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The Centre is directed by Professor Steve Benford, the Training Programme Manager is Professor Sarah Sharples and the Centre is managed by Emma Juggins.

The DTC is a 4 year PhD programme which focuses on cohort training to equip PhD students for careers in industry, academia or research. The programme includes a taught element and a 3 month industrial internship.

Contents

We are delighted to include in this brochure research highlights from 64 students from four Horizon DTC cohorts who commenced their PhD between 2009 to 2012.

Cohort 2009

The Horizon DTC cohort 2009 commenced their studies in September 2009 and will complete their PhD in September 2013.

There are 16 students in the cohort whose disciplines range from Art and Design and International Policy to Computer Science, GIS, Business and Engineering.

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Ahmed Yousif Ahmed

PhD Title
Designing technologies to support sequencing in collaborating musical performances

Abstract:
The rapidly increasing capability and ubiquity of music technologies provides new and exciting challenges for the design of interfaces. Performance settings such as bars, pubs, nightclubs and radio play host to fluid, dynamic and inherently collaborative musical experiences that combine aspects of consumption, performance and composition. An important feature shared by many of these experiences is the negotiation of individual and shared repertoires or playlists, and the on-the-fly sequencing of music that this facilitates is often integral to the performative aspect of the experience. How can we provide support for the negotiation of these repertoires whilst maintaining the expressive and artistic integrity of the performance? Through ethnographic studies of performers in three of these settings and subsequent participatory prototype designs, this thesis attempts to develop a framework of sensitising concepts and design considerations exploring ways in which technologies can support the creation, collection and sharing of these repertoires for both musical consumption and performance.

Ragad Mohammad Allwihan

PhD Title
Investigating Methods of Capturing and Sharing Experience in a Field Trip to Support Students Activity

Abstract
The important factor of field trip is to identify features in a landscape. Besides, it provides popular and memorable experience for the students to understand the different aspects of natural sciences. The experience in the naturally occurring contexts of everyday life as the contents of perception: thoughts, feelings and sensations. In their view, experience is more about how people feel about their lives. This is considered important information in the social and behavioural sciences: it has been studied by epidemiologists, by clinicians concerned with addictions and depressions and by researchers interested in work, education and family relations.
Note-taking is the practice of writing down pieces of information to fulfil two major functions: to record information and/or to aid reflection. The activity of note-taking seems to initially interfere with the appreciation and understanding of the surroundings. It is a common activity throughout all daily life and field of knowledge work. Any given note may include a variety of different formats, such as short texts, sketches, symbols, figures, numbers, etc. In addition, the collection of information can be classified into different types, e.g. temporary, long-term, confidential, private or public.
The rapid development of mobile information technology opens the door for a variety of mobile technology to become powerful aids for field work. It helps the students to collect, measure, record and share a rich diversity of information and experiences with other users, both in the real time and asynchronously.
This research aims to explore the use of mobile technology to facilitate capturing and sharing experience in undergraduate field trip.
The studies have been conducted with two undergraduate cohorts participating in different field trip setting; the Geography and Architecture. The Comparison between the two cohort groups indicated a number of common activities that can be considered generic to field study note-taking and some differences that may be discipline-specific.

Key Words: Mobile; Experience; Field Trip; Geography; Architecture; Note Taking

Jimmy Chim

PhD Title
Towards A Design Framework of Professional Trust for Online Creative Communities

Abstract
Adopting an HCI perspective, the research will explore the phenomenon of online professional trust and using a hybrid game theoretic approach will evaluate the types of trust tools and mechanisms required to establish and strengthen professional relationships in creative communities.

Antony Cousin

PhD Title
How can we design effective mobile device support to enhance the users' experience and enjoyment at large public events?

Abstract
Continued developments in device hardware integration and the range of software utilising them through mobile apps have led to ever-increasing and diverse ways of using our mobile devices. The proposed research intends to tackle the need to develop a stronger understanding of how to utilize these technological capabilities most effectively within the context of attending public events.
Unfortunately thus far the literature has been dominated by case-focused one-off developments with limited generalisable work. Whilst useful in terms of exploring the variety of ways in which emerging mobile technologies can improve visitors' event experiences, this has resulted in an incoherent output from the body of research, and a lack of practical, transferable guidelines regarding the development of mobile applications. In particular there is a significant gap in terms of how an event-based application can be delivered in a clear, intuitive and natural form over time spent at the event, given the complex blend of information, navigation, context plus additional 'crowdsource' data streams that may be sought. The disparate nature of the field of research has displayed a tendency within many projects to focus narrowly on the design and usability elements appropriate for one particular event context. This reinforces the sense that we are lacking concerted efforts to build a better holistic understanding of what effects the user experience across varying public event settings; why this varies depending on the event; and therefore, what designers should consider about the targeted context of their mobile applications and services in order to create better solutions.
It is hoped the outcomes of this work will include a revised framework for analyzing various event settings; clear design guidelines for this context; and in line with these guidelines, the subsequent evaluation of selected prototypes which utilise elements of novel smartphone technology to enhance public event experiences.

Jo Cranwell

PhD Title
The effect of delivering response inhibition training using a hand held device on increasing self regulatory resources

Abstract
The overall project aims to a) identify key contemporary data collection techniques useful to behaviour changes specialists b) explore the effect of motivational differences in adherence to behaviour change regimes and c) test interventions, based on psychological theory, to support these differences.

I am researching the 'strength model of self-control', in particular the 'training hypothesis' which suggests that self-control can be strengthened though regular training exercises. I combine this with exploring the role of mobile technology as a research tool especially in the assessment of behaviour and in the delivery of behavioural interventions. Of specific interest is health behaviour and human computer interaction.

Mark Dimond

PhD Title
Evaluating Extraction Functions for Detection of User's Journeys from Positioning Data

Abstract
Widespread GPS adoption on mobile devices has spurred academic interest in the feasibility of predicting users' geographic movements. A majority of this prediction relies upon the assumption that we can extract periods from position history data, conceptualised as *journeys* or *trips*, for input to prediction algorithms. Extraction functions, methods of performing this extraction, leverage changes in properties of the raw positioning data, such as speed and connectivity, to denote sections of the history analogous to the user's concept of a journey. Whether such consistently defined sections exist is unknown. Nevertheless, in the vast majority of cases threshold values for the extraction function properties are simply intuited by the application developer

(Monreal *et al*, 2009), or selected to target an estimate for the number of journeys required (Froehlich & Krumm, 2008).

This PhD has focused upon collecting ground-truth journey data from users that allows measurement of performance of these extraction functions. In the main study, users recorded the times at which they considered themselves to be starting or finishing a journey. At the same time, each carried a GPS device that records a trace for analysis of their movements. Properties of the trace, such as the user's movement, direction change, or GPS connectivity, are used to estimate journey state and hence extract estimated journeys. The extracted journeys for different properties are then compared with the actual recorded journeys in order to evaluate the properties (or combinations of properties) that best determine journey state, and the optimal settings for parameter thresholds of these properties.

Academic pedestrian route prediction work currently largely relies upon monitoring of GPS connectivity as indication of user activity: this can produce spurious journey data if signal is acquired when the user is, for example, in a garden or park. The course of research identifies and evaluates multiple other extraction functions which can be used to improve upon this, and hence significantly improve input data for route prediction work.

Mike Golembewski

PhD Title

How can models of artistic process be developed that (i) explore the implications of tool use by professional artists on specific stages in their working practices, and (ii) inform Human-Computer Interaction practice in regards to the design of tools for professional artists?

Abstract

To the non-artist, there is often a sense of mystery surrounding the creation of art. Skilled artists regularly perform acts of transformation: they take raw ideas, raw materials, thoughts, and observations, go into the studio, do something, and emerge with a finished piece of artwork.

That something is process; not mysterious, not a singular act, but rather a range of activities and actions that are employed by the artist in order to bring about that transformation. Conceiving of ideas, refining those ideas, manifesting those ideas into object form, refining those forms, finishing a piece... these are all different activities, yet all are aspects of process, engaged in at various times as an artist creates artwork.

Tools can be, and often are, used to aid in the range of different activities that comprise artistic process. Notebooks might be used to jot down rough ideas, quick sketches and rough models might be created with pen and paper, aesthetic variations on a theme might be explored and refined through the use of the camera, a final work might be crafted using a brush, or a chisel, or a computer. A wide range of tools are used across the full spectrum of process- related activities.

Although the activity stages comprising artistic process have been well explored, the impact and influence of the tools selected to aid in performing these activities have not.

Process activities all sit under the general umbrella of tasks related to making a piece of artwork, yet each stage of activity has its own distinct aims and requirements as well. Successful idea generation by artists, for example, is quite a different activity from that of successfully finishing a piece of artwork. The tools used by artists in order to perform these tasks must therefore be designed with different criteria in mind. A solid understanding of user and task are vital in the design and development of tools, particularly when dealing with tools based in emerging technologies. Yet at the moment, no frameworks or guidelines exist for the Human-Computer Interaction practitioner wishing to create technology-based process-stage specific tools for artists.

Rachel Jacobs

PhD Title

The Artist’s Footprint: Investigating the distinct contributions of artists engaging the public with climate data

Abstract

The Artist's Footprint investigates the role that environmentally engaged artists are playing in relation to engaging the public with climate data. Focusing on two studies of how the artist led collective Active Ingredient engaged the public with scientific climate change data through an interactive artwork and the design of an online platform for capturing, authoring and 'performing' climate data, that was then used by other artists engaging with environmental data. These studies draw on the perspectives of a range of artists, audiences and a climate scientist to reveal how this work was designed and experienced.

The Artist's Footprint investigates how the artists adopted a distinct voice that fostered an emotional engagement with data, rather than an informative or persuasive one. Charting the distinctive strategies, challenges and opportunities of artists engaging the public with climate data, including sensory engagement with data, temporal structures and the juxtaposition of different treatments of the data, suggesting that artists have a role to play in engaging the public with climate data, through interdisciplinary collaborations across science art and technology. The Artist's Footprint specifically reveals the distinctive contribution that artists provide to discourses within sustainable HCI by exploring new approaches to understanding and responding to the capture and presentation of this data.

Claudia Krehl

PhD Title

Using cognitive theories as a basis for multimodal interaction for mobile devices on-the-move

Abstract

Traditional interfaces still prevail even though they are very limited and cumbersome to use. They force the user to adapt a command driven language, which is very unnatural compared to language used when communicating with other people. They also fail to offer flexibility, which is crucial for the range of environments technology is used in as well as the range of people and their preferences and capabilities. Mobile device users face an additional set of challenges such as the need or desire to multitask, management of interruptions and unpredicted incidents, additional distractions and the fluctuation of settings. Multimodal interfaces are better able to support rich expressiveness using familiar communication modalities, and they are particularly well suited for mobile use, to minimise demands on the users' workload while keeping flexibility available.

Aims & Objectives

This research project has two main aims. Firstly, it investigates the cognitive resource use of tasks typically carried out by mobile device users when on the move. In order to achieve this objective, this research will use well know cognitive resource models such as the Limited Resource Model (Kahnemann, 1979) and the Multiple Resource Theory (Wickens, 2002). These models are both limited and this research will contribute to bridge the gap between these theories and explore some of their limitations. This project will also explore whether factors such as engagement also influence cognitive resource allocation. Secondly, a set of guidelines will be developed stating how modes of communication between humans and mobile devices are best exploited depending on the mobile context the user is in. At this stage research from multimodal communication and context awareness will be brought together to increase the impact on mobile interface design. Recommendations will be made according to the use of cognitive resources during specific times of a journey.

Methodology

This project uses a mixed methods approach. First, the importance of elements of context for mobile device users is investigated. Direct observation of users during journeys was used to investigate mobile device interactions. During the second phase the focus will shift away from the context towards multimodal interaction. A field experiment will be created to uncover the nature of the resources required when interacting with current mobile technologies for a specific set of tasks. The field study will have multitasking elements such as talking or walking and engaging with the mobile technology at the same time. This quasi field experiment is based on

Oulasvirta & Bergstrom-Lehtovirta (2010) Multimodal Flexibility Index. The findings of that study will be tested in a mobile game played by participants on campus and a follow up interview.

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Ewa Luger

PhD Title

Consent Reconsidered; Reframing consent for ubiquitous computing systems

Abstract

The developing complexity and decreasing visibility of pervasive computing systems, coupled with increasing value and sensitivity of personal data, mean that it is no longer sufficient to design systems that assume users capable of making informed decisions at a single moment. In particular, the unprecedented sensitivity of contextual data, and the potential harms associated with inferences made on the basis of that data, highlights the need to revisit our design principles in respect of consent. This thesis will use a mixed-methods approach to reframe 'consent' for ubiquitous computing systems, resulting in a series of design guidelines to inform future developments.

Author Keywords

Consent, Privacy, Design, Ubicomp

ACM Classification Keywords

K.4.1 [Public Policy Issues]: privacy

General Terms

Design, Security, Management

Introduction

Whilst some attention has been given to the concept of consent in respect of tangible online interactions, there is a clear deficit of (a) forward-looking conceptual work, and (b) research specifically addressing the challenges of consent within pervasive systems. Existing literature related to consent derives of multiple contributing disciplines (e.g. law, computer science, psychology, bioethics, sociology, policy studies) casting consent as a conceptually complex and multifaceted issue. However, even without the additional challenges posed by ubicomp, these perspectives are siloed, disparate, epistemologically distinct and often highly theoretical rather than applied and as such are not immediately useful to the design community. Add to this the dearth of ubicomp-focused work and the growing European policy imperatives in respect of personal data, and it is clear that without some consideration of the design of non-traditional systems, we are heading towards what might accurately be described as a crisis of consent.

Given the nature of pervasive architecture, it is clear that 'consent', as traditionally conceived, is no longer salient. The human agency involved in the act of consenting to the disclosure of personal information, whether explicit or implied, "is the *primary means* for individuals to exercise their autonomy and to protect their privacy" [4]. However, context-aware ubiquitous computing systems essentially 'decouple users from devices' [8], relying upon user-perceptions of seamlessness as a mechanism to interweave these systems into the fabric of everyday life.

Such decoupling, whilst easing the physical and cognitive burden upon the user and enhancing system responsiveness, necessarily impacts upon the locus of agency understood as the "operation of social power located in the actions and behaviour of human individuals" [14], drawing it further from the user. This trade-off, however, is not always made explicit and whilst notice remains a core design tenet, research shows that human capabilities and socio-psychological

responses render consent decisions increasingly meaningless. Equally, whilst we understand something of the social and behavioural norms related to explicit corporeal transactions the complexity, mutability and reduced visibility of ubiquitous computing systems problematise norm transferral to more pervasive contexts. This thesis will conceptually reframe consent for ubicomp by exploring (a) the salience of consent for pervasive computing settings and what it might mean in such contexts, (b) what the challenges to consent might be, and (c) how a revised concept might be applied in practice.

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Thesis Statement
The thesis will seek to conceptually reframe notions of consent to better meet the dynamics of pervasive systems and suggest a series of indicative guidelines to inform future research and systems design. Specifically, the thesis will answer; how might we reframe 'consent' for ubiquitous computing systems? Secondary questions addressed will be:

- To what extent is 'consent', as currently understood within systems design, transferable to ubiquitous computing systems?
- What new forms of consent might be useful and how might these be realised?

Sam Meek

PhD Title
Analysis, design and evaluation of line of sight modelling for query and annotation of the remote landscape

Abstract
Interacting with the landscape through the use of mobile technology has been a mainstay of Location Based Services (LBS) since the proliferation of location aware mobile devices in the early 2000s. The majority of these LBS applications have been designed specifically for way finding activities. Recently, a swathe of technologies has converged to allow for more complex on-location spatial queries such as the inclusion of direction and overall orientation of the device. These techniques employed through applications such as geo-wands allow for more direct interaction with the visible landscape via a point and click interface employing real world objects. These types of applications are mostly confined to urban areas and require the user-targeted features of interest (FoIs) to have certain characteristics. The majority of applications designed to query these FoIs employ a vector based intersection data model or a database of spatially indexed viewsheds. To take advantage of these methods FoIs must be discrete, salient, singular and inaccessible to the pedestrian.

The data requirements and inflexibility of current models of Mobile Spatial Interaction have led to the design of Zapp, a mobile application that allows for remote logging of points of interest and remote querying of features of interest. Zapp works by using a surface model created from aerially captured height data such as Light Detection and Ranging (LiDAR) or RADAR, using this surface model and the position and orientation of a mobile device, Zapp can calculate *where* the device is pointed on the surface model. Additionally, Zapp implements a system where areas of the landscape can be coded to refer to different FoIs that are returned to the device when selected. This approach allows for the flexibility of different types of surface to be represented and queried where in previous methods it was impractical to do so, an example of this is underlying geology on a field trip, where every point on the ground is essentially an FoI.

Testing of Zapp took place in several contexts; the first was a first year, undergraduate geological field trip where Zapp was employed as an aid to recognition of geological features in the English Lake District. In the second field test, Zapp was used as a method of augmenting the visitor experience through the creation of authored tours also in Cumbria. The technology was broadly successful in informing users about what they could see, however there were several technical issues with the stability and accuracy of the sensors on the mobile devices and the fidelity of the surface model. The main findings are concerned with how to successfully employ a line of sight technique in aiding users about the landscape around them as this method raises questions about authoring,

appropriate use, data suitability and overall scalability.

Finally, the app was tested on University Park campus using high resolution LiDAR data. The purpose of this test was to compare the Zapp raster line of sight method of logging remote data and querying information with previous geo-wand methods. These tests showed that the line of sight method allowed the user to pick out buildings in the landscape, providing models of vegetation were accounted for. Future research in this area emerging from the findings of this thesis are concerned with how to successfully deploy the line of sight technique in other contexts.

Rob Mitchelmore

PhD Title

AppMaps: Lightweight Plasticity for Mobile Development

Abstract

This thesis answers a question that first occurred to me on a summer afternoon a number of years ago, while I was picking my uncertain and error-prone way through Ovid's *Metamorphoses*. Ovid, and the other great poets of antiquity, wrote in Latin and Greek, which are languages which gave them a good deal of freedom in terms of the order that words could come in a sentence. They made use of this to great effect to pour the words they had chosen into the poetic forms they had chosen. One of the main mechanisms used to achieve this freedom was a linguistic feature called "case".

The question that occurred to me then was this: "Can case be used in analogous situations, to perform similar functions?" or more specifically: "The ways I interact with software are ordered; I interact with one control on the screen and then another. The nature of this order is defined partly by the conventions of the platform where the software is running. Can case be used to make this order freer, to allow people who write software to pour their design choices into platform-defined forms, and more easily to make software that moves between kinds of device?"

The answering of this question is a long journey, which begins with two stories. The first story answers the question "What is case? Is it a coherent phenomenon at all? Is it even meaningful to use it in this way?". The second answers the question "How can a software framework be built to embed case as a strategy for this re-ordering?".

The first story is a long and tangled one. The question "What is case?" is one of the oldest open questions in academic enquiry, with a continual thread of discussion reaching back to the Indian grammarian Pā ṇ ini who wrote the first recognisable treatment of case around 400 BC. To argue that case is a coherent phenomenon, the thesis gives brief outlines of the case systems of different languages, widely dispersed in both time and space. It then follows an argument by Barry Blake that these case systems are not arbitrary, but tend to follow a pattern.

This does not, however, answer either "What is case?" or "Is it meaningful to use it in this way?" The answer to the latter depends on the answer to the former: if case is simply a syntactic or phonological convenience then it cannot really be applied outside of these areas. If, however, it extends more deeply, then it is reasonable to use case outside of a strictly linguistic context. To answer these questions, the thesis summarises the more mainstream of the many theories of case and shows that at least some of them are compatible with a deeper understanding of case than just as a syntactic or phonological feature.

The second story begins with the question "What tools exist for cross-platform development already?" In answer to this, the thesis surveys tools both from the research community and from various industrial communities. It argues that the research tools tend to use an approach called model-driven engineering that, while expressive, is not a technique in mainstream use. To find out whether a case-based approach is more useful than the current tools developers are using, it needs to be directly comparable with the current approaches developers are using. The thesis contains a survey of industrial tools to show that model-driven engineering is very uncommon in this area.

The second question in this story is "What sort of software architecture can be used to embed case within?". Drawing on the survey, the thesis proposes a new software architecture (called "MVCD") consisting of a lightweight extension to the MVC family of architectures that are in common use in industry. This architecture is based on ad-hoc strategies adopted by existing tools.

To bring these two stories together, the thesis proposes the AppMaps notation; a simple notation which can be used as part of the MVCD software architecture and which uses case to annotate potential user interface events. It then outlines the implementation of the AppMaps tool. This is an implementation of MVCD and the AppMaps notation on top of the well-known Sencha Touch user interface toolkit.

To answer the original question, the tool is evaluated against three criteria: expressiveness, meaning the breadth of functionality catered for and the breadth of platforms supported; efficiency, meaning whether there is a perceived increase in productivity or efficiency or a perceived decrease in stress on the developer; and effectiveness, meaning the ability of the tool to produce quality output.

Each of these criteria is examined in two evaluation streams. The first examines the application of the tool in real-world situations. For this stream, two mobile applications were built for external organisations in very different areas of industry: a data-driven marketing application for a speaker bureau and an incident reporting application for a company that services agricultural machinery. Through this stream, the expressiveness of the the tool is examined through the difference of the industry segments in question; the efficiency of the tool is examined by comparing the finished project for one of the companies with an earlier prototype designed without the assistance of the tool; and the effectiveness of the tool is examined both by evaluating the applications against user interface guidelines and by means of feedback from the organisations for whom the applications were developed.

The second stream examines the relationship between developers and the tool. This stream consists of an initial workshop introducing the tool followed by a longer study in which developers use the tool to develop a project of their choice. The expressiveness, efficiency and effectiveness of the tool are here examined through developers' experience of the tool, and their perception of each of these criteria.

At time of writing, data gathering for these streams is still underway.

William Preston

PhD Title
Attack Points for Pedestrian Navigation in Augmented Reality

Abstract
This work looks at an augmented reality vision of the traditional Attack Point navigation method, Virtual Attack Points, and how it affects cognitive load, spatial knowledge, confidence and effectiveness of navigation on mobile devices. In Attack Point navigation the user travels along a trail of easy to find geographical features until they reach their destination. In augmented reality these geographical features are replaced with virtual objects generated by an algorithm and made easy to find by using visibility analysis.

Pedestrian and vehicle navigation are distinct. Pedestrians have much more freedom while vehicles are confined to a road network. Vehicle navigation looks to become a more automated task with self-driving cars. However, in countries with limited space, getting from a car park to the actual destination will continue to be a challenge.

