that becomes meaningful to the organisation over time.

Discussion

When contrasted against the typical approach within HCI, these broad themes for design have provided an alternative way of conceptualising Space. Whereas HCI has traditionally treated Space, either explicitly or implicitly, as a static stage for more interesting processes, our research has painted a picture of Space that is dynamic and shifting, and produced in a relational manner. In doing this, notions of relational space have provided us with a foundation for rethinking the relationship between space, technology and understanding.

By exploring the multitude of ways Space is produced within the organisation, and more specifically within the park, we have seen that the park is not just a singular place, but a pluralistic and dynamic entity being constantly made and re-made. Through this, we have taken the approach that environmental understanding is something that is derived from the interactions between staff and landscapes of the park, and it is these varied interactions that produce different *spaces* within which unique forms of knowing reside.

As a framework for design, Relational Space has provided us with a number of benefits. Firstly, it acted as a guide in the analysis of large quantities of qualitative data, and allowed us to move away from overly technical or location-based analysis. By first understanding that the park is comprised out of and produced from any number of different spaces, we were free to begin investigating the role that staff outside the physical bounds of the park played in the construction of knowledge about the park. Similarly, by moving away from a notion of Space that was instrinsically tied to cartesian representations, were were able to conceptualise a more dynamic and relational notion of entities such as landscapes and place names, and examine the ways in which those became meaningful over time, and how that meaning was shared amongst rangers.

It has also helped us answer questions grounded in the practicalities of staff within the park. In response to the question *What and how do rangers learn about the parks they manage?* Relational space highlighted that beyond formal representations of data about the park, knowledge about the park is bound up in the Spaces that define it. Similarly, in response to the question *how do they share and negotiate that knowledge?* The imporant role of the park itself was highlighted. Here, the landscapes of the park became important cultural entities that housed the collective memory and experience of staff.

Unlike traditional approaches in HCI, this research has shown that Space can be treated in a non-problematic way where it is something meaningful in and of itself. Future work will build on the notion of relational space as a framework for design by applying the themes presented here in the design of technology whose aim is to better reside in the relationship between staff and the park.

Conclusion

Cultural perspectives on examining environmental understanding have become increasingly important as technology moves 'into the world' (Dourish & Bell, 2011). The increased complexity of our relationship between ourselves, technology and the environments we live, work and move within calls for a more nuanced, cultural and sociological approach to space and spatiality.

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Within HCI, spatial concerns have traditionally been problematised and approached in a techno-centric manner that reduces space to the notion of an abstract container that only hosts more interesting phenomena. We believe that relational space provides an alternative way of conceptualizing spatiality for technologists and designers. By examining the practice of park management through the frame of *networked space*, *flow space*, *temporal space* and *embodied space*, we have found that relational space – and its focus on examining the networks, processes and interactions that produce meaning about environments – has been a fruitful way of conceptualising the park when aiming to design technology that fits within the networks, flows and complex temporal and embodied interactions that produce meaning.

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References

Bidwell, N. J., & Browning, D 2009). Pursuing genius loci: interaction design and natural places. *Personal and Ubiquitous Computing,* 14(1), 15-30.

Bly, S., Harrison, S., & Irwin, S 1993). Media spaces. Communications of the ACM.

Brewer, J., & Dourish, P 2008, Storied spaces: Cultural accounts of mobility, technology, and environmental knowing. *International Journal of Human-Computer Studies*, 66(12), 963-976.

Cartwright, W., Miles, A., Morris, B., Vaughan, L., Yuille, J 2008, Developing Concepts for an Affective Atlas. In *Moore, A., & Drecki, I eds, Geospatial Vision - New Dimensions in Cartography*. Springer- Verlag, Berlin

de Certeau, M 1984, The Practice of Everyday Life. University of California Press.
Dourish, P., & Bell, G 2011, Divining a Digital Future: Mess and Mythology in Ubiquitous Computing. MIT Press.

Gelernter, D 1991, Mirror Worlds: The Day Software Puts the Universe In a Shoebox... How it Will Happen and What It Will Mean?. New York.

Giddens, A 1984, The constitution of society. Cambridge.

Greenbie, B 1981, Spaces: Dimensions of the Human Landscape. New Haven and London: Yale.

Greenhalgh, C., & Benford, S 1995, MASSIVE: a collaborative virtual environment for teleconferencing. ACM Transactions on Computer-Human Interaction, 2(3), 239–261.

Harrison, S., & Dourish, P 1996, Re-place-ing space: The Roles of Place and Space in Collaborative Systems. In *Proceedings of the 1996 ACM conference on Computer Supported Collaborative Work*. 67 − 76.

Kitchin, R. & Dodge, M 2011, Code/Space: Software and Everyday Life. MIT Press.

Massey, D 1995, Places and their pasts. History Workshop Journal (39,182-192.

Raper, J 2007, Design constraints on operational LBS. in *Gartner, G., & Cartwright, W. & Peterson, M Eds. Lecture Notes in Geoinformation and Cartography* pp. 13–25, Berlin, Heidelberg: Springer Berlin Heidelberg.

Thrift, N 2003, Space: The Fundamental Stuff of Geography. In *Valentine, G & Halloway, S Eds, Key concepts in geography.*

Tuan, Y-F 1977, Space and Place: The Perspective of Experience. University of Minnesota Press, Minneapolis, MN.

Urry, J 1985, Social relations and spatial structures.

Urry, J 2007, Mobilities. Polity Press.

Zhao, S 2008, Copresence as “Being With”. In *Information, Communication & Society.* 11(4, 565– 583.

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