Popular navigation systems on mobile devices concentrate on a map-based interface. Maps provide a great overview that makes them an indispensable planning tool. However, it is a non-trivial cognitive task to convert map directions into a next step while in the field. Navigation by photograph is a promising area exemplified by Google Street View. However, Hile et al. (2009) expressed that existing online datasets are not complete enough to be used in practice.

In order for Virtual Attack Points to be realized there are a number of challenges that must be overcome. A sense of depth must be portrayed by the augmented reality view. An early study showed that the familiar size pictorial depth cue was one of the most effective in representing the location of a virtual object in a physical landscape. Placing virtual objects near physical objects was also thought to help. Position error must be minimized; near objects are largely affected by location (GNSS) error, far objects by orientation error. A combination of appropriately placing virtual objects and filters, such as Kalman filters, are used to mitigate error.

It is unknown how this concept might effect the acquisition of spatial knowledge. It could be argued that anything that decreases the cognitive load of navigating induces a passenger effect. Alternatively having the user to look at the environment for a greater time might increase spatial knowledge. In a comparison study with maps, landmark and route knowledge test were performed.

The effects of current technology on an augmented reality concept are also to be assessed: this is achieved by comparing an approximation of the concept with a live system.

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Gilad Rosner

PhD Title

Provisional title: Unlinkability in Citizen Credentialing: A Comparative Case Study of the United States and Germany

Abstract

Governments around the world are moving many public services online as part of their e-government strategies, hoping to reduce cost and engage greater numbers of citizens. Many meaningful e-government services entail an exchange of personal data. To engage with citizens online, public service agencies must ensure they are interacting with an authorised person; they need to know who is at the other end of the screen. To *authenticate* citizens logging in to online public services, governments are mounting various kinds of credentialing programmes. That is, they are facilitating digital identities for their citizens so as to enable more trustworthy transactions online.

However, electronic identification is a sensitive, potent domain. An increasing capability to identify citizens online has the potential to harm their privacy. Most democracies operate with data protection and privacy laws and policies designed to regulate the transmission and use of personal data. As governments build identity management systems, data protection and privacy impulses manifest in various ways.

Historically, the identification on the Web resembled many silos: each site or resource provided you with a username and password. The result is that people have too many passwords, and the ones they use are insecure. Rather than aggravate this state of affairs, governments are instead relying on a *federated identity* model, where one login is reused at multiple websites. In this model an Identity Provider (IDP) issues a credential to a citizen, and she or he uses it at multiple Relying Parties (RPs). The Identity Provider is responsible for vetting the citizen's claimed identity, ensuring that the person is whom she claims to be, and for binding the credential to her in a secure way. Relying Parties rely on the identity assertion of the IDP. This model scales well as more RPs enter the system, but the citizen need not enrol in other IDPs.

There is an inherent privacy challenge in the federated identity model. If one uses an Identity Provider across the internet, the IDP will know everywhere one logs in. For citizen interactions with online public services, the privacy challenge is deemed more sensitive as it involves vast amounts of personal data held by the state. To address this, governments are building privacy-preserving architectures within their burgeoning identity management systems. One such architecture is *unlinkability* – intentionally severing the 'links' of one's online activity so as to frustrate profiling. Practically, this means blinding IDPs from RPs and RPs from each other. Unlinkability helps to ensure that IDPs and RPs do not have a complete picture of citizens' online activities.

The thesis is a comparison of US and German policies of unlinkability within their citizen credentialing efforts. Each country has a different privacy and data protection backdrop, informed by history, culture and law. Technologically, both countries are also quite different. Germany has built its citizen credentialing efforts on the back of its national ID card, which recently became an e-ID card. In the United States, a national ID card is a political impossibility, as is government issuance of electronic credentials for citizens. Instead, the US government is relying on private organisations – companies such as Google and Yahoo, and universities – to supply citizens with credentials for e-government use. Both countries have required that their identity management systems implement some degree of unlinkability. The thesis traces the policy history of this requirement through to its technical and organisational implementations, and compares the institutional landscapes that gave rise to it.

Mark Selby

PhD Title

How do we encourage memory and meaning with a lifetime's worth of data and the things around us?

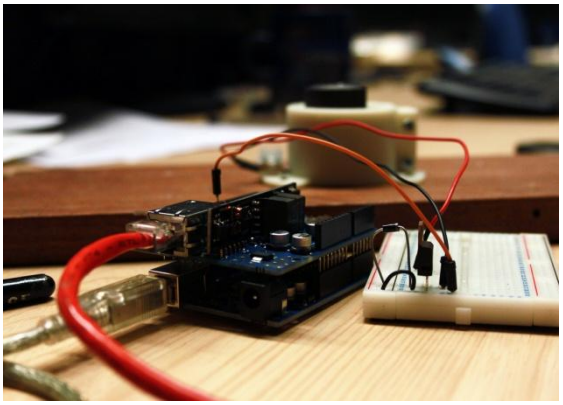
Abstract

From natural disasters to holidays, we have always used technology to measure and capture information about extraordinary events. Now, embedded technologies can be used to do this to a far greater resolution, creating vast data sets that cover almost every aspect of human experience. Increasingly these exist alongside a proliferation of personal subjective accounts created through personal networked devices and social media tools, that apply equally to more everyday, or private occurrences. The depth, breadth and texture of these records could provide us with much richer, more detailed, and potentially more human accounts of memorable events. But how can these vast data sets be searched, navigated and used in ways beyond the provision and recall of facts?

Meanwhile, data relating to our experiences is all around us, written through material and memory into the objects that we keep, collect and use. Meaning can be attributed to even the least likely of objects; a Biro may become an evocative reminder of a journey, or a broken vase a relic of an earthquake. In any case these objects bear the material signs of these events, and in doing so act as visual and tactile indexes to the narratives they embody, and the memories of their owner. These objects can become treasured connections to time, people and place, or even of triumph over adversity. The ways that we traditionally experience this object information are predominantly mnemonic rather than explicit, and is therefore more malleable and specific to our personal experiences. However we might also imagine, thanks to the values that currently drive innovation and manufacture, that the speed and cost at which our everyday objects can be created and replaced mean these object-stories are becoming rarer, more brief and less significant.

But now digital manufacturing technologies promise to disrupt the values that currently drive the production and innovation of simple and smart objects and devices. By creating manufacturing technologies that are more open, along similar lines to the open source software movement, the means of production of everyday artifacts are democratized and decentralized. This arguably allows the opportunity for new kinds of objects to exist, and for new opportunities in the creation of personally meaningful things.

This PhD explores these opportunities with a design led approach that uses newly designed prototypes as probes. In various ways and to various extents, these prototypes use aspects of participants' experiences to embed data into the materiality of objects that might be otherwise be seen as meaningless 'blanks'. By imagining digital manufacturing services and systems that use data about people's meaningful experiences, these probes seek to uncover opportunities for the creation of objects and devices that are more meaningful to their owner.



Emily Webber

PhD Title

Strategy Differences in the Use of Mobile Devices for Navigation

Abstract

As the use of mobile navigation aids such as in-car devices and smart phone applications continues to grow, we need to be aware of how their use affects the way that users engage with task, device and environment. Research has shown that the use of such navigation aids can negatively affect our memory for, and representation of, the environment around us; users can become device focussed and develop a reduced and disembodied understanding of the environment. However, mobile navigation aids *are* good at what they do – they get users from A to B with (usually) minimal stress and (again, usually) maximum efficiency. In an increasingly technologically enabled society, the use of such devices will continue to grow, particularly as devices become more sophisticated and offer users further support and better assistance. It is therefore important that users develop appropriate relationships with their navigation devices, with future mapping applications encouraging users to actively engage in the navigation process in synergy with the aid that is being used.

An understanding of user differences in this context is particularly important, as no one person uses technology in exactly the same manner. This can be understood from both a motivational and behavioural perspective, and in terms of the individual's underlying cognitive processes and strategies, and is influenced by the context of use. Although a multitude of interacting factors affect the way in which users navigate, this PhD focuses in particular on the existence and adoption of different user strategies when navigating with mobile devices, with a particular focus on pedestrian mobile navigation. A mixed methodological approach has been used through this PhD, combining quantitative and qualitative techniques to gather rich, contextual data. An initial set of exploratory interviews provided a broad understanding of user differences in the use of navigation aids in a variety of contexts. Real world pedestrian navigation studies then combined mobile eye-tracking and verbal protocols to explore the existence and adoption of different user strategies during navigation with a mobile aid. Consolidation and analysis of data from these sources has revealed three archetypal strategy groups that users fall into when navigating – those who navigate in an *Independent and Attentive* manner, those who require *Constant Support and Information* and those who navigate with *Least Effort*. These groups vary in terms of the amount and type of information they use to navigate, and the way in which they engage with the task, device and surrounding environment.

T he use of real-world experiments has resulted a detailed, contextual understanding of the archetypal strategies that users adopt while navigating with a mobile device. The outcomes of this are two-fold; an understanding surrounding the use and details of these user strategies will not only extend theory on environmental psychology and HCI within the context of navigation, but will also be used to create a framework to inform the information and design requirements of future mobile mapping which is sensitive to both context and individual.

Cohort 2010

The Horizon DTC cohort 2010 commenced their studies in September 2010 and will complete their PhD in September 2014.

There are 16 students in the cohort whose disciplines range from HCI and Psychology to Business, GIS and Computer Science.

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Edward Anstead

PhD Title

Conceptualising Multiscreen Experiences in the Home as Pervasive Systems

Introduction

The proliferation of smartphones and tablets has led to a strong trend of television viewers interacting with second screen devices whilst watching [10]. Broadcasters have been capitalising on this by releasing companion, dual screen applications. Examples such as the BBC's Secret Fortune quiz app [7] or Autumnwatch Companion [8] enhance the TV viewing experience with additional interactive content, allowing the viewer to play along at home, using their personal devices in synchronisation with the broadcast.

In my PhD I am proposing a pervasive research perspective, which analyses the intricate timing and spatial possibilities of these systems, for their analysis I adopt the mixed reality trajectories framework [3] as a theoretical model. I suggest this approach to comprehend the construction and consumption of existing applications, with a view to better inform future experiences. These proposed systems would coordinate the distribution of television content across time and devices, supporting the integrity of the programmes story and the divergent processes of users in the living room.

Dual Screen applications as pervasive systems

I posit that current companion applications represent early ventures into joined up multi screen experiences in the home. The model of standalone bespoke applications however doesn't support the complex processes found in this setting [4]. My work sees television watching with multiple screens as a context in which viewers creatively share programming at different times and in different spaces appropriating an unknown number and type of device. I view this as a pervasive computing environment [9], in which a viewer's progress through a programme is monitored by a wider living room computational system to ensure comprehension of the narrative between users. These users, whilst collocated or communicating virtually, may have watched or interacted with different parts of the content on a personal device at different times from one another. Additionally the pervasive computing paradigm idealises "masking uneven conditioning" [9], ensuring a coherent experience is available to all users regardless of the devices they have available to them, an important consideration for broadcasters who endeavour to reach the largest audiences possible.

My initial exploration of this problem space involves utilising the Trajectories framework as a potential model for the analysis of dual screen experiences. The framework was developed to understand user experiences of mixed reality performances as a dialogue between users and artists across time and devices [3]. Subsequent work has investigated the frameworks use in visitor settings such as Museums [6] and Theme Parks [5]. The key points of the framework that I see as appropriate to the understanding of multi screen experiences are:

- Balancing the scripted experience developed by the programme maker with the improvised actions of the user. For example if a user chose to watch second screen programme content on the television and the main programme on a personal device.
- Conceptualise experiences that extend over space, time and across multiple display devices. For users who engage episodically should content be tailored to the gaps in between viewing and the device they are using?
- Finally the framework utilises a structured layers of timing for conceiving narrative content with unfolding plots and events [2]. This allows for a story to be deconstructed into its constituent parts for playback across devices and ensuring the integrity of the programme is maintained.

Initial Case Study
My initial investigations will involve an Olympics dual screen application. The application was developed in coordination with BBC Research and Development to demonstrate the potential of dual screen applications with regard to sports programming. The companion application was retrospectively designed as an enhancement to the London Olympics coverage, allowing the viewer to engage with additional statistics feeds and simultaneous coverage of multiple events synchronously between devices. The context for the application was chosen because the multisport nature of the Olympics allows viewers to watch different sports unfold across TV channels and engage with additional statistics on an internet enabled device. I intend to investigate through analysis using the trajectories framework and user evaluation, how the narrative structure is distributed between devices and consumed by viewers.

Implementation
The application expands currently deployed dual screen functionality with two novel features. Firstly it allows the user to engage with the primary content on the tablet or television screen. Therefore the companion device can be interacted with in isolation by a user in the same room as others watching other Olympics sports feeds or entirely different television content. The second feature allows for users to choose whether they see statistical updates or whether they are protected from spoilers until they have seen the action on the video stream. Allowing user to take agency in the order and media they use to consume the events.

Investigation with the application
I propose a process of evaluation of the Olympics application to inform future iterations of its implementation and our understanding of dual screen apps as pervasive experiences. The first phase of this investigation is analysis of the application within the theoretical lens of the trajectories framework. In doing so I hope to establish a taxonomy for using the framework for multiscreen television. This process will ideally uncover the following facets of dual screen apps. (i) Which features of the application are best suited to analysis as pervasive systems using the framework. (ii) In What ways could the framework be extended to better encapsulate television experiences as a unique context distinct with mixed reality performance. And (iii) in what ways does the framework extend beyond the scope of current experiences, suggesting future areas for development of dual screen experiences as pervasive systems.
The second phase of investigation involves a process of user evaluation. In particular examining how the application presents numerous sports narratives that can be distributed across multiple devices and collocated users. The evaluation of such a trial would analyse how users appropriated the possibilities of narrative consumption and device sharing offered. For example how do collocated users configure multiple displays when not all of them want to watch the same event, how are the available devices, both personal and communal configured? Furthermore what interactive or technical advancements could be developed to support users in organising their time and space.

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Anthony Brown

PhD Title
Rethinking Home Network Infrastructure

Abstract
This document is an overview My PhD so far. It aims to provide a background context to my work before summarising the completed work. It goes on to outline future direction and how I have engaged with the wider community.

Author Keywords

Home Networks, HCIsec, Design

ACM Classification Keywords

C.2.1 Network Architecture and Design: Wireless
communication

General Terms

Design, Security, Management

Introduction
Home networks are now commonplace in the developed world with households increasingly making a broadband connection accessible throughout the home. However, these home networks are built around essentially the same protocols, architectures and tools developed for the Internet as a whole in the 1970s. These have migrated into the home with little or no reflection upon their appropriateness and suitability. In particular, the primary Internet protocols were designed for a context of use that assumed relatively trust worthy endpoints, and made assumptions about the level of technical ability of network administrators and users.

The home network is quite different Home networks tend to be relatively small in size, supporting between 5 and 20 devices, and with all network elements accessible. Home networks are physically located within the home, so infrastructure is predominantly self-managed by residents who are not typically expert in networking technology and have no motivation to become expert. The heterogeneity of devices connecting to the network is also startling: it would not be unusual for connected devices to include desktop PCs, games consoles, smartphones, printers, digital cameras, televisions and media players from a multitude of manufactures.

This mismatch between the deployed technologies and their context of use results in users experiencing difficulties in configuring, managing, maintaining and expanding their home networks [1, 2, 3, 4]. The highly diverse ecosystem of network-connected devices found in today's homes, which vary widely in complexity, capabilities and interaction styles, combine to burden the user [6]. This is further aggravated by the fact that home networks are also usually built in an ad hoc fashion rather than being strategically planned [1]. This combination of factors significantly impacts the usability and thus the security of currently deployed approaches [5]. The complex technical and social setting surrounding home networks is the backdrop to my work.

Methodological Approach
My work so far has focused on the use of technical probes to enable me to explore my interdisciplinary goals of:

1. Understanding the needs of users,
2. Proving and testing new technology,
3. Stimulating user discussion and thought about the impact of new technologies.

So far I have only deployed my probe in the lab but I intend to start deploying them 'in the wild' to gather richer contextual information.

Progress to Date
I have started exploring the home networking space by building and evaluating a technical probe called MultiNet. It is an intervention in to the process of joining device to a domestic wireless network. MultiNet focuses on the user interaction rather than the engineering requirements of the protocols. This leads to a novel architectural arrangement of the home network infrastructure:
the network is dynamically re-configured to accept each pre-configured device, rather than the current norm where each device is configured to be acceptable to the pre-configured network. MultiNet uses on out-of-band visual channel and a third device 'Network Controller' to provide a constancy and and easy to use interaction across any device. MultiNet is also fully backwards compatible with existing devices. I have evaluated Multinet from a technical prospective an found it to be an acceptable solution for domestic networks. Lab based usability studies have also shown that MultiNet has significant befits over existing device association methods. MultiNets consistent interaction approach was readily adopted by users and the network controller is easily integrated into peoples' domestic environment
where access to the AP is often limited.

The next phase
Next I intend to look more broadly at the interaction between users and home networks. The home Access point is normally a passive device which is only interacted with if there is a problem or a new device is added to the network. However, the home access point is ideal placed in the network to become a more active participant on the network. It can gather large amounts of data on how and when user use the network and what activities they perform online. Through the monitoring of mobile devices it may also be able to sense when you enter and leave your home. This dataset is a valuable resource and there are several ways in which we could use it to improve the user experience.

Making the access point more active and giving it an ability to directly interact with its users by sending messages presents a number of interesting problems. How and when should the device communicate problems and information. And how do we let the users feed information back into the system. I intend to build a technical probe to explore these issues. It will monitor an aspect of user activity either RSSI signal strength data or HTTP browsing patterns and communicate with the user through twitter asking them to annotate the data it collects and informing them of significant events.

Deploying this type of system in real homes I hope to explore the how and when it is appropriate to include the user in network related activity. For example if we detect unusual outbound HTTP traffic when the users are believed to be away from the home should it be blocked until the user confirms this is expected or not?

The recent HomeWork[6] project has collected a large set of data from access points deployed in real homes I am currently exploring this data as a starting point before developing a system to deploy and evaluate. I hope to develop techniques for it to be used to improve the usability and security of home networks.

Community Engagement
I have attempted to engage with the wider academic community through several routes. We initially submitted MultiNet to SOUPS'12 which was rejected. While this rejection was disappointing I gained valuable experience in the paper writing process and received constructive feedback from the review. I also presented MultiNet at Multi-Service networks workshop 2012 in Abingdon, Oxfordshire. I also submitted MultiNet as a demo to SIGCOMM 12, was accepted and l attended the conference on 14th August 2012. Multinet has also been submitted and accepted to SIGCHI 2013 Pairs where I am looking foreword to presenting .

Acknowledgements
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The author thanks his PhD supervisors Tom Rodden and Richard Mortier for their ongoing support.

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Chris Carter

PhD Title
Social Media, All Grown Up; Informing Users of the Professional Rules of Engagement

Abstract
Social media research studies have not sufficiently addressed the deepening complexity of social and professional norms that surround current day use of social media, and what impact this may be having on how people manage their multifaceted, digital identities. The thesis uses a mixed methods approach in order to conceptually reframe the prevailing perspective on identity and impression management through social media, leading to the development of guidelines that can help inform those who may be putting their reputation at risk through their public interaction with the technology.

General Terms
Theory, Management, Measurement.

Author Keywords
Impression Management, Identity, Social Media, Professional, Norms.

INTRODUCTION
The increasing pervasiveness of social media technologies in contemporary society presents researchers with a fascinatingly novel platform upon which to build and adapt theories of identity within a digital epoch [1]. Whilst Goffman's dramaturgical perspective [2] remains one of the most dominant adopted throughout the literature on social media-based self-presentation [1], research in this vein [e.g. 3, 4] typically either precedes or downplays the potential influence of a transformation that has seen quasi-'third place' [5] spaces for social interaction become subject to increasing organisational utilisation and scrutiny.
The deepening complexity of social norms surrounding the use of different social media platforms presents an unprecedented range of opportunities and challenges for the user to negotiate in managing their multifaceted digital identities [6]. On the one hand, social media purportedly 'empower' individuals by enabling them to construct and market an image through personal branding [7-9]; a hyper-agentic perspective on identity management that implies a vital role for social media in underpinning the notions of free agent [10] and reputation economies [11, 12]. Conversely, consistent reports of 'Facebook fail'-type norm violations in the use of social media [13] carry a dual purpose as both gleefully Machiavellian news items and cautionary tales of the dangers that lurk throughout social media. Researchers have emphasised the need for users to consider how the accessibility and durability [14] of their social data upon the web, often interpreted separately from its intended or original meaning and context [4], can contribute to very tangible and lasting reputational damage [13].
Yet, despite a growing body of interdisciplinary research (e.g. computer-mediated communication, sociology, psychology, organisational studies, media theory, marketing) focusing on the related concepts of identity and impression management on social media, there is currently a paucity of empirical research that addresses the role of social norms in the management of identity upon social media. This thesis will conceptually reframe current perspectives on digital identity by exploring:
(a) The social and professional norms that constitute and influence present day interactions with social media, (b) how an understanding of the role of norms may broaden the concept of digital identity beyond a dramaturgical perspective to other potentially relevant psychosocial theories [15, 16], (c) what situational and

psychological factors might be important in predicting norm-compliant (and deviant) behaviour upon social media, and (d) how people in particular situations or with specific traits associated with lesser concern for professional norms of social media use, might be appropriately informed in order to avoid potentially damaging reputational consequences.

THESIS STATEMENT

This thesis will seek to conceptually reframe the notion of digital identity management in the use of social media, and suggest guidelines that will inform future research and the practical ways in which those who are typically less aware of the 'professional rules of engagement' in using social media can be better equipped to protect their reputation through their digital interactions. Specifically, the thesis will answer; how might we inform people of the professional norms that underpin appropriate behaviour on social media? Secondary questions addressed will be:

- What types of behavioural strategies do people engage in to manage the professional impressions created by their multifaceted digital identities?
- What situational and psychological factors might influence the extent to which people engage with such strategies?

METHODOLOGICAL APPROACH

A mixed-methods approach is adopted to address the previously outlined research questions. This approach comprises of five key phases:

(1) An analysis of secondary sources to re-examine the current concept of digital identity, including relevant academic literature and artifacts representing evidence of professional identity norms upon social media (e.g. organisational social media guidelines).

(2) A series of semi-structured interviews with 14 employees of a UK-based Higher Education Institute in order to explore how people manage the personal and professional aspects of their digital identities across social media, within an organisational context.

(3) The development of a scale representing the constructs of professional impression management strategies in using social media. Item generation is informed both deductively, through a thorough understanding of the literature and relevant artifacts (phase 1), and inductively, through an established set of themes derived from the data (phase 2).

(4) The implementation of the scale (phase 4), along with other situational and psychological variables of theoretical interest (informed by phase 1), using a survey method. The intention of this phase is to assess whether the variables of interest can statistically predict variation in the extent to which people consider the professional appropriateness of their digital identities, as indicated through their interaction with social media.

(5) Empirical exploration of how people in particular situations (e.g. making the transition from student to worker) successfully manage their digital identities, in order to inform guidance on how others might do likewise and avoid reputation damage.

EXPECTED CONTRIBUTION TO THE FIELD

It is anticipated that the thesis will contribute to the field in a number of ways: (1) it will explore the seemingly complex role of social norms in influencing identity enactment upon social media, and in turn is anticipated to highlight the need to extend our understanding of digital identity by encompassing psychosocial theories of identity that extend beyond the dramaturgical perspective; (2) it is anticipated that it will highlight the need to consider that as a set of technologies, social media are neither value free nor distinct from 'reality' - they *are* reality, with real professional and economic consequences; (3) it is anticipated that the scale created through the thesis research will be a valid measure of professional impression management in using social media, and as such may serve as a useful instrument in further studies in the field.

PROGRESS TO DATE

At the present time of writing, phases one and two are at an advanced stage of completion, with phases three and four underway in April 2013. Though the precise method to be used for the fifth phase is yet to be finalized, it is currently in the planning stages and is likely to be conducted across two time points, starting early May and concluding around September 2013.

Guidelines constructed on the basis of the final phase findings will begin to be constructed between October and December 2013, with the writing up of the studies to be carried out concurrently from Summer 2013 onwards. It is anticipated that submission will occur in September 2014.

ACKNOWLEDGMENTS
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Olga Fernholz

PhD Title

Innovating for Today While Innovating for Tomorrow: How Technology Based Firms Manage Technological and Organisational change.

Abstract

Innovating for Today while Innovating for Tomorrow" is the topic of PhD research which looks at the challenges an innovative firm faces as it strives to exploit the opportunities provided by the established technological base while at the same time explore technologies that will fuel future innovations. The research aims to test the concept of *innovation ambidexterity* and asks questions such as: What opportunities for capability development are provided by the ubiquitous digital technologies? What organisational factors create contexts that stimulate employees to act ambidextrously? How personal characteristics and organisational factors are interrelated to enable ambidexterity?

John Harvey

PhD Title

Giving and sharing in the digital economy

Abstract

This thesis examines how digital technology mediates the behavior of consumers in online systems that facilitate offline gift

giving and sharing. A mixed-methods approach is used to analyse the way technology is used in each stage of gift giving (decision making, exchange, and reformulation). The results offer insight into how consumers manage identity, select partners, participate in ritual, and negotiate ambiguous property rights.

Keywords
Giving, Sharing, Internet & Technology, Economic Anthropology, Consumer Research

Introduction
A variety of informal offline gift economies have been facilitated by the internet. Consumers with common interests come together online before meeting offline for the purpose of exchanging, giving or sharing goods. As mobile technology has become ubiquitous these informal economies appear to be increasing in number due to the improved potential to match people across space and time. Recently there has been a surge of commercial activity in the field of 'collaborative consumption' - a term first coined by Felson & Spaeth(1978). These systems help consumers to exploit a spare pool of resources; they can reduce the cost of acquisition and the environmental impact of consumption in comparison to the more typical product lifecycle. Interestingly, many of these systems eschew or even prohibit monetary-based transactions, favoring deliberate redistribution of resources without formalised quid-pro-quo exchange. Unlike similar transactions that rely on money to create equivalence through a shared understanding of quantified value, here technology helps to mediate the transfer, aiding both donor and recipient alike. Despite the wealth of research into gift giving and the abundance of commercial consumer gift systems, the role that technology plays in these economic transfers has received little attention in the consumer research literature. Dobscha & Arsel(2011) have described the emergence of these systems as a form of hybridized exchange which do not correspond to a singular prototypical behaviour such as giving, sharing, or commodity exchange (see Belk, 2010), but instead demonstrate characteristics of each. The core research objective is to understand how technology mediates the ambiguities that arise from this hybridization in order to create and perpetuate structured, ritualised behaviour.

Thesis Statement
Specifically, the thesis will answer: how does technology mediate gift economies? Secondary questions addressed will be: How do consumers clarify ambiguous property rights in indiscrete forms of consumption such as sharing?; and, how do networked technologies influence the long-term structure of gift economies.

Related work
The phenomenon of gift giving has received an enormous amount of cross-disciplinary attention over the past century. Since seminal work by Mauss (1925) and Malinowski (1922) scholars in anthropology, sociology, economics, philosophy, and consumer research have examined the antecedents of giving. Despite this wealth of research the scope of gift giving is so diverse and complex that application of universal rules or typologies is difficult, if not impossible. However there are a number of dimensions that can be used to classify types of gift giving, these include *agency*, *structure*, *ritual* and *property* (see Yan, 2005, for overview). These dimensions have been considered to varying degrees in much of the existing consumer research, but often the gift is viewed as a continuous act of reciprocity, whereby the act of giving provides a dialectical chain between dyads. These case studies offer only a limited insight into the digital sphere due to the one-to-many forms of giving made possible by networked technologies such as the internet (e.g. Giesler, 2006).

Adrian Hazzard

PhD Title
Influencing the exploration of public spaces via dynamically adapting musical soundtracks

Abstract
Increasingly, our daily activities, routines and experiences are accompanied by mobile music listening, supported via a growing number of mobile applications and systems intelligently controlling music choice deemed appropriate for our changing contexts. These applications aim to enhance, or affect user behavior within these activities. This integration of music into activity is explored in this thesis with a focus on creating a framework for the

composition of novel location specific adaptive soundtracks which influence and enhance exploratory experiences within the public spaces. The qualities of *motion, arrival* and *transition* contained within the fundamental components of music will be scrutinized for their bearing upon affecting physical behaviour.

Author Keywords
Composition, Location based experiences, Adaptive Media

General Terms
Design, Security,

Introduction
This thesis investigates methods of enhancing and influencing user experiences via adaptive music; including a user's physical movement through public spaces, alongside interaction with points of interest, and artifacts contained within these spaces. Mobile technologies are increasingly ubiquitous within societal behaviour. Music listening, and particularly mobile music listening, is becoming progressively integrated and active in our everyday activities, rituals and experiences, for example: high tempo songs providing a motivational soundtrack for sport and fitness routines; 'party' music setting the mood during in preparations for a night out; the playlist that transforms a bus journey to and from work into an elaborate day dream. These integrations into our daily routines express the function of music as a resource, as opposed to an entertainment commodity. Viewing the function of music in these terms defines a conceptual platform for the development of music led systems with a responsive and influential responsibility; where the music is not selected for an activity by a user, but is partly generated and dynamically adapted by the activity itself, with the express purpose of influencing a user's trajectory through the activity. The possibilities are broad and numerous. The definition of 'experience' in this research is defined by user journeys and explorations of physical space – the voyaging of public spaces, which may not have specific routes, goals, or destinations attached. These may include nature walks, art installations or mobile games. Users' spatial movements characterize the 'actions / activities' placed under influence from music. Two primary threads of user experiences are to be influenced and analysed: First - guiding a user to an unknown location, by shaping a user's route choices via adaptations to specific musical parameters (i.e. pitch, rhythm, harmony, texture) contained in an accompanying soundtrack. These parameters are adapted via captured GPS data; second - the effect of a dynamically adapting soundtrack on a task perception and enjoyment. These distinct functions converge to propose a compositional and / or music arranging framework, which supports the development of soundtracks for interactive experiences.

THESIS STATEMENT
How can the exploration of public spaces be influenced by dynamically adapting musical attributes within an accompanying soundtrack - and can these adaptations create a framework for the development of novel musical arrangements to enhance task enjoyment?

Research question 1
Could a user navigate a physical space from musical cues / clues embedded within an accompanying dynamic soundtrack? Can music be used as a tool to subtly direct users towards a destination; music engaged as a method of spatial navigation? This research question elicits the exploration of music to communicate instruction, or signify progress towards a terminus. The practicalities of this exploration refer to the effect of different musical components (dynamics, melody, harmony, timbre, rhythm) on provoking *motion*, *arrival* and relaying changes of physical position.

Research question 2
Would a user explore a space differently in response to an accompanying musical soundtrack which adapts and responds to the individual's actions?

Research question 3
How best to develop a novel framework for musical composition and arrangement using the observations assembled from the investigation of research questions 1 and 2? If a set of 'musical rules' for influencing and enhancing user experiences can be accurately predicted, controlled, and reproduced, how best to enable other composers and sound designers in the production of original music for interactive location based / audio experiences? This research question necessitates effective development and communication of a

framework, which considers a broad range of interactions, contexts and compositional styles.

Related work

Mobile listening

The mobile device could be considered the most pervasive of ubiquitous technologies, whose attributes and functionality are increasingly embedded within a user's everyday activities. This immersion into a personal musical space whilst in communal environments has blurred the boundaries between perception of private and public spaces [1]. The ambient auditory experience of public spaces is no longer enforced; users now control this experience, choosing their private soundscapes, which transform their relationship with their environment [2]. People now use music to control their mood and emotions in tandem with their activities and experiences; the prevalent function of music is no longer a "commodity", but a "resource" [3].

Sound navigation

Non speech audio has been widely explored as a method of spatial navigation and guidance in a range of systems, which for the most part are aids for people with visual impairments [4,5,6,7,8] Some [4] employ a unique vocabulary of musical 'earcons' to impart a range of navigational instructions; requiring the user to learn the lexis to enable comprehension during in use. These systems are not concerned with listening enjoyment simply the communication of navigational commands. The majority of audio based navigation systems use dynamic volume adjustment to imply relative distance to a destination, alongside spatial positioning of the sound source in the stereo field to mirror relative orientation [5,6,7,8]. These systems, housed on mobile devices, generally use existing music playlists for source material and GPS location services for control data. While these classes of systems present some favourable attributes, they are significantly limited in the scope of dynamic modifications available to them, being restricted to adjusting only the presentation of an existing music track (volume, panning), rather than adaptation of the individual elements contained within the music; therefore limiting the integration of the music into a user trajectory.

Audio influenced experiences

Dynamic music systems are found in a range of contexts and settings, such as sport and leisure activities, creative exploration of urban spaces and tour guides: Many approach the design of these systems by exploiting tempo tagged playlists to either influence, or respond to, user actions have [9,10,11,12]. Accelerometer and physiological data trigger music tracks tagged with tempo metadata, which are best matched to a jogger's or walker's pace, for instance. However, there is an absence of devices displaying a richer awareness of context [13]. *Lifetrak*, for example, extends the range of data types driving music selection which include GPS, clock-time, kenetic, entropy and meteorological information. All of these systems employ existing playlists of commercial music for sound sources, and as noted with the sound navigation systems, the potential for fertile adaptive soundtracks are significantly restricted. Other approaches have sought to address this problem via generative music, controlled via real-time senor data output. *Score for open car* highlights the temporal, interpretative and interactive parallels between the navigation of maps and the musical score. Using speed, heading and altitude data to create a soundtrack broadcast back to the driver via the car radio [14]. *Sonic City* [15] , *Sensory Threads* [16] and the various *RjDj* systems [17] create adaptive soundtracks to accompany trajectories through urban environments through sonic manipulation of ambient sound captured from the explored environment. The style of the music generated from these systems is inclined towards the avant-garde/experimental, partly owing to the use of captured ambient sound sources. Creative audio systems are also found as tour guides; *Listen*, an example of a dynamic and personalized audio guide, which delivers a 3 dimensional soundscape of speech, music and audio effects, placed virtually within a museum setting [18]. The quantity and mode of information delivered to the user is personalized via a process of layering, in response to the duration a user spends interacting with the artefacts.

Fundamentals of music

Music is a systematic construction of pitch, rhythm, harmony, timbre, texture and dynamic intensities. Music reveals a sense

of action, whether it is fast, slow, soft or harsh [19]. The presence of these components can consequently be viewed as the conditions for music.

Music perception and cognition

Music is sensed in general ways that are universal: its shape, motion, form, and inferring of mood. Personal experiences coincide with the general, but contain unique associations formed by the individual [19]. Music can be viewed from a variety of perspectives: a series of gestures – the shapes that music form; associations – to imagery, objects, actions or words; feelings – it is often suggested that music's ability to conjure emotions is its key function [19].

Music is a temporal contour, progressing towards objectives. These objectives are points of *arrival* and must be present for a composition to be comprehensible [19]. The overarching form and structure of a composition is built on the succession of, and the links between, these points of *arrival*. This concept of music as *motion* and *arrival* is analogous with journeys through physical space [19]. Melody is formed from the attributes of pitch and rhythm. This combination of vertical pitch and time can be viewed as a melodic trajectory [20], whose contour outlines the rises and falls between defined start and end points; the melody's resolution, or *arrival*. Harmony - the sound of two or more pitches played in combination is also employed to evoke musical *movement* and *arrival* [19]. Different harmonies are constructed around the combination of stable (consonance) and unstable (dissonance) note intervals. Dissonances, in traditional western tonal music, need to resolve [21]. Resolution constructs an impression of *motion* and *arrival*: *motion* is generated from the sounding of a dissonance, which therefore implies a necessity for a subsequent resolution - a step forward out from the tension; *arrival* is realized from the process of resolution - a release of tension, which serves to punctuate the music.

There is a long history of cross-modal analogies between musical parameters and spatial motion. Tempo mapping to physical speed; pitch to vertical movement; 'intensity contours' to contour changes in speed and distance [22]; musical growth and reduction maps to physical distance and intensity of movement [23]. Single musical parameters can infer multiple spatial motions: ascending pitch provoking imagery of increasing velocity in addition to vertical movement for example [22]. However, research has also highlighted inconsistency within these analogies, predominantly with observed asymmetry. Whilst there is conflict within this area of research, music's ability to infer a strong impression of motion, direction, and growing or retracting intensity is nonetheless present.

RESEARCH Approach

A series of field studies will inform the progression of the thesis. The first stage consists of an initial probe to interpret the effectiveness of musical *motion* and *arrival* upon users' trajectories through physical space, free from any other activity or function; this has the aim of affecting a user's choice of spatial progression and terminus in response to adaptations in accompanying music. The second stage will focus on overlaying the concept of *motion/arrival* upon an exploratory physical activity; where users interact with multiple points of interest or artefacts contained within the designated physical space. The introduction of an interaction layer provides opportunities for investigating the role of the adaptive soundtrack in influencing user behaviour upon 'arrival' at these points of interest. A final study stage will centre on the design of an adaptive soundtrack for a third party curated experience; to apply and assess the developed framework in a real world context.

The preliminary thrust for the creation of music to imply physical *motion* and *arrival* draws its focus on isolating, and then adapting, individual musical components (referred to as *signifiers*). The rationale for the definition of these components is as follows: The fundamental features of music have been categorised into three classes: *Melodic*, *Dynamic*, *Colour*.

Melodic class: melody and harmony (adjustments of pitch and rhythm); modulations of key; harmonization. Rhythmic content is included in this category, as it is intrinsic to the presentation of any melody or harmonic progression.

Dynamic class: crescendo, decrescendo; accelerando, de-accelerando; any growth or reduction of musical texture; tempo; volume; articulation.

Colour class: instrumental timbre; combination of timbres and sound textures; articulation of instruments; and sound production (spatial positioning, effects, synthesized sounds).
The value of *melodic* material for influencing physical movement lies is the creation of *motion* and *arrival*. These qualities are formed from careful control of musical dissonance and placement of its resolution. Therefore, melodic and harmonic adaptations should be used to imply steps toward and discovery of a target location.
Dynamic material contains the attributes of *motion*, *proximity* and *pace*. Motion is created by the shifting contour; proximity is implied by increasing volume, or intensities levels, mirroring the relationship of a user to the origin of a sound source; and tempo maps to pace of physical movement. Consequently Dynamic Contours will be tested in creating motion towards a physical destination.
Colour in music does not contain dissonance, resolution, growth, or shifting intensities, so is unable to convey an impression of *motion* and *arrival*. Modifications to musical *colour* communicate changes of 'state'. In the context of physical movement, these changes could create an impression of transitions between altering environments, or new locations. Therefore, *colour* as well as an important tool for music arranging could symbolise progression through a journey.

Expected contribution to the field
It is anticipated that the thesis will offer two key contributions: First – the development of a composition/ arranging framework that will inform the design and creation of adaptive music for interactive physical experiences; second - a recognition and enhanced understanding of the widespread impact music, and creative audio, conveys upon exploratory interaction. Additionally, it is anticipated that the research process will embrace opportunities for examination of this framework within existing public experiences, so tendering a temporary impact.

Progress to Date
Current progress concerns the completion of the first study stage, which investigated the impact of adaptive musical soundtracks on a basic walking task. Its intention was to probe the range of participant interpretations and responses to 4 variant soundtracks when asked to walk around an open space and 'follow the music to a destination'. Each of the 4 soundtracks contained a focus on adapting a different musical signifier, as presented in the 'Research Approach' section. This study exposed a number of pertinent factors: First - the effect of playback silence upon user behaviour. Users were observed either viewing silence as an instruction to end the walking task, or as a 'container', which encouraged an alteration to their heading in an attempt to become re-enveloped by the music. This behaviour is referred to as Global Attachment, the designation of physical boundaries via constant music playback. Second – adaptations of instrumental timbre, changes in the music chord harmony, or instrumental texture defined Regional Attachment. Participants divided the task space into regions based on where signifier adaptations occurred. When users progressed between regions a process of transition was implied. Thirdly – Local Attachment was observed in response to short duration musical events, viewed as markers on the ground that represented points of arrival. Fourth – dynamic contours create a sense of motion, however harmonic movement in this example did not. Further analysis and presentation of this data is currently on-going.

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Paul Holmes

PhD Title

How might people be supported in interacting with their increasingly large amounts of diverse and fragmented personal information?

Abstract

As we ever more indiscriminately digitally record our lives it becomes increasingly important for people to be able to understand, control and locate the multitudes of ever increasing types of personal data they are generating. This research will examine how we might more effectively support people in dealing with the problems associated with this increasing multitude of diverse information. The research will aim to establish a better understanding of the relationship between people and their personal information by investigating methods of knowledge elicitation and then use this understanding

to inform the design of interaction with personal information through new representations of it.

Annika Hupfeld

PhD Title

The Role of Digital Artefacts in Envisioning Future Selves

Abstract

As digital artefacts are becoming ubiquitous their lifecycles are more dependent on the social and technological network they are associated with. While much work has looked into the societal implications of these developments, little is known about their social implications, in particular in terms of people's future orientations through digital artefacts. This thesis develops (a) an understanding of the social implications of changed digital artefact lifecycles using books and e-books as a case study, and (b) guidelines for designing digital artefacts that support the social and material practices involved in envisioning future selves.

Introduction

Things have a life - they are conceived of, produced, consumed, and discarded – and they have a social life too: in acting to support (or hinder) people in both their material and social practices, over a lifetime of use, they go through a process of changing social and material value: 'things have no meanings apart from those that human transactions, attributions and motivations endow them with. Meanings are inscribed in their forms, their uses, their trajectories.' [1]. As artefacts are becoming increasingly digital and networked, their lives become more dependent on the social and technological network they are associated with. While much has been written about the implications these changes carry for sustainability (e.g. [2]), less is known about the social implications in the lives of individuals. This thesis develops (a) an understanding of the social implications of changes in the lifecycles of digital artefacts using books and e-books as a case study, and (b) guidelines for designing digital artefacts that support the social and material practices involved in envisioning future selves.

Related Work

Research relevant to the social life of artefacts is predominantly found in the social sciences and humanities, such as social anthropology and material culture studies, social psychology, philosophy, and cultural studies as well as human-computer interaction (HCI).

Since Appadurai's [1] call for the adoption of a 'methodological fetishism' in the social sciences - arguing we should study the social life of things like we study the biographies of people - biographical approaches towards studying material culture have gained some foothold (e.g. [3], [4], [6]). However, much of this research is concerned with how artefacts are evocative of the past, a tendency that is also true for the study of digital artefact lifecycles (e.g. [7]). Research that has particularly considered the role of artefacts in projecting into the future includes work on superstition and magic [5], as well as work on how artefacts provide a sense of comfort and security [8, 9]. However, there is a lack of studies that look at the ways people project forward through the lives of digital objects.

Methodology

This work combines empirical with practice-led research. The empirical work includes a series of field studies on the use of books and e-books for leisure reading. The aim here is to understand changes to the book's traditionally rich social lives as e-books are finding their way into people's everyday lives. This first phase of studies is followed by a practice-led phase, including the design, realisation, and evaluation of a series of digital artefacts to support envisioning future selves.

For the empirical part, a series of in-depth interviews with households owning books and/or e-books is conducted to understand people's social and material practices around books and e-books. Particular focus is placed on, first, the life trajectory of the book as it comes to be part of the household up to the point it leaves, and second, the role books play throughout the past, present and future life of their owners. The second study is a diary study focusing on people's

practices and orientations around e-books in more depth.

The practice-led phase includes the development and evaluation of a series of design explorations enabling people to project personal futures. This is followed by one or more selected concepts being produced and given to a set of people for reflection and feedback.

Progress to Date

At the time of writing, the empirical phase is complete and in the process of being analysed. It is expected that the conceptual design work will be complete for evaluation by July 2013 after which work on the production and evaluation of the final design will begin. All studies are concurrently written up as data collection and analysis is finalized.

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Mark Iliffe

PhD Title

Eliticiting Spatial Data In Developing Nations

Abstract

National mapping agencies are the traditional preserve of authoritative spatial data. They control the collection, curation and dissemination, potentially aided by Spatial Data Infrastructures (SDI). The emergent field of Volunteered Geographic Information (VGI) has begun to augment the spatial datasets of NMAs where volunteers cooperate to crowd-source and democratize spatial data creating new forms of maps. This is especially relevant in developing nations where NMAs either do not exist or do not have the resources to provide a complete map. Consequently VGI is critical for organisations and governments to support public services like education, transportation and sanitation. This thesis will present an analysis of volunteered geographic information in a developing nation, a framework for improving the collection of spatial data refining current understanding of VGI and an enhanced understanding of spatial data infrastructures.

Author Keywords

Cartography, Citizen Participation, Spatial Analysis

Introduction

Haklay (2010) et. al. and Haklay (2010) provide a full assessment and methodology for assessing the quality of VGI data. However, there is no recognition of Perkins (2007) community mapping, where "Democratised mapping offers new possibilities for articulating social, economic, political or aesthetic claims. Formerly marginalised groups can gain a voice". This jars against Haklay et. al.'s (2010) assertion that "information is provided by many participants, who are acting independently and with loose coordination". Iliffe (2011) clashes against this argument presenting a community mapping project in Dar Es Salaam, Tanzania. Here, communities have been creating their own spatial data - mapping infrastructure relating to their own community. Consequently prior assumptions regarding quality and mode of production seem to be false due to the emergent phenomena of community mapping.

Thesis Statement
This thesis presents analysis of VGI spatial data quality and the characteristics of the collection of data in developing nations. Specifically the thesis will answer; *"How to elicit spatial data in developing nations"*.
Secondary questions addressed will be:

- How can the process of VGI in developing nations be changed to improve quality?
- How can spatial data infrastructures be made more efficient to deal with VGI data?

Related work
Community mapping was first defined by Perkins (2007) as *"local mapping, produced collaboratively, by local people and often incorporating alternative local knowledge"*. He further synthesises the characteristics of community mapping from Aberley (1993) and King and Clifford (1985) in producing an agenda for community mapping;

- *"reasserting indigenous people's rights*
- *re-publishing the past for contemporary consumption advancing local claims to land*
- *re-mapping lost place-names*
- *protecting local wildlife in the face of development*
- *conserving landscapes threatened by agribusiness*
- *protesting against planners*
- *opposing military power*
- *rejecting surveillance*
- *showing the powers-that-be what might be locally distinctive.*

While this list well represents community mapping in IACs, it is not a comprehensive list of the characteristics of community mapping in IDCs. While these factors may indeed become important, a different agenda exists for the production of community maps. This view is reinforced by Parker (2006) looking at how community mapping is "a response to conventional, elitist cartography, comprising an alternative, egalitarian counter-culture." She provides a case study of the Portland Greenmap and its contributions to themes of inclusion, empowerment and transparency in allowing the 'community' in creating their own parks and green spaces. O'Neill (2002) defines IACs and IDCs with respect to the study of the ergonomic nature of systems in nations, concluding that respect has to be given to the environment in which a system is developed, with *local* factors needing to be considered.
Koukoletsos (2012) looks at geospatial data gathered in the aftermath of the Haiti Earthquake in 2010. Specifically he compares VGI with VGI information, in the form of UN 'MINUSTAH' (United Nations Stabilization Mission in Haiti) and Google Map Maker (crowdsourced, driven by a community but with a proprietary, non-free, license). However, the nature of the data collection differs from community mapping; the data was collected during a crisis, therefore, the mapping is typified as crisis mapping Goolsby (2010). Crisis mapping combines the merits and practice of Neogeography with humanitarian volunteers and crowdsourcing.
Hagen (2009) introduces the first community mapping project within an Industrially Developing Country with the explicit aim of producing VGI data; Map Kibera. Map Kibera is a project designed to create a map of one of the largest informal developments (otherwise known as a slum). This project has since transitioned into a community mapping movement within Kenya, with Mikel Maron, Erica Hagen and Primoz Kovacic's work catalysing a larger citizen led community. Hagen (2009) and Iliffe (2011), show the focused nature of Community Mapping projects within IDCs. Contributors aren't spatially distributed working asynchronously, contrasting with the discussion of "data collection by amateurs, the distributed nature of the data collection and the loose coordination among them" in Haklay et al. (2010).

Methodological Approach
Phase one consists of a thorough analysis and comparision of the spatial quality (completeness, temporality, attribute, positional accuracy) according to ISO:19113 – Geospatial Quality Principles of Dar Es Salaam.
Phase two consists of a human factors approach to understanding the process of VGI data collection using Cognitive Work Analysis as presented by McIlroy and Stanton (2011), Vicente (1999) and Rasmussen et. al. (1994). This involved semi-structured interviews, conducted in 2011 and 2012 involving participants and stakeholders of community mapping.

Phase three consists of the development and deployment of the Taarifa platform. This creates feedback loops; hence, a community monitoring and aggregation tool for spatial data.
Phase four consists of a theoretical decomposition of Spatial Data Infrastructures comparing their usage in the developed world and the developing world. A framework for lightweight SDIs will be constructed.

Expected contribution to the field
It is anticipated that the dissertation will form the basis of (a) a multi-disciplinarily approach to understanding and testing the quality of VGI, in addition to (b) understanding the characteristics of VGI and its acquisition and (c) VGI's usage and dissemination. It is hoped by reframing the current discourse of spatial quality toward developing nations future developments in the practice of community can occur enabling and enfranchising a new generation of community mappers.

Progress to Date
At the time of writing Phase One - a quality assessment of Tanzanian open data and community mapping data - has been produced and is *in press*.
Phase Two builds explicitly upon Phase One looking at how the data in phase one was collected and a decomposed to expose the processes of collection and improvements. The beginnings of this work were presented as a paper at GISRUK 2013.
Phase Three – Taarifa - was started in September 2011 and has been deployed in Tanzania, Ghana, Uganda and Nigeria in collaboration with the World Bank and other organisations. Best Paper at the Association of Geographic Information 2012 and was an invited keynote at the Ordnance Survey.
Phase Four will be conducted between July and October. This final phase will build upon and unify the findings and themes of the previous three phases.
Writing up of the studies is being conducted concurrently and it is anticipated that submission will occur January/February 2014.

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Lorena Macnaughtan

PhD Title
Collaborative Digital Healthcare Technologies: Raising (Un)Certainties

Abstract
The research is grounded in the contemporary digitally transformed economic landscape, at the intersection of the consumer and healthcare markets. Through an inductive case study approach of three collaborative digital healthcare technology (CDHT) producers, the research aims to understand how these firms navigate varied ambiguities of a nascent fragmented field.

General Terms
Digital Healthcare, Management, Strategy

Introduction
CDHT *are intended to support people's wellbeing, either by helping individuals to stay well physically, mentally or socially, or by helping to diagnose or manage the medical conditions with which they are confronted*. The emergent nature of this field is shown by multiple debates, from terminology and governance, to market models and benefits. The existence of multiple and various stakeholders creates a fragmented emerging field, with conflicting institutional settings that are difficult to address. Fragmented fields are to be found in areas that involve public service, because they are entangled in the interests of direct or indirect beneficiaries, specialised interest groups, professionals, local and national governments, regulatory and standardisation bodies

Thesis Statement
This research takes a "problem driven approach" (Santos and Eisenhardt 2005: 505) and aims to contribute to a developing strand of work that combines institutional theories with strategy topics. The goal is to understand how collaborative digital healthcare technology (CDHT) producers navigate varied ambiguities of a nascent fragmented field, at the intersection of the consumer and healthcare markets. The research questions are *How do the CDHT producers shape their organizational boundaries in an emerging, institutionally complex environment?* and *What types of boundaries are dominant in such an environment?*

Related work
Parallel to calls for research with more synergistic approaches to boundaries in social sciences, Santos and Eisenhardt (2005) call for research that go beyond atomistic views of boundaries and that can reveal the relation and particularities of the interplay between the types of boundaries (efficiency, power, competence and identity) at organizational level. Nascent markets require, enable and potentially reward organizational action, "yet it is unclear how existing theories of organizational boundaries might apply in nascent markets where the basic elements of industry structure are ambiguous, evanescent, or nonexistent" (Santos and Eisenhardt 2009: 644).
Santos and Eisenhardt (ibid.), through a multi- case inductive study, explore the boundary creation in a nascent market in the digital economy. Based on its empirical findings, this empirical research contributes on one hand to the institutional entrepreneurship theories with the importance of novelty and dominance as opposed to isomorphism and legitimacy, and on the other hand to the strategy literature by revealing mechanisms that organisations enact in a nascent market. However, its setting is not a fragmented field.
Rindova and Kotha (2001), through a two case inductive study of two internet search engine companies, Yahoo and Excite, explored the relation between structure and function in nascent fields. This research showed how organisation exchanges with the environment are translated in a continuous morphing, where organisations do not engage solely in path dependence decisions, but also in path breaking ones. The empirical research setting is not a fragmented field where powerful stakeholders may preclude or force boundary decisions and may not allow for quick and continuous changes.
Zong and Demil (2012), through a field level inductive case study, focusing on boundary decisions in the nascent fragmented field of nanotechnology, showed interestingly that organisations may encourage blurred identity boundaries. These results are contradictory to existent theories on organization struggle for clear boundaries of

identity (Wry and Lounsbury 2013). This suggests that fragmented fields pose interesting settings and that organisational action in complex institutional environments still remains to be explored. Although focused on a nascent fragmented field, this research does not focus on entrepreneurial action as such and it does not address the digital economy.
These studies show that the contemporary economic landscape needs to be explored through meta-theoretical approaches in order to be better understood and to bring practical and theoretical insights.

Methodological Approach
A multi-case study approach employs the logic of inductive inquiry suitable for investigating phenomena that are relatively poorly understood (Eisenhardt and Graebner 2007). An inductive inquiry is not merely a description of a realm of social or economic life, but it is a "theory-building approach that is deeply embedded in rich empirical data" (ibid.: 25). At the organisational level, the units of analysis are boundary decisions, mechanisms and boundary types. The research setting is at the intersection of digital technologies and healthcare, which creates a nascent fragmented field, with conflicting institutional demands. There will be three organisations selected based on technologies developed and time since founding. Data will be collected from multiple sources; primarily semi-structured interviews with CDHT organisations' representatives and document analysis (ibid.). Data will be analysed by the researcher through iterative comparisons and it will be validated both by extant theories and re-examination of the empirical data (Rindova and Kotha 2001, Eisenhardt and Graebner 2007, Santos and Eisenhardt 2009), at case level and across cases.

Expected contribution to the field
The main aim of the research is to understand of how entrepreneurial digital technology producers are navigating in nascent, fragmented fields. Theoretical contributions are expected towards theories of entrepreneurship and strategic management. The results may have practical benefits for technology producers and policy makers interested in harnessing digital technologies in healthcare.

Progress to Date
At the time of writing, the researcher is preparing for ethical approval submission and organization recruiting.

Acknowledgements
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Tim Pearce

PhD Title

How does spatiotemporal metadata affect the process of newsgathering by broadcast journalists in the modern newsroom?

Abstract

The Technological Newsroom

Technology has had a significant impact on journalism, from the start of Electronic News Gathering (ENG) in the 1980s to social media and multiplatform content today, each revolution improving the quality and immediacy of breaking news. This PhD focuses specifically on the workflow of video journalism and user generated content (UGC), what effect does increased contextual metadata have on the production process?

ENG, the digitisation of the news production process has been one of the most significant developments in broadcast journalism in the last 30 years. Newsrooms are typically divided in two halves, "newsgathering" and "output" working around a centralised multimedia content hub. Newsgathering is responsible for the discovery of news and collection of raw footage, which is then submitted to the hub along with key metadata (who, what, when, where, why and how). The output team monitors feeds provided by the hub and edits packages of video from the raw content for specific platforms such as the web or the evening television news. The PhD research will, at the moment, focus on the newsgathering side of the newsroom as this has most exposure to the challenges of UGC.

User Generated Content: The rise of the citizen journalist

In the last decade, newsrooms have had to adapt to process user generated video content from citizen journalists, those that were present at the event and recorded what was happening on their mobile phone. The most significant example of this was during the events of the "Arab Spring" where much of the footage used by professional journalists was sourced from YouTube. Traditional news organisations have had to adjust the process of newsgathering with user generated content, employing human and technological resources to find the highest quality, most accurate clip of the news event to be integrated into their report.

Verification of content is a key element in the UGC newsgathering process, ensuring that the event being reported in the output content matches the event being captured in the video. Currently this involves a manual investigative process in which the video's poster is contacted and asked for the key items of metadata: who, what, when, where, why and how? These are checked by a number of strategies including cross-matching locations on maps, checking the local weather conditions at the reported time, listening to the language and dialects of people speaking in the clip and finding corroborating content.

The aim of the PhD is to assess the impact of increased contextual metadata on the UGC newsgathering process. Through technological intervention at the point of content capture, video can be enhanced with streams of data from the device's sensors, such as the GPS and accelerometers. What metadata is useful for journalists in the UGC newsgathering team? How can interfaces be designed to visualise the metadata and improve the selection and verification of user generated video content?

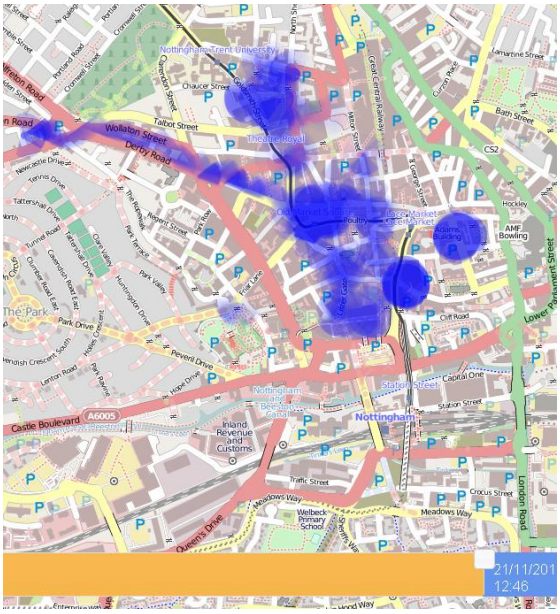
Mobile Application for Citizen Journalists

As part of the research, a platform has been developed for the collection, submission, storage, retrieval, visualisation, browsing and selection of mobile video footage using metadata. The first component of the platform is an Android mobile application which collects, in the first iteration of the project, the location and orientation of the device whilst recording video. A background service on the phone monitors the device's default camera directory for changes, triggering metadata capture whenever the standard camera application is used to record video. This process allows users to capture in the same way they would normally and make full use of the camera settings, such as white balance and quality.

During video capture, the background service uses sensor fusion to combine the data streams from the device's 3 axis accelerometers, gyroscopes and magnetometers to gain an accurate compass bearing. Combining this data stream with the location of the device (provided by GPS and WiFi hotspots) and

the camera's horizontal view angle generates a "viewcone" for every second of footage. This data is then uploaded from the device to a remote server, which provides an API to submit and retrieve data from multiple devices. Video footage is uploaded to YouTube, which provides a convenient and scalable means of storage which is easily distributable.

Visualisation, Browsing & Selection engine for broadcast journalists.



A HTML5 browser application has been built to browse the collected videos by time and location. A custom overlay on an OpenLayers map draws the viewcones generating a heatmap of coverage, where darker areas have more footage. Time and location filters can be applied to dynamically change the heatmap and provide a timeline of videos, which can be watched back via YouTube. This interface is intended to be used by broadcast journalists in the newsgathering process for improving content discovery, selecting suitable content, verifying content, compliance checking and submission to central media repositories. It could also be, subsequent to submission, used by picture editors to select certain types of shot for inclusion in output content packages.

Next Steps: User Study

The study will involve working with students from broadcast journalism courses to assess how geospatial and temporal metadata affects the process of newsgathering. Participants will be asked browse footage from two events collected by citizen journalists, the World Event Young Artists Festival and Nottingham Christmas Market and select videos for use by the output team. They will perform the task twice under time pressure to simulate a real newsroom environment, once with the geospatial visualisation & browsing tool and once without. Their interaction with the system will be recorded and analysed using hierarchal task analysis and a post-task semi-structured interview.

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Abdur Rahman

PhD Title
The influence of social identity when sharing location

Abstract
Social media is designed to reflect real-world social relationships and can even be a means to strengthen them. In attempting to do so, it assumes that users have a single unified identity. This problematic approach can leave users vulnerable to identity conflicts that can have potentially serious consequences. In the real-world, people maintain multi-faceted identities, carefully segmenting their lives, and only exhibiting behaviour deemed appropriate to a particular context. They consistently switch between facets e.g. social to professional to family. This research seeks to understand how social identity is manifested in location-sharing software and how we can design future systems to help people manage different aspects of their identity.

General Terms
Design, Human Factors, Ubicomp

Introduction
Social media, at its core, tries to reflect real-world social relationships. Through features like virtual profiles, and 'friends', users can engage in online communication, strengthening existing bonds and even creating new ones. But in trying to mirror offline relationships, social media makes some problematic assumptions. One such assumption is the idea that everyone has a unified identity that fits all social situations, (Farnham & Churchill, 2011).
Past research has indicated that rather than being singular, people have many facets of identity that together form a self-concept. Some of these facets can be quite personal and idiosyncratic and others shaped by social context. Take the example of a woman who may categorise herself as a mother in her family life, a professor in her work life and a friend in her social life. In each of these roles, the expectations on her can vary considerably. In the family role, a mother is expected to be affectionate and caring toward her children. However in the work role, that same individual is now expected to be an intelligent and articulate professor toward her students. Such facets of identity are carefully segmented in the real-world. Behaviour deemed appropriate in one role may be entirely inappropriate and even harmful to another. One could argue that the concept of multi-faceted identities has not been replicated particularly well in social media. This is not the only concept that social media has overlooked. Related to this is the ambiguity of terming everyone as a 'friend' online. In popular social media websites, it is perfectly acceptable for users to have thousands of 'friends' – an accolade not entirely reflective of the real world. Just as not everyone is a friend in the real life, similarly it is highly questionable to assume that one identity fits all situations.
The mismanagement of identities in different social contexts can lead to very real distress, a problem amplified in social media. In fact, some research has shown how conflicts in role-segmentation can have many undesirable consequences – from being reprimanded to even experiencing job loss. One such example is a user purposefully "cleaning" all information about himself online, particularly photos showing him "drinking alcohol" to avoid damaging the professional image expected of him at work (Dimicco & Millen, 2007).
This problem may be exacerbated with the introduction of location-based services. In this context, we are not just talking about virtual profiles but people's physical whereabouts. Infamous social media websites like Facebook and Twitter now allow users to tag their location, a feature seamlessly integrated into their systems. Once location is shared, it has the potential to be seen by everyone, making segmentation that much harder.

RESEARCH GOALS
The research seeks to study real-world social behaviour, in our case social identity, and how it is manifested in existing location-sharing technology. The aim is then to understand how location-sharing software can be designed to better reflect real-world social behaviour. Specifically, the research will answer three core questions:

- What is the relationship between identity and location?
- How do people manage their identity across different groups within their social network?
- How can we design location-sharing software to help people manage different facets of identity?

Methodology

The research takes an interdisciplinary approach, drawing upon social science, computer science and human factors HCI.

An exploratory online web survey has already been constructed to understand attitudes toward identity and location. The survey was distributed to a range of location-sharing users including students, academics and business professionals alike. A total of 189 participants responded and the data was analysed using both quantitative and qualitative analysis techniques.

It was found that for many participants identity is comprised of personality, hobbies and interests, relationships held with others, events and activities. All of these factors can help build an identity. Identity is also linked to location in a variety of ways. It is particularly the case if a person has a personal attachment to a place i.e. place of birth, childhood memories, reflecting particular stages in life. Participants remarked that these types of locations were more likely to be shared.

Many participants also acknowledged that identity is faceted and that different locations are shared to convey different aspects of one's life. Some participants were very conscious over how their location was interpreted, particularly wary of conflicts in identity. They actively screened their content before posting, ensuring that their location was appropriate for the intended audience. Others maintained different friends lists depending on their audience e.g. friends, family, acquaintances etc. Most participants were simply very careful about who they had on their social network in the first place. They were very meticulous, even tentative when accepting invitations. Some respondents even used different platforms to manage different aspects of their life e.g. Facebook for personal, social use and LinkedIn for more professional purposes.

These results corroborate previous research such as (Patil, 2012), who found that regrets when sharing location did not stem from the act of sharing location per se, but from a misalignment in audience. As he states "the audience to which the location was available was not well-matched with the audience for which the information was intended".

It is clear from the above results that there is potential for identity conflicts in existing location-sharing software, stemming particularly from misalignment between the content and the context e.g. audience in which it is shared. Previous research, Farnham & Churchill, (2011) argue that this is down to social media making the assumption that users have single, unified identity that fits all social situations. Rather, people maintain facets of identity, carefully segmenting different aspects of their life, and exhibiting behaviour most appropriate to the current context.

With this in mind, part of the research is also to understand how we can design location sharing software to help people manage different facets of identity. The approach is not to just look at location-sharing as it relates to groups within the social network, but to design location-sharing around the self, as it relates to different facets of life. In other words, it is less about segmenting the social network, as is the case with conventional approaches, but more about designing location sharing *around* different facets of identity. This means getting users to think about how their sharing relates to their social, professional and family contexts for example and managing their sharing around these modes.

An experience prototype will be designed that incorporates the key research goals. The prototype will initially be low-fidelity, demonstrating the concept and various design features. It will be exposed to location-sharing users in a lab setting.

Picture-based scenarios will be employed to communicate and evaluate the prototype in context. Such scenarios are easy to create and use and can capture important contextual details about usage that can be difficult to represent otherwise, (Pedell & Vetere, 2005). We will be evaluating how well the design helps people manage facets of identity. Since we are modifying the way in which people think about their location-sharing, it will be interesting to assess the impact of this, both in terms of usability and the wider impact on social interaction.

Results will help inform the design of a fully-functional prototype at a later stage.

PROGRESS TO DATE

Currently, the first study has been completed and analysed. A low-fidelity prototype has been designed and the second study is due to commence shortly. The second study will help inform the design of a fully-functional prototype to be deployed in the field.

Expected contribution to the field

We anticipate that by attempting to reflect real-world social behavior more closely, the study will help inform the design of future location-sharing systems. The contributions of this research will include:

- A greater understanding real-world social behaviors and how they can be better represented in location-sharing technology.
- The design of a prototype that helps people manage facets of identity.
- The impact of such a tool in both a usability and social context.
- By framing the study around intrinsic social behavior, overall findings will help inform the design of future location-sharing systems and wider social networking technologies as a whole.

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Julian Rosser

PhD Title
Incremental Refinement of Building Interior Models

Abstract
Indoor spatial data forms an important requirement underlying many ubiquitous computing applications. It gives context to users operating location-based applications, provides an important source of documentation of buildings and can be of value to computer systems where an understanding of the environment is required. Despite the importance of indoor geometric models, incorporation of such measurements with existing data, such as 3D models of building exteriors, is challenging. Different methods of data capture offer varying levels of precision and accuracy and complex building geometry yields high likelihood of data conflicts and deficiencies. A need has been identified in how interior measurements may be integrated and refined in a flexible way to facilitate building modelling by multiple agents and sensors.
Categories and Subject Descriptors
H.2.8 [Database Applications]: Spatial databases and GIS

General Terms
Spatial adjustment, data integration

Keywords
indoor space, building modelling, accuracy improvement

Introduction
For useful digital modelling of any geographic feature both spatial information, together with some knowledge of the feature's characteristics, is required. Building models contain information regarding a building's geometry, topology, appearance and semantics and are an important infrastructural requirement in many end-user applications and location-based services. Collecting a comprehensive set of building interior geometric measurements is a challenging task. Representations may be sparse if measurements are forgotten or are not yet made. Disjoint structures can be formed and conflicting data can be captured. It is important to recognise that, in order to make full use of building models in a wide variety of applications, the data is structured in an appropriate and well-defined manner. This sets building models apart from 3D geometric models which are mostly comprised of unstructured and un-interpreted "polygon soup" [1]. CityGML is a semantic data model and exchange format for urban 3D information that can be used for this purpose [2]. The CityGML standard is generic, open and extensible. It is defined so as to be applicable to the wide range of possible uses of 3D building models, contains accuracy recommendations and integrates with existing geospatial data referenced using global coordinate reference frames.

Thesis Statement
The overall aim of the thesis is to design and develop a system capable of integrating building measurements to form the "best", most likely representation of interior geometry. The objectives are to: 1) define a flexible procedure that resolves issues of conflicting measurements, makes sensible assumptions when data is deficient and supports refinement as additional observations are added; 2) define the accuracy improvement gained through the enforcing of different constraints; 3) demonstrate generation of well-defined, standardised building models through combinations of measurements made with sensors with varying levels of precision.

Related work
Various academic disciplines contain work relevant to the research including spatial data integration and conflation, map generalisation and computer graphics. To address issues of integrating multi-accuracy geometric data, a statistical framework has been proposed by [3]. This framework defines a data model for a Multi-Accuracy Spatial (MACS) database where observations (object coordinates) are described using probability theory with the object's relations (topology) described using logical approach. The framework identifies how to determine accuracy information when only general aggregate accuracy metadata is provided with a dataset e.g. maximum error for absolute positions and maximum error for relative distances between features.
In some circumstances, conflation techniques can be used to integrate spatial data together. For geometric data this involves matching elements between two datasets then adjusting one dataset according to some transformation [4]. This introduces certain distortions into transformed dataset

depending on its transform type. Preserving the characteristic geometric shape of the input datasets is important for some map integration scenarios and relevant to taking indoor measurements. [5] describe a least-squares adjustment framework applied to land parcel data conflation that maintains shape whilst incorporating relations between features.
[6] defined a redundant data structure model for completing 3D as-built building survey. Starting with a sketch that defines the topology of the building structure, measurement observations may be modelled stochastically and added into the model. These are then used within a least-squares adjustment to determine the building's absolute geometry.
Conceptually, the work so far and proposed ongoing development is similar to [7]. To enable architects to engage in more "responsive design" when completing space planning tasks, the authors propose a system based on modelling of physical forces. The key component of the idea is modelling a mass-spring-damper element which exerts force between two masses as they move closer, but pulling them together when moving apart. Using this idea, topological and geometric design objectives of the space-planning problem are formulated. Example topological objectives include adjacency, separation, orientation and geometric objectives alignment, area and proportion amongst others.
Technically relevant work includes [8] who demonstrate a method for generating exterior shell and interior floor plan from a set of high level specifications such as the building footprint, number of a particular room type (e.g. bedroom or bathroom), specific existence of particular rooms or room dimensions, specific room adjacencies etc. Firstly, an architectural program is derived from the high level requirements using a Bayesian network trained on a corpus of layouts. A plan of each building floor is then generated using a stochastic optimisation over the space of possible layouts. The cost function evaluates the quality of the plan considering accessibility between rooms, desired room dimensions, inter-floor compatibility to prevent generation of overhanging upper floors and room shapes. As the method produces cohesive spaces across multiple floors, 3D models of the residential building layouts may be produced.

Methodology
The research has proceeded to identify the state of the art in building modelling with respect to data capture, integration, structures, generalisation and application. Methods of geometric model acquisition have been investigated and implemented. These include mechanisms for collecting precise and imprecise measurements.
Following identification and definition of accuracy criteria in accordance with relevant standards and acquisition mechanisms, a set of rules has been defined. The aim is to develop a method to automatically resolve issues in the data whilst enforcing these various predefined rules and tolerances. Rules have been mathematically defined as constraints to be used in an optimisation routine. Methods for automated discovery of relationships between building features required as inputs to other rules have been developed.
Successful experiments using simulated and basic real-world measurement data have been undertaken since developing a simple model. Refinements and additional constraints to the system are envisaged before undergoing more rigorous evaluation of the quality changes arising from the adjustment process. Demonstration of the system with precise and imprecise data collection case study scenarios will follow.

Expected contribution to the field
The main contribution the thesis is expected to make is toward understanding how and to what extent interior geometric measurements of buildings can be integrated, adjusted and thus refined. The development of a novel cost model to improve modelling through use of constraints suitable for use in stochastic optimisation procedures will be presented together with demonstrations and quantifications of the benefits.

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Jianhua Shao

PhD Title
Valuation of user data in digital economy

Abstract
User data plays key roles to sustain digital business. Allowing interaction to user data would encourage service innovation, but negative effect of misuse would follow in sequence. This study will explore the value of user data by analysis the motivation and actual behavior of data demand. In specifically, with empirical study on Android market, it will explore how data consumer would demand and access user data. It will study the actual behavior of developers with their apps on user data, in order to understand the business model behind the surface. With case study on real market, this study demonstrates the valuation methodology to study user data in digital economy. The knowledge will help user to understand their data value better and guide developer to generate revenue in proper way. Market owner can strategy use it to balance the openness and control in order to service innovation.

Author Keywords
User data, mobile app market, privacy, value network, service innovation.

THESIS STATEMENT
This thesis will seek to understand the valuation of user data in digital economy. It is commonly believed that user data becomes a next-generation important asset [6] in the current and future digital economy business. Assets create and maintain value in goods exchanging. Therefore, it is necessary to study the motivation of creating, holding and exchanging of user data, in order to understand the value of user data. User data has been mentioned for value study in side previously, but it is less commonly to exam as a systematically fashion in the digital market. This thesis will contribute to fill this gap to systematically summary the value of user data by listing the motivation of data use in context. It will then explore the methodology of valuation based on case studies of user data model. This thesis will exam the interaction between three roles, and they are data provider, data consumer and exchange agent. By specific to digital economy, for example a mobile apps market, three roles are users, third party developer and apps market owner. With case studies in concrete real market, the thesis will explore to answer following questions:

1. Economy purpose of user data demand
2. Positive/negative effect on business sustainability
3. Strategic lesson to balance the user data openness?

Methodological Approach
Study on Android marketplace would simulate a complete mobile app market interaction. Mobile device has becomes a central gateway linking user to external world [1]. Mobile device has various types of user data dynamically generated and maintained, for example location data, user contacts data, browsing historical data, etc. Third party app developer would demand those data to extend device's existing functionality, connect to external service, innovate new service, and improve existing service, etc. However, such openness would also allow misuse user data to cause privacy issue and lower down user experience. This case study will involve multiple steps to understand how to balance between open and control on user data.

Data collection: The study will collect large-scale non-ethic research data about apps from Android Marketplace. So far, it has collected about 567,730 apps that convers nearly 84% apps population in a complete Google Play. For each app, it collects performance measure (downloads, user review score), meta info (category), developer, permission required, etc.

User contacts case study: It will firstly choose user contact as a type of users data in mobile device for prior study. The reason to choose user contact is because, user contacts is a major type of data matching device functionality which is for social, and user contacts is a valuable user data to third party developer. The study would explore whether using user contact would be relating to the performance in apps level and developer level.

User data overview study: based on prior on user contacts case study, this study will advance to explore all user data on the device. It will summary the context of user data in mobile device comparing to finding from literature. It will then explore the pattern how developer would access to those user data. It will then study the motivation to access those

user data. Same to prior study, it would compare how user data would contribute to app performance and how negative effect would generate in opposite purpose.

Critical permission study: Permission is the media for developer to access to user data in Android device. Each permission would perform read or write behaviour on specific data type. Permission combination is a unite of service innovation to meet long tail customization user need. This study will exam how permission combination could be relating to positive service innovation or negative user experience. The study will involve phylogenetic analysis to identify and interpret how user data would be relating to digital innovation in Android market.

Business model study: app development is profit driven which fits into business model. Business model can well explain how developers would use user data for which could represent the value. This study will identify possible business model in mobile app market and cluster apps and developer into each business model. This knowledge will help market owner understand developer better to encourage positive service innovation and lower down negative user experience. User can also understand value of their data to determine whether to interact with data exchange.

Related work

Many previous work studied user data [6], but those studies would normally focus on a type of user data due to lack of a complete market as research resource.

Android market becomes hot in research in last 4 years. Most researchers are focusing on security control [2; 5] and people prospective [1].

Platform strategy studies involves to understand the strategy for openness and control [3; 7]. Existing literature is less popular focus on mobile market and less common to explore from user data prospective.

Business model on mobile service is popular studied [4]. New search methodologies also involved to understand the digital innovation business model [8]. They will guide to the study in this thesis.

Expected contribution to the field

The systematic study will contribute to the comprehensive understand of user data value. Specifically, it is anticipated that the dissertation will form the basis of (a) summary of user data on mobile device and how they can be accessed by third party developers, (b) explore the motivation of user data be demanded by third party developer that frame the business model. This knowledge would generally help user to understand how their data can be valuable which is not commonly clear to public so far. User could make better decision whether to install mobile Android app specifically to improve the 'better create better' with crowd wisdom. Third party developer could learn to greenly involve user data value interaction to improve product quality and revenue. This knowledge could also help market owner to guide proper use of user data to developer and user. Market owner could use to balance the strategy on open and control of user data access, in order to maintain the service innovation but also protect necessary players.

Progress to Date

All steps undertake in parallel. At the time of writing, it completely finish data collection, user contacts case study. User data overview study is nearly done for analysis. Critical permission and business model study are in the middle stage, and are expected to finish in the end of 2013 as these two studies crossover to each other. Writing up of the studies will be carried out concurrently and it is anticipated that submission will occur September 2014.

Acknowledgements

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Mercedes Torres

PhD Title
Automatic Habitat Classification Using Ground-taken Photographs

Abstract
Habitat classification is an important ecological activity for monitoring the environment and biodiversity. Currently, this process is done manually by human surveyors, which is laborious, expensive and subjective. The aim of my thesis is to automate this process using image analysis, ground-taken photographs and context information. We formulate the problem of habitat classification as an automatic image tagging problem, in which the classes to identify correspond to the Phase 1 Habitat Classification scheme. Moreover, as part of my dissertation, we have collected a geo-referenced habitat image database containing over 1000 high-resolution ground photographs that have been manually annotated by experts. Experimental results obtained until now show that ground-taken photographs are a potential source of information that can be exploited in automatic habitat classification and that our approach, based on random projection forests and feature extraction, is able to classify with a reasonable degree of confidence four of the ten main habitat classes.

Categories and Subject Descriptors
H.3.4 [**Database management**]: Database applications - *Image databases*

General Terms
Algorithms, Design, Experimentation.

Keywords
Image annotation, feature extraction, habitat classification, random forest, ground-taken photography.

Introduction
Habitats are defined in the European Union Habitats Directive as "terrestrial or aquatic areas distinguished by geographic abiotic and biotic features, whether natural or semi-natural" [6]. Their classification and characterization has been carried out for more than one hundred years [1] by different environmental agencies of countries such as the United Kingdom and Germany [18].
The purpose of classifying habitats is twofold: First, it helps to reduce the complexity present in the natural world. Second, by categorizing habitats, their characterization and comparison can be done much more efficiently and effectively. One of the schemes used widely by ecologists is the Phase 1 Habitat Survey scheme [10].
Habitat classification can be applied in multiple fields, such as shore and habitat monitoring, land cover and identification, and rare species monitoring and conservation [6, 16, 19, 21]. However, one of the main drawbacks of Phase 1 Habitat Classification is that it relies very heavily on human surveyors [10]. This is laborious, expensive, time consuming and, given the similarities between some of the habitat classes, subjective. While approaches have been developed with the aim of automating the habitat classification process, to our knowledge, no clear and accurate alternative has been presented to this date. One of the main reasons why fully accurate results have not been obtained is because most of the methods developed use

aerial photography or satellite imagery [15]. Given the grade of detail that is necessary to distinguish between some of the habitats collected in the Phase 1 Habitat Survey scheme, both aerial and satellite imagery have proven to been insufficient.
We have approached automatic habitat classification from an image annotation perspective in which the classes to identify in the photographs are the habitat categories from the Phase 1 scheme. Our current method, based in feature extraction and random projection forests, is novel in two different levels: first, it uses ground-taken high-resolution photographs, which have a higher level of detail and are easier to obtain than aerial or satellite imagery (shown in Figure 1). Secondly, it uses random projection forests (RPF) to annotate the images to make the classification process more efficient.

Thesis Statement
The main aim of my thesis will be to create and evaluate an automatic habitat classification approach using ground-taken photographs and context information. The research questions aimed to be addressed are:

- Is ground-taken imagery a reliable source of information for the classification of habitats following the Phase 1 scheme?
- Which type of context information can be extracted?
- How can the combination of feature extraction and contextual data improve the accuracy of habitat classification?
- Which habitats obtain better results and why?

Related work
There are two main areas whose related work is relevant:

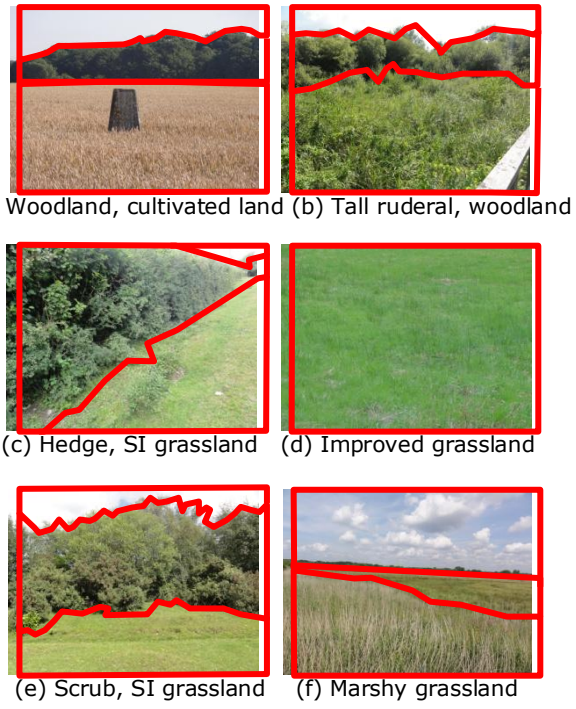
Habitat Classification**:** Up to this date, there are numerous terrestrial and freshwater habitat classification schemes that have been developed worldwide [7, 15, 22]. Examples of these are: Phase 1 Habitat Classification [10], European Nature Information System (EUNIS) and Coordination of Information on the Environment (CORINE) [17]. Although their objectives and parameters are quite different, the classifications with better results rely heavily on surveyors and manual classification. However, habitat surveying is labour intensive, costly, subjective and can take a significant amount of time [10]. On the other hand, most of the automatic approaches proposed use either satellite imagery [5, 9, 14] or aerial images [7, 24] in their design.
In terms of Phase 1 classification, the use of aerial and satellite imagery to categorize habitats presents several disadvantages, such as little species information and they can be difficult to interpret [10].

Moreover, satellite and aerial photographs are difficult to obtain in comparison to ground-taken photographs. However, to the best of our knowledge, the use of ground-taken photographs to classify habitats using a Phase 1 classification has not been attempted before. Therefore, there are no previous results about how accurate ground-taken imagery is when automatically classifying habitats using the Phase 1 scheme.

Image Annotation: From an image processing perspective, automatic Phase 1 habitat classification using ground-taken imagery can be approached as an image annotation problem. In this case, the aim is to identify which habitats are present in which photos and where they are localized. There are many approaches that have been developed for image annotation with general classes. For example, [21] combined image annotation with semantic information and bag-of-features to classify photographs according to twenty-one classes such as *building, grass, tree, cow, water, chair, road* and *cat*. [23] used semantic texton forests to annotate and classify images with a similar classification scheme. [2] combined interactive and online learning to create a framework that was able to annotate bird images. [13] also developed a method for indoor and outdoor scene recognition based on partitioning an image into increasingly finer sub-regions and computing their histograms. However, what makes the problem of habitat classification and our approach different from other image annotation problems is the nature of the classes that need to be recognized. Instead of conventional and clearly separable classes, such as *building, flower, tree, dog, cow, road, body, boat, mountain, forest* [21, 23], Phase 1 is a hierarchical classification whose classes are difficult to identify and tell apart even for human surveyors. The aim, instead of classifying trees, grass or water, for example, is to classify *which kind* of trees (broad-leaved or coniferous), grasses (improved, semi-improved or unimproved) or water (standing or running) appear in the photographs.

PHASE 1 HABITAT CLASSIFICATION

Habitat classification is the process of mapping all habitats present in an area according to a determined scheme [10]. There are a large number of schemes that can be used to classify habitats. In our case, we are following Phase 1 Habitat Classification because it is one of the most widely-used schemes. A robust classification scheme, such as Phase 1, is an essential tool for nature conservation since being able to identify and record species, ecological communities and habitat types is vital to ensure their protection. Phase 1 is a standardized hierarchical system for classifying and mapping wildlife habitats. It was first devised in the 1970s in the UK and it is designed for rapid wildlife mapping over large areas of countryside. It comprises ten broad categories: Woodland and scrub **(A)**, Grassland and marsh **(B)**, Tall herb and fern **(C)**, Heathland **(D)**, Mires **(E)**, Swamp, marginal and inundation **(F)**, Open water **(G)**, Coastland **(H)**, Rock exposure and waste **(I)**, Miscellaneous **(J)**. Figure 1 shows examples of labeled ground-taken images from our database containing habitats A, B, C and J.



(a) Woodland, cultivated land (b) Tall ruderal, woodland

(c) Hedge, SI grassland (d) Improved grassland

(e) Scrub, SI grassland (f) Marshy grassland

Figure 1. Labelled data. Classes present: (a) A, J, (b) A, C, (c) J, B, (d) B, (e) C and B and (f) B. SI stands for Semi-improved. The sky is also labelled as Miscellaneous (J).

In total, the Phase 1 classification scheme contains 155 recognized habitat types organized in three different tiers, from more general to more specific. Each class is identified by its name, an alpha-numeric code, a description and a mapping color. However, current implementations of the Phase 1 scheme rely on human surveyors to map the habitats. This has many disadvantages. Firstly, surveyors need to be trained specifically in Phase 1 classification. Secondly, depending on the size of the site to audit, manual habitat classification can be expensive and time consuming. Moreover, given the degree of detail that this classification entails in particular, it can be extremely laborious.

Methodological Approach

I have followed an iterative approach, as shown in Figure 2. After identifying the problem, we carried out the literature review. In each iteration, the problem is refined in order to improve the accuracy of the system and a relevant literature review is conducted if needed. After that, a new updated design is proposed and implemented. To evaluate the accuracy of the new design, we calculate several measures, such as the recall and precision [26] of the algorithm. Results obtained influence the next iteration cycle. Each iteration has the same stages but the focus varies depending on the iteration. For example, during the first iteration, stages 1 and 2 were the focus (identifying the problem and the literary review) while later iterations focused on the implementation of the algorithm (to make it more efficient) or in the evaluation.

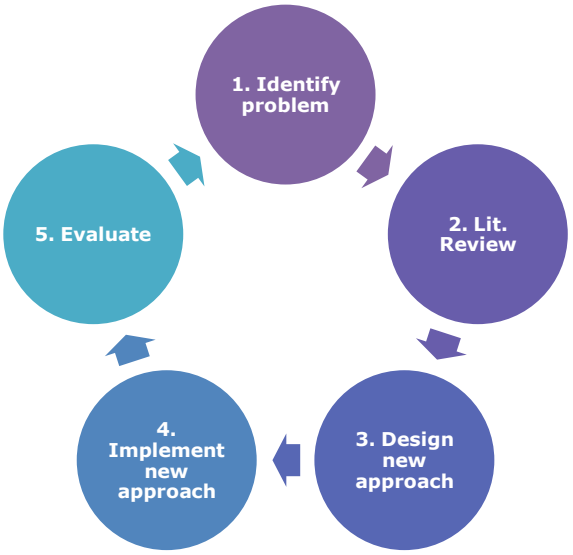


Figure 2. Iterative Methodology. Each iteration has the same stages but the focus can vary.

Expected contribution to the field

The dissertation will contribute to three different fields: Image processing, Ecology and GIS. The main aim of my dissertation is to create a new approach to automatically classify habitats combining different types of data, such as image features, high-level annotations and location information. Moreover, while I am working with habitat classification, this approach could also be applied to other types of classification tasks (for example, automatically classifying animals).

Additionally, habitat classification is an important ecological activity. By automating this process, habitat surveyors and agencies with projects on habitat classification could benefit from my approach, which could reduce costs and make habitat classification less subjective. Moreover, an accurate automatic habitat classification approach can be applied to other ecological activities such as the identification and conservation of rare species, disaster management and landscape ecology and analysis.

Progress to Date

At the time of writing, the first four iterations of out methodology have been completed. Firstly, we collected and labeled a ground-taken photograph database with over 1000 photos using a MATLAB annotation tool [12]. We have approached the problem of automatic habitat classification as an image annotation problem [11]. We have combined projections [3] and random forests [4, 8] to create a random-projection-forest algorithm based on image-feature extraction [20]. Moreover, we have tested its results in the images as a whole and with blocks within the images [25]. Our fourth iteration consisted in comparing different types of features (colour, texture, pattern and significant-points features) and computer visions approaches (random forests, k-means, k-NN) to obtain a clearer view of which features are more accurate and to improve our random-projection-forest approach.

The current short-term goal is to study which type of contextual information is available (season, time of the day, weather, coordinates, position of the horizon, habitats that appear more frequently around other habitats), how to select which information could increase the accuracy of our system and how to include that information as high level annotation information in our previously-created framework.

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Min Zhang

PhD Title
Digital Engagement in Visual Arts

Abstract
At a time when the Internet is changing our daily life, the digital technology is transforming the way people create, distribute, consume and share arts content and experiences (Arts Council England, 2010). The Arts Council England set the goals for visual arts in 2011-2014, one of them is to enable more people to value and enjoy Art. The motivation of this PhD project is to explore the interesting and effective ways to engage more people with visual arts digitally.

Why arts matter?
Arts can make great positive impact on a person's life. Great art helps people to develop thinking, imagination and understanding. As the writer Blake Morrison said, 'Art can do many things: entertain, instruct, console, inspire, enrage, transform. It teaches us things we can't be taught in any other way and makes us see things we wouldn't otherwise see. It allows us the illusion of escaping our daily lives while simultaneously taking us deeper inside ourselves.'

The Taking Part[1] is an annual population survey started in July 2005, which collects information about attendance and participation with the leisure, culture and sport in England. The survey provides useful data on public engagement in the arts, libraries and museums in England, both for adults and children across nine regions. It also explores the non-traditional engagement, that is, digital participation. Figure 1 shows both traditional and digital participation for Museums or Galleries.

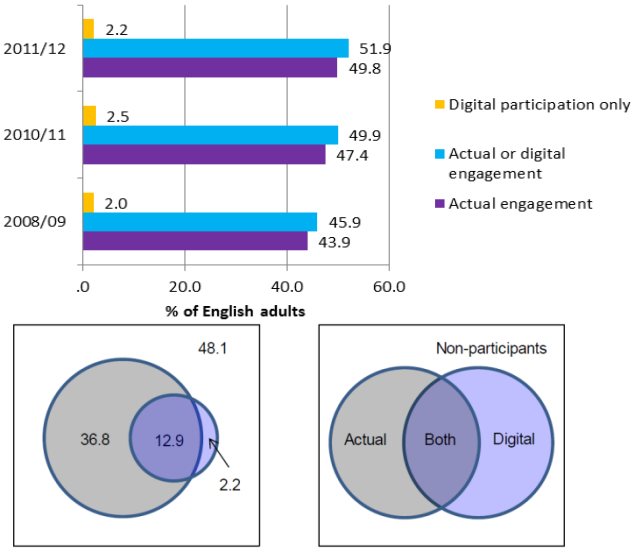


Figure 1 Museums or Galleries engagement
Figure 2 Adults Visiting museums/galleries, 2011/12

Current Digital Engagement in Visual Arts
With broadband speeds are increasing (Ofcom, 2007), and a wide variety of devices are continuing to capable of supporting many different media and connecting to the network (Emily, 2009), involving more people in visual arts, especially the young people, will become easier with new technology and tools. There are also more and more museums and art organisations digitising their art archives. For example, BBC has lunched 'Your Paintings[2]' website which now allow the public to access and tag 212,000 oil paintings online. According to recent Taking Part survey (DCMS, 2012), there are more English adults who visit a museum or gallery in person or participate digitally, from 45.9% in 2008/09 to 51.9% in 2011/12 (shown as Figure 1). However, just few of adults digitally participate only (2.0% in 2008/09 and 2.2% in 2011/12), as Figure 2 shows.

Current digital participation includes visiting websites for multiple purposes such as viewing an online museum/gallery collection, taking a virtual tour, searching for information about opening hours or to buy tickets; mobile learning via mobile devices apps developed by museums or art organisations as a marketing tool or an enhancing participative arts experiences platform. For example, the 'Social Interpretation' project (Digital R&D, 2011) drew on the social media models to make Museum visitors interact with other visitors via the machines or QR codes located near to Imperial War Museum (IWM) objects.

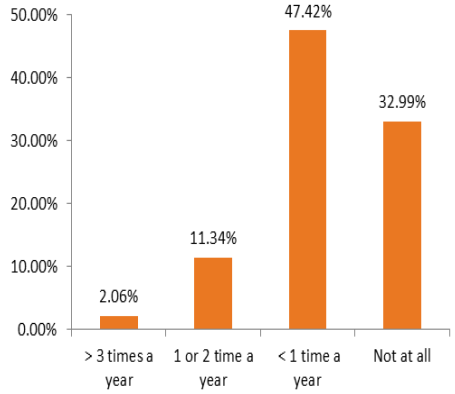
1 https://www.gov.uk/government/organisations/department-for-culture-media-sport/series/taking-part

2 http://www.bbc.co.uk/yourpaintings

Progress and Plan

Arts do not make any impact on the world if n obody see or hear what artists trying to say (Feldman, 1996). With the aim to bring more visual arts (Paintings especially) into people's everyday lives, this PhD project plans to develop the mobile apps with the new and interesting ways to get more people interested in art, especially making an opportunity for those who don't visit museums/galleries.

Until now, an **online survey** about mobile phone people used, their tastes of paintings, museum/gallery participation, were completed. There are 92.7% (102 out of 110) of respondents used the touch-screen mobile phone, and 86.36% (95 out of 110) with Internet data package. Only 2.06% of people visit museums more than three times a year, 32.09% of them never go to museums/galleries (shown as Figure 3).



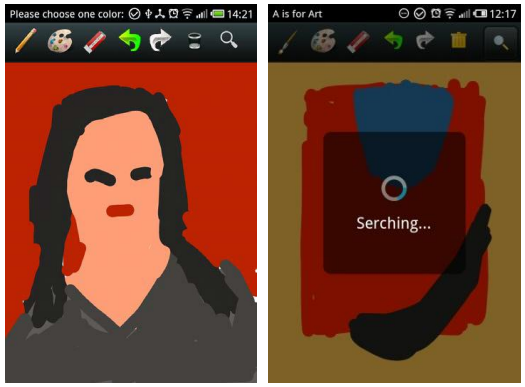


Figure 3 How often people visit museum/gallery
Figure 2 'A is for Art' Mobile App screen-shots

Data collection:

- Tate Collection: 748 abstract paintings and 2200 landscape paintings, 91 portrait paintings collected from Tate website[3].
- Nottingham Castle Museum and Art Gallery: 786 paintings collected from Your Paintings website[4].

'A is for Art' Mobile App is a client-server based searching paintings by color-drawing or line-sketching (Figure 4). The **focus group** to evaluate the usability of this mobile app will be conducted in this April, followed by **user study**. Another Mobile App for social engagement in visual art attendance will be designed and developed after that.

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Cohort 2011

The Horizon DTC cohort 2011 commenced their studies in September 2011 and will complete their PhD in September 2015.

There are 13 students in the cohort whose disciplines include Engineering, Psychology, Sociology, GIS, Business and Computer Science.

Paul Brindley psxpb2@nottingham.ac.uk

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Paul Brindley

PhD Title

Neighbourhoods: Identifying the places that people talk about on the web

Abstract

The thesis will identify and extract vernacular neighbourhoods (in terms of names and geography) in an automated fashion from web pages. It does so by analysing address information in order to form fuzzy spatial neighbourhood units, with nesting and contestation. The benefit of the work is that it will be possible to map and derive data for the places that people associate with, in contrast to using existing administrative boundaries.

Introduction

'Neighbourhoods' are often expressed as the places where events of everyday life occur [2]. They are geographical units to which people connect and identify with. Neighbourhoods are seen as a key element in government agenda, described by Eric Pickles (Secretary of State for Communities and Local Government) as "the building blocks of public services society" [7]. Thus, there is a practical desire to have a set of units that people can relate to – that are statistically large enough to be robust but small enough not to average out actual effects.

However, neighbourhoods do not pre-exist and are human constructions which clearly wouldn't exist without us prior defining them. There is no singular definition of the word 'neighbourhood' and the term has a number of different meanings or formulations. The majority of differing perspectives aim to group individuals together that share something in common, often with the purpose of bonding them or forming attachment to the area.

From a bureaucratic perspective, it is easiest to perceive neighbourhoods as discrete, distinct objects that are nested within current administrative boundaries. However, such administrative boundaries do not necessarily fit with neighbourhood extents even with the same name [10]. This thesis will seek to nationally identify and map the neighbourhood level places that people talk about through the use of passive mining of widespread digital data held on the internet.

Thesis Statement

The research question of the thesis is: "How can a data model be constructed that allows users to identify bounded neighbourhood level places?" There are also four sub-questions:

- To what extent do the neighbourhood spaces nest or create contested spaces?
- How can the data model be used to investigate the transient nature of such areas?
- To what extend is it possible for the data model to define neighbourhood areas for different user groups (for example: an estate agents view of neighbourhoods versus a resident's perception)?
- How homogenous are neighbourhoods in terms of their socio-economic characteristics?

Related work

Whilst the past years have seen the development of a body of research related to vernacular geography and mapping geographic objects using internet data, none has focused upon specifically mapping neighbourhoods at a national scale (with the distinct issues that such an approach brings) and when neighbourhood names are not known a priori.

There has been a long tradition of geographers mapping neighbourhood areas, such as the work in 1960s in America by Lynch [5]. Such research is a strong influence on more recent research for deriving vernacular place names [1, 6, 9]. However, although such work has great merits, they utilise a small number of selected city case studies due to the nature of data collection (for example through asking residents to draw perceived neighbourhoods) and such methods are not viable for a national coverage.

The project 'Spatially-aware Information Retrieval on the Internet' (SPIRIT) has demonstrated the potential of identifying geographic references referenced on the web [4, 8]. However, this project itself was concerned with larger spatial entities appearing in existing gazetteers which frequently exclude local neighbourhoods. Other research in the field may use a single datasource, such as Gumtree [11]. Alternatively if a more general search engine is employed the target terms are required to be known a priori [3, 4].

Methodological Approach

This thesis has developed a method whereby postcode address information is utilised to undertake searches on the internet using structured addresses (for example "21 melbury road * nottingham NG5 4PG" – where

the * may possibly contain some 'neighbourhood' descriptor). Searches are undertaken using the Bing API and the returned snippets potentially hold both the neighbourhood names and geo-coordinates (through the postcode). Automation is achieved using Python coding.

Unlike existing work in this area which seek to simply present each resulting neighbourhood as a density map using weighting for the points [4, 11] – this work would construct a series of further computational rules. For example, if an area is on the edge of a city or by a park – one would expect the number of returns to be lower (due to the number of households). Without such expected levels of data return, areas such as shopping areas for example, would be given a greater property of being a neighbourhood simply due to their high web visibility.

Neighbourhood names would be validated by using existing point sources references such as Yahoo Geoplanet, Open Street Map (OSM), Ordnance Survey data and so forth. Validation of the areal extents of the areas would be undertaken via resident consultation.

Expected contribution to the field

This body of work has the potential to revolutionise the way in which we map our urban areas. Wilson [12] argues that the geography of neighbourhoods provide a framework within which to observe and analyze social problems within society. Thus, they become units of analysis that are relevant to everyday life and more interpretable for the general public. Imagine data delivery systems that could provide information such as the 2011 Census for the units of analysis that we actually use and associate with (neighbourhood names) as opposed to current and frequently meaningless administrative boundaries.

Using such neighbourhood bounded data, analysis could be undertaken within a diverse range of applications including Police intelligence, health effects, neighbourhood planning and social housing preference for tenants. The work would also contribute to semantic interoperability concerning vernacular neighbourhoods.

Progress to Date

At the time of writing, data collection has commenced – with information for Sheffield, Nottingham and parts of London having been collected (see Figure 1 for example map).

Methods and coding have been implemented to collect the necessary data and extract neighbourhood names (including issues such as spelling).

The second phase of work (next six months) will predominantly address the mapping of the data and will investigate appropriate density parameters and additional rules as outlined in the methods section. Validation will commence approximately in Sept. 2013 before an extensive analysis period (Dec. 2013-Sept. 2014). This will allow for an ensuing writing up period with anticipated submission occurring Sept. 2015. Conference presentations will be given at GISRUK or AGILE at Easter 2014 and with subsequent journal publications.

Acknowledgements

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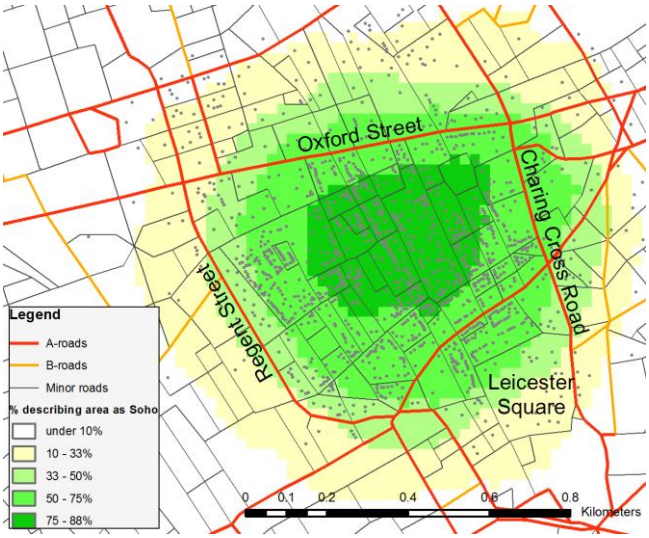

Figure 1: Map of Soho, London based on structured neighbourhood address extraction

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Jacob Chapman

PhD Title

Multi-Agent Stochastic Simulation of Occupants' Comfort and Behaviour

Abstract

Building performance simulation software allows architects to analyse buildings' energy performance, giving insight into how robust the building design will be in the real world. Their main weakness is the deterministic rules used to model occupants' behaviours. Rigorously addressing this will give greater insight the impact of occupants' interactions on building performance and support the development of robust design solutions. It is hypothesised that the multi-agent stochastic simulation of peoples' presence, activities and behaviours is the most coherent approach for achieving this.

Introduction

Building performance simulation allows architects to perform energy analysis; giving insight into how robust the building design will be in the real world. Building simulation programs such as EnergyPlus (E+) use different models, all of which are simplifications of reality, to simulate different aspects of the building. For example, in E+ occupants' presence is represented by repeated schedules describing the percentage of the total occupancy at each sub-hourly time step for each zone. Occupants' behaviours, such as the use of windows, shading devices and heating systems are represented as deterministic rules (e.g. always open window at 25^{O}C). In addition occupant comfort is calculated using models that ignore occupants' adaptations and the impact that these have on their perceived comfort.
People by nature are reactive to their surrounding environmental conditions; they make changes to improve their personal utility. Diversity over time and amongst occupants is high meaning they will behave differently. The fixed schedules currently used in building simulation software are rules that do not account for this behavioural diversity.

Thesis Statement

This thesis hypothesises that a coherent basis for rigorous prediction of a building's performance is the multi agent stochastic simulation of people's presence, activities, comfort and behaviour within a building simulation environment.

Related work

Haldi & Robinson (2011) found that random variations in occupants' behaviour can affect building energy demands by a factor of two; identifying the need for models that explicitly address this stochasticity. Roetzel et al. (2011) concludes that annual carbon emissions for a worst case occupant scenario exceeds that of the ideal scenario by up to a factor of three, indicating that diversity in behaviour can have a significant impact on simulation. There is therefore a need to build stochastic models of occupants that accounts for this diversity. In social sciences people have been simulated through agent based models. Agents are implemented in software as objects; they have rules and behaviours making them excellent for modelling individuals and group interaction (Axtell, 2000). Agent based models are often used to test theories but there has been a

trend to use empirical data as an input to fine tune agent parameters (Janssen & Ostrom, 2006).

Methodological Approach

Agents are an effective way of modelling human interaction (Bonabeau, 2002). Combining agents with Markov chains developed from time use survey (TUS) data, in collaboration with Said Jaboob, allows for stochastic agents whose decisions regarding which activities to perform are informed by empirical data. Figure 1 displays an example of the time-dependent probability that an average person will perform a particular activity; used to inform the agent based model.

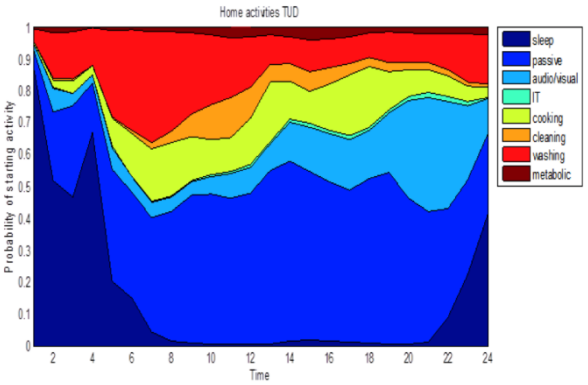

Figure 1: Daily Activity profile for home setting simulated using Markov chains and TUS data

Agents' environmental interactions are also input to the building performance simulation tool. They also respond to the feedback of this interactions; this feedback influences their thermal comfort and subsequent actions. These behaviours can be further refined using archetypes, currently being defined with collaboration from Martin Kruusimägi. Agent attributes are set based on their archetype, allowing for specificity in the simulated population.

Expected contribution to the field

This new approach of occupant modelling coupled with building performance simulation tools will allow building performance to be simulated in response to agents' stochastic decisions. This approach can provide a probability distribution of occupants' thermal sensation improving insight into a buildings performance as well as of the buildings' energy use. It will also be possible to visualise occupants' environmental interactions.

Progress to Date

The current phase is that of implementing rudimentary agents; based on Markov activity chains. Once built, these agents' behaviours (e.g. adjustments of windows, blinds, clothing) will be modelled; firstly for the aggregate population and then for archetypes.

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John Cunneen

PhD Title

How has ubiquitous computing changed the organisation of UK policing?

Abstract

The study will investigate how ubiquitous computing has changed the organisation of policing within the British Police Service from a historical and contemporary perspective. A historical approach is required as the study will be looking at technological change and development over time. The research method that will be used for the thesis is the case study method. In achieving the case study approach, relevant sources of information, such as documents, oral history interviews and ethnographic observation will be used to describe and compare each case study. The study will enable an increased understanding of both historic and contemporary applications and implications of technology and ubiquitous computing within the police service. It will also generate guidelines and lessons learnt

from each case study that will be of great interest and relevance to the police service and the digital economy.

Author Keywords

ICTs, Organisation, Police, Criminal Justice Service, Digital Economy, Ubiquitous Computing.

Academic disciplines
Computer Science, Organisational Studies, Human Factors, Criminology, Sociology.

Research question and aims
How has ubiquitous computing changed the organisation of UK policing? I aim to address this question using historic and contemporary case studies as well as giving perspectives to current and future technological developments.
In answering the main research question will enable the following aims to be achieved:
(i) To develop a greater understanding of both historic and future applications and implications of ubiquitous computing within the police service.
(ii) To generate guidelines and lessons learnt from each case study that will be of great interest and relevance to the police service and the digital economy.
(iii) To develop an increased understanding of the behaviors, strategies, attitudes and adoption of ubiquitous computing and technology within the police service.

It is anticipated that the final thesis will provide a guidance framework to assist with the implementation of technology in the UK police service. This is both rational and practical as stated by Ackroyd (1992) "that a guidance framework is really the most that should be expected from an academic study undertaken with modest resources that will emerge organically from doing good research rather than applied research. That is from a sound and theoretical and observational base rather than from an avowedly practical intent."

Methodological approach

The primary research method that shall be used within my thesis is the case study method. Thomas, G (2011) defines it as "case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame, an object, within which the study is conducted and which the case illuminates and explicates." A further definition is "the essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what results." (Schramm: 1971) In achieving the case study approach, relevant sources of information, such as documents, oral history interviews and ethnographic observation shall be used to describe and compare each case study.

Background and relevance

"With the proliferation of telephones in the early twentieth century, policing changed. Citizens called-and in fact were encouraged to call-the police to deal with a multitude of problems, and the police responded to those calls from dispatch via a two-way radio, and sped quickly to locations via patrol cars. These technological advances, along with changes in police administrative procedures, helped to create the police as we know them today". (Harris: 2007, p153) The police service has historically and contemporarily had to adapt to the ever increasing sophistication of crime within society. The required response from law enforcement and the criminal justice system (CJS) to combat criminal and deviant behaviour is continually evolving. However, with the application of information technology and the ever increasing ubiquitous nature of technology and computing capabilities, the modern police service has changed considerably. As Manning (2008, p276) states: "New forms of policing, based on community-oriented work, problem-solving and prevention, anticipation and intervention as well as patrol, are now facilitated by combining crime mapping, crime intelligence and linked databases. 30 years of development of complex, linked data bases, management systems for storing, retrieving and aggravating data, geocoding, GPS, MDTs, laptops and other software, reduce pass-through time, and may enhance problem solving. If policing is to shape effective community problem-solving it will require integrating information technology such as crime intelligence and crime mapping with investigation and problem solving in a focused fashion." The police service has always been an institution that has been powered principally by the efficient accumulation of information as described by (Arntfield, M: 2008) and it is information that is used in the

prevention and detection of crime. According to Custer, B (2012) increasing efforts are made by police forces all over the world to optimise the use of technology in policing and remove any obstacles as new and existing technologies provide new opportunities for law enforcement.
Information technology has taken an integral place within all modern police stations in the UK, and is a corner stone of all activities as Maltz, Freidman, and Gordon (1991) state that "information is the lifeblood of the police. Without information the organisation will become stagnant." However, the amount of information that the police receive during the activities of its daily operation is overwhelming according to Gottschalk (2006) and the police use information technology tools at almost every stage, including allocation of resources, patrolling, crime prevention, crime tracking, in the apprehension of criminals, and crime solving. It is therefore important to understand how information technology has changed the overall organisation of UK policing overtime.

Research contributions
The thesis will contribute new knowledge by addressing an area that has not been researched extensively within the British Police Service. It is also applicable to the Digital Economy and Horizon as police technology is becoming increasingly ubiquitous and sophisticated, it directly meets Horizons goals and research into "always on, always with you." Also, Horizons research and themes: societal issues, privacy and the Human Factors Group.

Current studies/selection
A literature review has been completed and a case study selected. Research has also been conducted on the use of the police radio. Nottinghamshire police has also indicated that they are interested in the research of the consequences of technology. I will update verbally at the writing retreat on recent developments with regard to case study selection and further Public Sector Collaboration.

Acknowledgements

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Lesley Fosh

PhD Title
Personalising museum visiting experiences for individuals within groups

Abstract
A key challenge for museums and galleries is to create a personal engagement between visitors and exhibits which can aid learning or lead visitors towards constructing meaningful interpretations. However, the diverse range of people who visit museums means that the methods for engaging visitors, such as the presentation of interpretation material, may only closely meet a small proportion of visitors' needs and preferences. Personalising interpretation resources to the visitor using mobile technology is a technique that can overcome this, however a conflict arises due to the fact that most visits take place within small groups. This PhD will explore how personalisation of museum and gallery interpretation material can best occur within a group context.

Author Keywords
Galleries; museums; trajectories; interpretation; art; sculpture; collaboration; audio; instructions.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI).

General Terms
Design

Introduction
Museums and sites of cultural heritage hold a wealth of knowledge about the objects displayed within them and this can be presented in a number of different ways. Each object in a museum can have a wide range of information collected and written about it. Traditionally, museums have displayed printed interpretation material in labels and guide books, however these media are limited by their size, the short amount of time visitors spend at an exhibit, and the requirement to appeal to a wide audience. Using digital media, information relating to museum exhibits can be filtered so that a visitor is presented with material that is relevant to their existing knowledge, interests and preferences.
Whilst a wide body of research has been carried out into adaptable museum guides, the

overwhelming majority have focused on the user as an independent visitor, even when it is acknowledged that he or she may be part of a visiting group. However, we know that most museum visits take place within a social context, and that visits will vary in style, length and content depending on whom they are carried out among. For example, Falk and Dierking assert that adults will behave differently in museums when they are with children than when they are only with other adults [6]. Children, they argue, will behave differently when they are on school trips than when they are with their families. Further aspects of social context identified include how crowded the museum is and interaction with museum staff and volunteers.

Since social context is a significant factor that influences how a person experiences a museum, this is something that should be taken into account when designing for personalization, in order to be able to support the group as well as the individual.

Related work

HCI in museums is a well-researched area, with museums providing an unconstrained yet measurable environment for studying interactions between individuals and individuals' interactions with objects and technologies.

Researchers have recognized the need for adaptive systems based on visiting style and visitors' existing knowledge. Adaptations can be based on crude stereotyping, the results of questionnaires and on-the-go monitoring of visitors' behaviour. Systems that have gone beyond personalising to individual users on individual visits include a tourist information recommendation system that attempted to tailor its content to a visiting group by taking characteristics and preferences from each member of the group and working out recommendations that suited the group as a whole [2]. Personalisation has also been taken beyond the single museum visit using, for example, visitors' own mobile devices to store their own user model, which can be brought to each museum visit [8].

Some previous research has acknowledged that museum visiting takes place within a social context by supporting interaction between group members. Communication between visitors to share information about location and orientation has been seen as essential in maintaining group awareness and cohesion [3]. A key study in the literature involved the development of a shared listening system with the aim of supporting and enhancing social interaction [1]. Pairs of visitors were able to eavesdrop on each other's audio guide commentary. Sharing the audio gave visitors a more continuous engagement with each other and a shared resource for conversation. Systems have also been developed that allowed visitors to send messages to each other [7] and to share opinions or suggestions [5].

Of particular relevance is a study by Callaway et al., which proposed a system that would deliver a dramatic narrative to members of a visiting group [4]. Group members are exposed to different elements of the narrative and prompted to engage in conversation with one another to piece together the different parts of the narrative, in order to resolve a buildup of dramatic tension. In addition to stimulating conversation, the system monitors the group's cohesion levels by indoor positioning and detecting levels of conversation. It adapts its method of presenting the different parts of the story depending on the group's behaviour.

While the literature discussed goes some way to explore ways of managing group experiences in the museum, there is still the question of how to create personally engaging interpretational experiences within the context of a group visit.

Methodology

The research takes an iterative user-centred design and evaluation approach. Information about users' behaviours, needs, preferences and limitations will be gleaned throughout the research, initially through analysis of existing ethnographies to determine how users organise themselves into different types of groups. The bulk of the research will take place in the wild, through building prototypes of interpretation systems and testing them with groups of museum users outside of the laboratory, in their natural context of use. Evaluation of prototypes will be achieved through naturalistic, ethnographic studies in the museum setting with members of the visiting public. Data will be collected using video recordings, sound recordings, system logs and interviews with participants. Analysis of data will feed back into system design in an iterative process.

Two main studies will be carried out in two museums or galleries. Each study will consist of the iterative process described above and the results of the first will feed into the second. It is hoped that by conducting two separate

studies in different settings it will be possible to generalise the findings or derive conceptual results.

Progress to Date
So far a pilot study has been carried out at a local sculpture garden. An interpretational system consisting of musical accompaniments to sculptures and instructions for viewing and physical engagement was developed and tested with members of the public. This focussed on creating personal engagement between visitors and artefacts and managing personal engagement within pairs of visitors.

The interpretational system will now be adapted for a contemporary art gallery setting. The focus of a further study will be to look at how visitors might be able to personalise an experience for one another. The study design will be based on a participatory design methodology. Design workshops will be run for participants who will act as 'givers'; designing the content for an interactive experience for a friend. The resulting experience will be gifted to the receiving friend and both will be studied on a visit to the gallery.

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David Hand

PhD Title
What role does technology play in facilitating how 'men looking for men' meet, and what interactions does it lead to?

INTRODUCTION
Online dating is becoming established as a phenomenon in Western society, with a number of notable online and mobile services available although, despite the importance of technology to this, in the realm of HCI although there is an increasing amount of research into sexuality it still remains 'fractured, filled with gaps and missed opportunities' (Kannabiran et al, 2011). Also, despite there being a number of services specifically targeted at men, such as *Gaydar* and *Grindr* who are seeking men there has been relatively little attempt made to investigate these in depth outside of the sphere of health (Davis et al, 2006), with no emphasis at all on how interactions are carried out on such services, or the interactions that they may lead to.

RELATED WORK
One of the key aspects of this study relates to identity; specifically the ways in which it may be constructed online, and how that then relates to an interaction that moves from a virtual environment into an in-person one. There are often 'assumptions made about the freedom of the cybersubject to be performed through an identity of choice online, [while] there have simultaneously been continued anxieties about authenticity' (O'Riordan, 2005: 30). There is some argument that these anxieties about authenticity are overplayed at times, as 'the net [...] annuls the body, thus presumably enabling a fuller expression of one's authentic self' (Illouz, 2007: 75). However, this view perhaps needs to be interrogated a little, as online profiles, and

interactions, are more likely governed by the notion self-disclosure as a form of identity management. While this does encompass the idea that 'the anonymous nature of cyberspace provides a place where people can open up about aspects of themselves that they might not feel so comfortable doing face-to-face' (Whitty & Carr, 2006: 22),

In terms of approaching the experiences that such services and applications lead to, a way to examine and explore them would need to be detailed. One such possibility is offered by Benford et al (2009) in their conception of the Trajectories framework. While this is arguably targeted more at providing a model for evaluating and influencing design, it is also intended to offer 'empirical researchers "sensitizing concepts" to guide their approach to studying user experiences and providing a starting point for interpretation' (Benford et al, 2009: 710). As there is a focus on experiences in this work, adopting such a framework is appropriate. Firstly, there is the canonical trajectory, which is the experience or user journey that the designer hopes comes from their application or service. Alongside this, there is the participant trajectory, which is the experience that participants actually undergo in using the service, particularly when they have some element of freedom to make choices within the service or application.

PILOT STUDY - METHODOLOGICAL APPROACH

In order to begin exploring some of the issues that have been raised through the literature, and to start to understand the experiences and interactions that use of such services bring the men that use them, a pilot study has been planned.

This involves data collection taking place over three stages, utilising a combination of two different methods. The first and third stage will involve semi-structured interviews, designed to 'allow [participants] to express their opinions and ideas in their own words' (Esterberg, 2002: 87), while the second stage will utilise a diary study approach. In adopting this structure the first stage is intended to explore themes which have been made apparent though the literature review, but in a way that allows participants to discuss those which they deem the most important or relevant to them, or raise entirely different issues, as well as to gain thoughts and opinions on the services being explored. Following this, the diary study in the second stage will allow for an exploration of how, where, and how often, people actually use services over a period of time, to allow for 'the examination of reported events and experiences in the natural, spontaneous context' (Bolger et al, 2003: 580), rather than them being recalled through interview and that context being missed. The final stage will be an interview to follow up on the diary study in order to explore some of the themes which may arise from it, although this stage will be voluntary on the part of the participants, in order to minimise time commitments on them.

PROGRESS TO DATE

At the time of writing, an initial literature review has been completed, although this remains an ongoing process and is particularly likely to be revisited after the pilot study discussed above is completed. Regarding the pilot study, the ethical approval process has been started, and an interview guide and guidance for the diary study are currently being worked on. It is anticipated that the pilot study will take around two months to complete, following which the resulting data will be analysed and will then feed into the direction of a larger study in the following year. Alongside this, detailed trajectories of two major service providers, Grindr and Gaydar, are being worked on.

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Chrisminder Hare

PhD Title
Designing External Representations for Big Data Systems in Emergency and Military Environments

Abstract
Every day, every second, huge volumes of data are created. The explosion of data, coupled with the need for operators to make effective decisions has given rise to the creation of bespoke data visualisation systems. In particular, visualisation techniques and human cognition theory need to be explored to understand how best to present data to operators. This thesis will use a mixed methods approach to produce design guidelines and frameworks to aid system developers create big data system interfaces.

Introduction
There has been substantial research in the information visualisation domain. However, there is need to focus on visualisation research for big data and the respective cognitive burden that big data places on the operator. The challenges of big data are related to the complexity of the data. These include how to understand and use big data, how to capture the most important data and finally how to present it to people in the right manner. Consequently, effective visualisation techniques for big data need to be understood to allow for a reduction on an operator's cognitive load and to enhance their decision-making process when dealing with large data.

Thesis Statement
The focus of this work looks to create design guidelines and frameworks to aid the building of interfaces for big data systems. The guidelines aim to reduce the operator's cognitive load whilst enhancing decision-making in the context of military and emergency service.

In order to achieve this four research questions will be explored; (a) how are big data systems currently designed? (b) How do operators use and interact with big data systems? (c) How can information from big data systems be most effectively displayed to inform decision-making? (d) How can big data system information on interfaces be designed to enable computational offloading?

Related work
It is important for the operator to ascertain the right information at the right time. Gathering, collecting and storing data is no longer a problem for companies. The challenge now is to identify methods and models, which can turn the data into reliable and provable knowledge. Kiem *et al.* 2010 explicitly cites the need for design methodologies and guidelines for the human factor issues impacting on visualising big data. Figure 1 shows the main themes that will be investigated to develop design guidelines.

Figure 1: PhD Themes

Humans are superior at recognising patterns, reasoning and bringing meaning to data. Machines are superior at retaining, processing and representing large amounts of data. Information Visualisation techniques can be used to present data in a more accessible format to the operator, which enhances the operator's interaction and analysis of the data. Card *et al* [1] describes visualisation as 'the use of computer-supported, interactive visual representations of data to amplify cognition.' Visualisation takes into consideration the human eye's pathway into the mind to allow users to see, explore and understand large amounts of information [2].

Visual Analytics, a related domain, combines automated analysis techniques with interactive visualisations for an effective understanding, reasoning and decision making on the basis of very large and complex datasets [3]. Visual analytics looks to create interactive visualization that allow operators to explore, recognize patterns and bring meaning to data. These techniques look to get the computer to do the labour intensive tasks (such as retaining, storing, fusing and representing the data) whilst allowing the operator to do more intricate tasks (for example exploring, interacting, recognizing and reasoning with data to make more informed decisions).

Methodological Approach
The research takes a mixed-methods approach. First, the thesis will examine current literature in visualisation techniques and decision-making. This will be followed by a series of interviews to understand industrial perspectives of implementing and using big data interfaces. Then a set of experiments testing key themes of visualisation techniques for big data systems will be conducted. Finally, a user study will be implemented to test the resulting design principles with end users.

The first two studies have been designed, the goal of the first study is to understand how big data interfaces are designed and created in industry. The study investigates the techniques, guidelines and prior knowledge used to develop them. The second study aims to get an insight in to how big data systems are used in real world. Semi-structured interviews will be used to investigate the operator's use and interaction of the interface.

Expected contribution to the field
It is anticipated that the thesis will comprise of an in-depth insight into how interfaces are designed in industry and how interfaces are used in industry. Furthermore, design guidelines and frameworks will be created to aid system developers create interfaces for big data systems. This will result in a series of papers highlighting a range of issues regarding development of big data systems.

Progress to Date
At the time of writing, a high level insight of industrial system developers has been gained. Studies one and two have been sent for ethical approval. Implementation of both studies is scheduled for the spring/summer semester 2013.

Acknowledgements
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Michaela Hoare

PhD Title
DIY Music Communities; shared networking and authenticity methods for the sustaining of local music practice

Abstract
There is a developing DIY music movement taking place in the UK which sees digital technologies enabling artists to network and form alliances, produce unique performance styles and expand their audiences. Within the shared ideology and practices of this burgeoning DIY music culture there lies an essential juxtaposition between a quest for authenticity, the managing of live and digital identities through DIY digital technologies and

collectively seeking social capital. Alongside this, the ability to trade resources and skills whilst achieve a sense of originality and creative control is a fundamental part of how these groups sustain their livelihoods as well as obtaining economic and social capital through shared authenticity values and methods.

RESEARCH QUESTIONS

With an aim to add to previous discussions of authenticity and DIY artists in the digital economy context, this project will be asking the following questions;

How are artists within DIY communities adopting digital technologies to form and facilitate their collective DIY activity?

How might a shared desire for authenticity be influencing the establishment of DIY communities and a collective DIY practice?

By investigating networks of DIY artists and communities, this project aims to add to current research which has not yet empirically investigated in much detail whether artists' pursuit to achieve a sense of authenticity in their music is related to their rationality for pursuing DIY practice (a passion for performing music but perhaps also a cultural venture opportunity). This research will explore how and why DIY activity is pursued by artists, exploring in particular how their adoption of current digital technologies combined with live music performance is influencing the online networking and formation of diverse DIY communities across the UK. In addition, this activity may be encouraging the creation of new performance styles inspired and facilitated by accessible digital technologies. These new tools allow the creation of hybrid, fluid forms of music communities and performance techniques which transcend existing genre boundaries, creating a sense of empowerment for diverse artists. Thus, existing digital technologies act as a method for artists aspiring to keep music fresh and sustain local music scenes.

Issues of livelihood for semi-professional musicians working in local creative economies and their pursuit of social and economic capital will also be investigated as a factor influencing these novel DIY practices and the ways in which DIY communities collectively manage and construct a sense of authenticity in their work. The accessibility of DIY digital services arguably provides utopian opportunities for these part-time musicians as well as the organisation of cultural production on more democratic lines.

METHODOLOGICAL APPROACH

By taking an ethnographic approach, I will be studying group activity at local DIY music events through overt participant observation. This will aim to reveal both informal and formal aspects of shared networking, collaboration and authenticity processes. Attending these events and speaking to audience members with a semi-structured interview approach will give me the opportunity to share people's individual experiences of collective DIY music practice.

Two DIY communities will be selected who are currently adopting digital tools to manage their live-to-digital identities, share digital assets, network with other groups and expand their audiences. Both communities' digital footprints and online identities will be researched prior to the collection of observation data, offering further analysis of how these groups perform and construct their identities digitally and in a physical setting.

EXPECTED CONTRIBUTION TO THE FIELD

This research aims to add to previous Sociological theoretical concepts and writings concerning creative labour in cultural production, subculture identity politics and capital gain, local music scenes practice in the UK and semi-professional musicians' social and digital interactions. The research will offer a new multidisciplinary approach to an understanding of DIY communities' practice and their significance in a new fragmented music industry.

PROGRESS TO DATE

At the time of writing, initial case study selection and analysis has been undertaken with the collation of an extensive up-to-date literature review to situate the research in a broader academic context and stimulate questions during data gathering and analysis. The methodology has developed into an ethnographic participant observational approach and HCI focus on 'how technologies take on specific social meanings through their embedding within systems of practice' (Dourish, 2006: 546).

Initial textual analysis of the field has been undertaken, revealing the hybrid diverse forms of current DIY communities collectively

managing their live-to-digital identities and digital resources as well as practicing an eclectic range of music genres and performance techniques. The time constraints for conducting rich ethnographic work have been considered, with a current focus on approaching potential case studies in the Midlands area.
Data collection and analysis of DIY groups' digital identities and interactions as well as their local performance activities is likely to lead next to the refining or redeveloping of the research questions in the original project proposal. Recent literature review work has sought to direct theoretical sampling to inspire ideas for how to uncover phenomena important to the development of theory and in turn define more clearly the aims and objectives of the research.
DIY and its impact on local music practice is currently under-researched, so initial research undertaken has aimed to explore the key aspects of its practice. In particular, how ethnographic work may reveal unidentified aspects of creative labour in cultural production, local creative economies and their relation to a larger digital economy. The next stage of the research will be to confirm case study selection, make contact with the key gatekeepers of both communities and enter the field. Further textual analysis of both communities' online identities will also be conducted.

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Laura Kinley

PhD Title
Enhancing the efficiency of crowdsourcing through the integration of machine learning techniques

Introduction:
The increased availability of high-resolution satellite imagery alongside the ubiquity of mobile computing and GPS signifies that such imagery is an increasingly useful resource for businesses and communities. People have the potential to radically change mapping, creating geospatial information (GI) and enhancing it through annotation despite pertinent concerns surrounding data quality. This research aims to find ways of bringing the complementary strengths of new remote sensing classification techniques and VGI together so as to provide enhanced and more deployable data.

Keywords: Remote Sensing, Volunteered Geographic Information, Data Quality, Machine Learning

Aims & Objectives:
>Establish the extent to which and circumstances under which the use of crowd-sourced data sets can reduce spatial, temporal and attribution error in land cover and land use classification from remotely sensed imagery.
>Test the effect that crowdsourced data has on the success of remote sensing classifiers in training the data to an appropriate standard. An appropriate method will be selected and modified before a system is developed that permits crowd generated training data to be submitted, tested and evaluated.
>Use case: Is machine learning a viable method for mapping where professional interpretation is not efficient?

Background:
The use of remotely sensed images to investigate terrestrial properties such as land cover and use traditionally requires the expensive and time consuming acquisition of ground data. In remote sensing, training sites are areas of known ground cover and can be ascertained via a combination of field work and personal experience of the professional. The training sites contribute to the classification of remote sensing imagery during supervised classification in which the image is classified according to the reflectance values for each pixel, with the chosen algorithm making a decision about which of the spectral signatures it resembles most. Imperfections in ground reference data produce systematic bias in estimates of change occurrence and change detection accuracy which can have strong negative implications for ecological studies.
Crowdsourcing can be very useful in analysing large quantities of geospatial information and several platforms rely on VGI to inform projects, such as GeoWiki which sources volunteer land cover information to determine levels of human impact and crop distribution. Whilst the quality and accuracy of VGI is portrayed as "good enough", VGI content has been critiqued for its susceptibility to error particularly with regards to completeness, attribute and temporal accuracy (Flanagin and Metzger 2008) creating an impression of poor

quality that limits its proliferation in a number of domains.

Research exploiting the potential of crowdsourcing and VGI for image classification is sparse (Boyd & Foody, 2012) though it could have great potential in enhancing the mapping process. Further to simply using incomplete user created data sets there is the opportunity to integrate machine learning with VGI. Rebbapragada and Oommen (2011) suggest the improvement of crowdsourced earthquake damage assessment with remotely sensed imagery training, trialling semi automation shifting the focus from the classifying of the entire database to generating reliable training data. Tuia & Munoz-Marí, (2012) use VGI optimisation approaches which do not assume uniformity between user generated submissions. This denotes that there could be scope for user reliability metrics to be incorporated into the classification training to further improve data reliability. This alternate model of crowdsourcing by which fewer areas are classified many times could have significance in improving both the quality and completeness of classifications as local and temporally accurate knowledge is fed into machine learning techniques.

Expected Contribution:
Dealing with vast quantities of uncoordinated crowd content is a huge problem and thus increasing the efficiency of crowdsourcing methodologies is a research priority. Existing efforts focus upon synergising taxonomies and folksomonies to make the derived data interoperable alongside the use of iterative quality checking. By combining crowdsourcing with machine learning techniques there is great potential to create highly accurate thematic maps quickly. Enhanced land cover currency and detail could have great relevance with regards to ecological modelling and environmental planning, making these maps more appropriate for a greater range of stakeholders.

Progress to Date:
An initial study looked into the feasibility of combining existing or incidental crowdsourced land cover data from OpenStreetMap and Geograph with authoritative Ordnance Survey data. Geometric comparison and Python word matching scripts were used to determine the extent to which the sources varied in terms of quality and content including the spatial scale at which land cover was identified. The results indicate that the crowd do use terms which meet the requirements of official land cover ontologies with up to 20% of tags spatially identical in the authoritative and crowd data. There are also a greater proportion of highly detailed tags within crowd submitted content that could be harnessed to provide a greater level of detail and quality in land cover mapping, including many at species level.
A web page was also developed to allow the testing of purpose specific crowdsourcing with a view to informing the viability of using VGI to enhance the quality of existing Centre for Ecology and Hydrology land cover attribution. The web based crowdsourcing platform permitted the exploration of how different groups of volunteers coped with various classification taxonomies and how they interpreted the scale at which they should classify something which is important in understanding how error may come about.
A current study involves testing traditional statistical, neural network and support vector machine classifiers alongside active learning methods on simulated remote sensing imagery sets. Adding varying degrees and types of error into the image training set (to simulate the errors commonly present within crowdsourced data) can establish the extent to which various user supervised classification methods lend themselves towards volunteered content. It is hoped that this will inform enquiries into moving away from blanket 'classify everything' crowdsourcing approaches to the integration VGI in the classifier training stage of remote sensing.

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Martin Kruusimägi

PhD Title

Effects of interface design for ambient intelligence home heating controls on users mental model formation and control

Abstract

The increasing emergence of ubiquitous and quasi-autonomous / ambient intelligence devices for home controls challenges the existing status quo between users and products as systems start performing increasingly more complicated decision-making tasks in the computational background of systems invisible to users. With this being the case, this research aims to investigate the effects it may have on the user's mental model formation as well as the element of control in the relationship between the user and system.

Author Keywords

Interface design, Ambient Intelligence, Thermal Comfort, Mental Models

General Terms

Design, Built Environment, Human Factors

Introduction

This research into interface design of quasi-autonomous ubiquitous building controls focuses on the domain of home heating controls. The chosen domain is extremely topical as and the UK government seems to rely highly on the promise of energy monitoring and control systems to reduce the country's carbon footprint to 12.5% under 1990 levels, committed to under the Kyoto Protocol (DEFRA (Department for Environment Food and Rural Affairs), 2008). As well as achieving 80% below 1990 levels mark by 2050 (UK Parliament, 2008). Much work on current thermostats has revealed vast shortcomings in design (Meier, 2012; Meier et al., 2011, 2010; Peffer et al., 2011) and the numerous project in designing smart homes (AIRE Group MIT, 2012; Amigo Project, 2012; Brown and Wyatt, 2010; Georgia Institute of Technology, 2012; Herkel et al., 2008; Mozer, 2012; University of Essex, 2012; University of Florida, 2012) tend to be exercises in computing capabilities, superficial in terms of the implications for real occupants. From this, it is evident that a multidisciplinary approach of design, built environment and human factors is needed to make these systems from a scientific experiment into a usable, real-life product.

Thesis Statement

This thesis will inform the field of interface design of quasi-autonomous ubiquitous (ambient intelligence) building controls. This contribution will be achieved through an investigation into the role of mental models in regard to ubiquitous, quasi-autonomous control systems. For the contribution to be achieved, answer to the following questions need to be provided:

- Does the hidden nature of ubiquitous intelligent systems reduce the ability of users to form mental models about the system's functionality?
- Does the lack of mental model forming influence users perception of control over the quasi-autonomous system and the environment?
- How can interface design facilitate increased sense of being in control for users?
- To what extent can quasi-autonomous heating controls minimize energy use whilst minimizing discomfort
- How can discomfort be characterized and addressed in the heating strategy of such systems?

Related work

As it is multidisciplinary in nature, this research is greatly influenced by several academic domains including mental models, thermal comfort, building controls and ambient intelligence.

It has been suggested that "given the profound changes that housing design is currently undergoing to meet the tough low-carbon agenda set by governments around the world, occupants need better guidance and vastly improved systems. A successful approach will allow inhabitants to feel empowered, rather than guilty, although reality checks provided by individual footprint and carbon taxes may be essential to demonstrate and reinforce the consequences of their actions" (Stevenson & Leaman, 2010, p. 440). This, however, highlights a conflict in application: the ubiquitous nature of ambient intelligence systems at hand is speculated by this author to restrict the formulation of a mental model by the user. Mental models, on the other hand, can be seen as an internal computational structure (Rutherford and Wilson, 2004), that can be "run like a computer simulation allowing an individual to explore and test different possibilities mentally before acting." (Jones et al., 2011, p. 4) Inability to form these models has significant impacts to building control as "without a good

model we operate by rote, blindly; we do operations as we were told to do them; we can't fully appreciate why, what effects to expect, or what to do if things go wrong." (Norman, 1988, p. 13) Therefore, if a user is unable to for a mental model about the inner workings of a system that controls their home, the user will be far less likely to support the system and for more likely to find overrides (Ackerman, 2000, p. 187). Furthermore, "if building project teams design systems to overrule human action-taking they also, by so doing, take away human responsibility for and awareness of their immediate surrounds." (Jaffari and Matthews, 2009, p. 6)
Even the more successful projects in designing automated building controls (Rogers et al., 2011) often fail to take into consideration the stochastic nature of people in their everyday activities and assume households to be rational in choices and behaviour. Research in thermal comfort prediction and modelling has shown this not to be the case and highlighted the importance of this aspect (Bahadur Rijal et al., 2012; Haldi and Robinson, 2011, 2010, 2009, 2008; Herkel et al., 2008; Rijal et al., 2007; Yun and Steemers, 2008). Furthermore, research in thermal comfort has shown that perceived control over the occupant's environment increases the occupant's acceptance of the condition, making him feel comfortable in a wider range of conditions (Baker and Standeven, 1996; Black and Milroy, 1966; Fishman and Pimbert, 1982; Rowe et al., 1995; Williams, 1995). These finding suggest that a successful design of an interface can assist in delivering control to the user, even in the case of ubiquitous quasi-autonomous systems.

Methodological Approach
This research adopts a design approach to the thesis. This approach compromises of iterative processes working towards a proposed interface design coupled with the academic knowledge contribution. The iterations of studies comprise of (1) participatory design sessions with target users, representatives relevant academic fields as well as professional interaction designers to develop initial concepts; (2) focus groups with target users to improve original designs; (3) lab-setting tests of simulated interfaces with target users; and a (4)piloted semi-longitudinal study of a deployed interface in real-life setting. This methodology will possible be enhanced by a low-tech early real-life study to enhance the understanding of real-life implications and generate further requirements for the interface.

Expected contribution to the field
It is anticipated that this research will provide a deeper insight into the role of the interface in ubiquitous building controls with regard to user mental model forming and facilitation of control. The proposed interface developed over the course of the PhD study will serve as an analytical tool highlighting positive and negative features of ambient intelligence interfaces, leading to possible guidelines for other similar applications.

Progress to Date
At the time of writing, development of first studies is underway with particular interest being in the functionality of the proposed quasi-autonomous system for the prototyping and deploying of the developed interface. Secondary focus is on completion of base-knowledge and theoretical background for the formulation of specific studies.

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Claire Murphy

PhD Title
Privacy in the Digital Society

Abstract
Living in the modern world, we face constant reminders that participation in both the digital economy and society is vital as a means of keeping up with our peers. The rewards of both are lauded as far outweighing the drawbacks, as the disclosure of information for economic and social gain has become the norm, and privacy is rapidly becoming an antiquated concept. However, as the matter of online privacy has been taken up as a legal cause across the world, greater focus has come upon the necessity for privacy in the digital society and the need for technological and behavioural solutions to privacy problems.

Author Keywords
Privacy, Design

ACM Classification Keywords
K.4.2 [Social Issues]: privacy

General Terms
Privacy, Social Media, Design,

Introduction
Our privacy is inextricably linked to our social identity. The ability to withhold certain items of information about the self at-will is what allows people to project a socially-desirable persona to their peers, which may differ considerably from the actual self. With this in mind, users must take care to ensure that careless content does not damage their public persona.
When communicating online, individuals typically face a variety of social problems. The most-encouraged forms of communication are relatively public, through participation on message boards, Facebook or Twitter to name a few. Individuals are limited in their ability to be aware of every potential audience. Disclosure decisions are typically made in a blanket manner, with little consideration for the nuances of each social relationship.

Thesis Statement
This thesis aims to analyse the psychological processes involved in privacy management in social media and to create an understanding of how users currently value and manage their privacy. By doing this, it will be possible to aid the design of privacy solutions that are consistent with existing concepts and work with a user's attitude towards their privacy. This thesis additionally aims to firmly establish the extent to which users are psychologically impacted by threats to their online privacy, in order to open the door for further theoretical exploration in the field of psychology.

Related work
There have been multiple definitions of privacy, with some emphasising seclusion and concealment, while others focus more on choice and revelation. Some would argue that privacy centres on withholding information as a means of identity management [1]. Others view privacy as a dynamic process, where an individual must find their optimal level of privacy, balanced with the level of disclosure needed for social function [2]. Another aspect of privacy is the context in which information is shared. Information sharing should occur in a context-aware manner, ensuring that the information given is appropriate for the recipient. This concept, known as Contextual Integrity has been specifically examined with regards to Facebook use, finding that the flattening of the "friends" relationship poses a threat to the ability to share information in an appropriate manner, and that the use of newsfeeds presents more information to users than could be considered appropriate [3].

Methodological Approach

As the area of online privacy is underexplored in the field of psychology, it is necessary to take a bottom-up approach to establish the privacy issues currently faced by social media users, how they manage their privacy and the associated psychological issues. After conducting exploratory qualitative research, a more quantitative, hypothesis-driven approach can be taken.

The initial research undertaken consisted of a survey to establish the privacy attitudes of Facebook users and how they associated with social networking experience and concepts of

control. This was further explored using a series of focus groups that unpacked some of the emerging issues in the area, focusing on concepts of personal responsibility, the loss of privacy in the digital society, and the technological limitations placed on users.

This approach allowed for the identification of some key issues in online privacy, especially with regards to how users compensate for a lack of confidence in privacy-protecting technology. While admittedly, this study only addressed the concerns and opinions of university students, it brought to light the issue of users not feeling sufficiently motivated to take privacy-protecting action.

My current research addresses in more detail the issue of how social media users are handling the privacy of their personal data, and to generate typologies of social media users, dependent on how they manage privacy-related social situations. It also addresses the potential problem of users holding an inaccurate understanding of their current privacy settings.

This is done using a diary study concerning the management of social relationships on Facebook, focusing particularly on information flow. This study aims to create a more nuanced concept of user behaviour, by allowing users to demonstrate what issues are most salient to their experience.

The methodologies of subsequent studies will be informed by the outcome of the current study, but will be more hypothesis-driven by nature, with a greater emphasis on quantifiable data.

Expected contribution to the field
My expected contribution to this field of research is multi-faceted. My PhD is interdisciplinary, catering both to theoretical work in psychology and potentially more practical work in HCI. I hope to generate solid psychological theories on the concept of online privacy, as well as support the development of technological privacy solutions that cater to varying user typologies.

Progress to Date
At the time of writing, phase one of this study has been completed, and data collection is ongoing in phase two. The generation of theories and methodologies on which a number of further studies may be based is ongoing and should be put into action during the summer of 2013, extending into my third year of study. Writing up of the studies is conducted concurrently, and it is anticipated that the submission of my thesis will occur in September 2015

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Daniel Ratzinger

PhD Title
The role of universities in the Internet startup ecosystem

Introduction
The Internet economy has been noted to have the ability *"to deliver more value and wealth to more consumers and citizens more broadly than any economic development since the Industrial Revolution"* in a recent report by the Boston Consulting Group [5:5].
In the United Kingdom the Internet economy accounted for 8.3% of GDP in 2010, which made it the sixth biggest industry sector and it is also predicted that this share will increase to 12.4% by 2016 [5:47–48]. Although the Internet economy is one of the largest industry sectors in the UK and the Internet itself has also been widely researched, the Internet as an economy is not yet well understood [7:4].
This industry sector is currently part of one of the Research Councils' priority areas in the

United Kingdom [13] and in order to be able to allocate the funding most effectively, the Research Councils UK are concerned about the impact of UK research [15], which is distinguished between academic and economic as well as societal impact [14].
In terms of economic and societal impact of universities, Hughes and Kitson [6] criticise the emphasise that is currently being given to, what they refer to as "hard commercialization", technology transfer activities in forms such as university spin-outs and patenting. While it has been recognized that those activities are an effective way for some disciplines at academic institutions to collaborate with industry, it has also been argued that technology transfer only represents a small part of the variety of roles that those institutions can play in the business ecosystem. It has also been found that these *"direct commercialisation pathways are in the distinct minority of all academic interactions with external organizations"* [6:734]. While spin-outs potentially deliver high returns, the total number of ventures is very low [20:5]. The ease at which direct commercialization methods can be measured creates the risk of focusing too much on these specific activities when measuring academic impact, which ultimately effects the amount of funding that is being allocated [6:744–746].

THESIS STATEMENT

This thesis seeks to better understand the role of universities in the Internet startup ecosystem by focusing on the human as well as social capital theory. The thesis is going to focus on the relationship between human capital and social capital and the influence that universities and the particular industry have. By gaining an insight into the role of universities, improvements can be made to the way entrepreneurial activities, especially besides hard commercialisation routes, can be measured and evaluated.

Related work

Formal education has generally been found to have an influence on engaging in entrepreneurship, however, when it comes to the success of the entrepreneurial activities, other than previous startup experience, education has not been found to have any significance [4:302]. It has been concluded, that *"even the most specific type of explicit human capital, formal education as provided by business classes, only succeeded in increasing the pace of gestation activities, not in affecting critical outcomes"* [4:322] and it has also been noted that higher levels of human capital may give entrepreneurs more confidence as they perceive that alternative employment can be easily found in case the venture fails [4:321].
In contrast, an earlier study came to the conclusion that entrepreneurs had significantly lower levels of education than corporate managers [18:202], which, in contradiction with Davidsson and Honig [4:321], has been interpreted with a possible increase in risk aversion due to being more knowledgeable by having higher levels of human capital [21:166]. A general myth about entrepreneurs being relatively uneducated existed, but several studies have now proven exactly the opposite [16:143].
It has also been found that entrepreneurs in the IT industry are generally very highly educated, with almost half of them holding a master's degree, a quarter holding a bachelor's degree and ten percent holding a PhD as their highest degree [8:430]. However, students from IT related disciplines have also been found to face a dilemma between pursuing a research degree and joining or creating a startup. In recent years, particularly with the growth of the digital economy, research and industry have come closer together in computer science disciplines. Consequently those two potential career pathways are commonly in competition with each other [22:229–230].
The human capital theory assumes that the performance outcome of an individual or a group is related to the skill and knowledge levels [9:211]. With increased knowledge, an increased performance and productivity level can be expected [17:8]. Personal traits are not considered as human capital because they cannot be transferred or developed over time. In entrepreneurship, human capital has also been identified as much more relevant than personal traits [23:791]. It is therefore assumed, that entrepreneurs with higher levels of human capital should also be more likely to identify entrepreneurial opportunities as referred to at the beginning of this chapter [4:305]. In addition, it has been assumed that human capital has got a positive influence on entrepreneurial exploitation, although it has also been noted that related empirical evidence is inconclusive [4:307,10:811]. However, it has also been noted that although the results of previous studies have not

reached a common conclusion, researchers have only examined the direct effect of human capital rather than the indirect one as well [2:611].

Education and training could be considered as a direct investment in human capital and it has also been noted that expenditures that have both effects are most important while very difficult to measure at the same time [17]. Education has also been noted to be *"the strongest human capital variable for identifying business continuance"* [1:555]. By investing in education, an entrepreneur's skill set and knowledge base can be increased which may ultimately have a positive influence on the exploitation and discovery of entrepreneurial opportunities. Many previous studies have relied on the years of formal education as a measure of human capital [10:811].

Nevertheless, Stuetzer et al. [19] came to the general conclusion that *"traditional human capital indicators"* like startup experience are less relevant than having a balanced skill set. It has been also suggested that the balanced skill set can be acquired by having a founding team with complementary skills [19].

Other than human capital, social capital refers to the multidimensional network of social structures as well as memberships and an individual's ability of benefiting through social exchange. The network itself is built on trust and is structured through ties that can vary from weak to strong. While an entrepreneur can benefit from weak ties, such as memberships, by utilizing them as a source of additional information and support, strong ties, such as family, can give an entrepreneur consistent access to additional resources [4:307–308].

Consequently, Mosey and Wright [11] have identified a relationship between human capital and social capital. It has been noted, that entrepreneurs with higher human capital are also more effective in increasing their social capital. While previous business ownership experience has been found to have an influence, particularly on the quality of the social capital, it has also been concluded that the discipline of academic entrepreneurs has an impact on the ability of creating social capital, with engineering and material sciences showing better results than biological sciences [11:932] This result is also in accordance with an earlier study [8:426].

Methodological Approach

When it comes to the role of universities in the overall startup ecosystem, a large number of institutions have put policies and infrastructures in place for supporting student venture creation. However, while investments are being made in these initiatives, institutions have been found to have difficulties of assessing the entrepreneurial output of their programs, which ultimately causes problems when assessing the overall effectiveness of their efforts [12:392–393]. The lack of reliably monitoring entrepreneurial activities within higher education institutions has also been identified by other researchers [3]. The need for being able to demonstrate the entrepreneurial impact of higher education institutions is ultimately also important for receiving further investments in this sector. Nevertheless, it has also been recognized that there are difficulties to be overcome in order to collect reliable data about entrepreneurial activities [12:396].

This thesis is aiming to quantify entrepreneurial activity by using a big data approach with mash-ups of several data sources based on the theories that have been identified.

Expected contribution to the field

This thesis is going to contribute to the entrepreneurship and computer science literature.

Progress to Date

This thesis is currently in its early stages and the major focus over the last few months has been on reviewing the literature. In addition, an initial pilot study has been conducted in order to test initial theories and to get an insight on further research opportunities.

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James Sprinks

PhD Title

Utilising crowd sourcing techniques in the study of the Martian surface:
A framework for Citizen Science web platforms

Abstract

Since the peak of the 'space race' in the 1960's until the present day, a number of remote-sensing missions have been launched to study the biological, chemical, geological and physical attributes of the planets within our solar system. The complexity and technological advancement of these missions has resulted in an avalanche of data being collected. To help fully realise the value of this data, citizen science platforms have been developed that enable the internet public to view, analyse and comment on the data through a number of different tools and communication methods. This thesis will use a mixed-methods approach to develop a framework for citizen science platform design, considering both the science case and the user in this form of human-computer collaboration.

ACM Classification Keywords
H.5.2 [User Interfaces]: Image Analysis

General Terms
Crowd Sourcing, Citizen Science, Planetary Science, Human Computer Interaction

INTRODUCTION & BACKGROUND

Citizen science can be defined as scientific research completed, either in whole or part, by amateur or nonprofessional participants. Formally, citizen science has been defined as "*the systematic collection and analysis of data; development of technology; testing of natural phenomena; and the dissemination of these activities by researchers on a primarily vocational basis*". It could be argued that it is a new term for a relatively old concept, with Isaac Newton, Charles Darwin and many other prominent figures starting as amateur and self-funded researchers. The difference in recent times however can be accounted for by the digital age. With access to the web becoming normality, the public has instant access to a vast range of scientific data from a number of disciplines. In return, the scientific community is starting to realise the potential of this online audience, enabling them to contribute to and carry out analysis across a range of different research areas.

One of the disciplines at the forefront of utilising online citizen scientists is astronomy, with several projects running on the Zooniverse [6] web platform, launched by the Citizen Science Alliance [1]. Through the input of over 100,000 online users on one such platform [2], over 10,000,000 galaxies have been classified in terms of either 'spiral' or 'early-type' systems. This knowledge allows scientists to better understand the formation and subsequent evolution of such systems [3].The consistency found comparing the results from Galaxy Zoo with those for subsets of Sloan Digital Sky Survey (SDSS) galaxies classified by professional astronomers demonstrates that the data provides a robust morphological catalogue.

Despite this success in terms of data analysis and scientific impact, there are gaps in current research. Whilst some attention has been given to the concept of motivation regarding citizen science volunteers and users [5], platforms similar to the zooniverse suite either concentrate on the 'science case' at their core, or have more commercial interests to consider.

Thesis Statement

This thesis will seek to develop a citizen science project, through the Zooniverse platform, allowing internet users to study the vast array of imagery taken of the Martian surface. It will not only contribute to the scientific knowledge of the geological processes on Mars, but will also consider the user. Through investigating different methods regarding HCI design and implementation, it will answer; how might we develop a citizen science framework that balances the scientific worth of crowd-sourced results with the user experience?

METHODOLOGICAL APPROACH

The past few years have seen the development of several new citizen science platforms covering a range of different research topics. Despite this, very little research has focused specifically on either the array of Martian data available, or the consideration of the user in human-computer collaboration. This research will take a mixed-methods approach comprising of six phases to ensure key stakeholder perspectives are represented. These include:

Formation of a Science Team

A science team consisting of planetary science, geomorphology and HCI experts will be created and consulted on a regular basis, in order to ensure both the science case is robust and that there are stakeholders interested in the results.

Hierarchical Task Analysis

A full analysis of previous zooniverse projects will be undertaken to assess the type of user-tasks developed, and their success in terms of user numbers and data accuracy.

User Types

A study will be carried out attempting to define the different types of user that visit the platform, in order to better understand their motivation, strengths and weaknesses.

Task Classification

The user tasks derived for studying the Martian surface will be classified in order of difficulty, so that user types can be specifically targeted, and investigations can be regarding user training and task progression.

Platform Development

This is expected to be an iterative process, with new tasks being added / altered and interface design tweaked based on the results of both quantitative and qualitative user feedback.

EXPECTED CONTRIBUTION TO THE FIELD

It is anticipated that the thesis will contribute to a range of disciplines. Firstly, the scientific results collected from the web platform will inform the planetary science community regarding the geological processes of the Martian surface. These results will also inform future missions in terms of site selection and research focus. Secondly, a

multi-disciplinary framework will be developed to inform further citizen science projects in respect of user experience, task analysis and human- computer collaboration.

PROGRESS TO DATE

At the time of writing, phase one of the study has been completed and a science case formulated. Also data types and sources are in the process of being identified and collated. Phase two has been initially completed analysing the current 13 zooniverse projects, with further, more in-depth, analysis about to be started.

Towards the end of 2012 the first iteration of the Planet Four website [4] was developed by the zooniverse team, and went live during the BBC 'Star Gazing Live' broadcast, early January 2013.

Currently the results are being analysed, and it is anticipated that in the very near future a survey will start to collate user feedback. A meeting with the zooniverse development team at Adler Planetarium has been planned for April 2013 in order to discuss further development and the overarching aims of the project.

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The author thanks his PhD supervisors Jeremy Morley, Steven Bamford and Rob Houghton for their ongoing support.

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Matthew Terrell

PhD Title

The spectrum of Innovators: constructing a framework to inform service innovation

Introduction

Individuals accredited for innovations are described using a assortment of terms referencing the context in which activities occur, or the extent to which the activities are determined a success. Crossing a multitude of industries and decades, research on the 'innovative user' continues to expand in an effort to locate and utilize their abilities and networks, which have continued to enable positive service innovation. Recognized data collection methods through to the development of specific head-hunting techniques have been deployed across various industries in the aim of finding these lead users. Regardless of subject area, each process similarly singles out key characteristics of the desired individuals. Examining prior research from a selection of tenuously related areas surrounding innovation provides initial evidence that stronger ties between these subject areas exists- comparability between users and research outcomes. If we collate indicators used in the differing methodologies we start to see patterns emerge, distinguishable characteristics, behavior and personality traits consistently direct researchers to their desired subjects: innovators. In previous studies we observe each of these individuals perform almost identical, in many cases sequential, activates to validate their abilities and provide the same desired outcome: service innovation.

Background

The method used to head hunting individuals with a specific skill set and a sub-set of attributes which enabled them to provide both needs and solutions stems from the innovation literature of co-creation of products by consumers[1], [2]. An overview of the innovation literature shows that a spectrum of innovators exists, from the average consumer who can express problems with existing products to the Lead users[3], who can express needs, solutions and create ideas of commercial viability ahead of the market trend. However the line dividing the different user remains unclear.

Overtime researchers have interpreted the two original characteristics of lead users differently[5], and while trying to match users to these characteristics, have used other measures of behavior and patterns, acting as proxy to determine if they match these underlying attributes, that are becoming increasingly valued [4]. Today the behavior and patterns that act as indicators are more established, some personality traits are also used as indicators[5]. However these attributes overlap with those used to describe other individuals that can provide similar worth, yet are given different titles - without these titles would make the hard to distinguish.

Entrepreneurs, innovators and lead users each participate in new and incremental product develop. Observed to be involved in both self-initiated projects and in collaboration with larger companies – all utilizing their communities and networks to achieve the desired goal[6], [7]. Academics have consistently described these three user types with the same characteristics, behavior patterns and even some personality traits, when conducting research online and offline, face-to-face and remotely – yet despite the large overlap across academic boundaries, they are labeled differently. Similarly opinion-leaders and 'influential's' are also described with consistently similar attributes, however they tend to be less associated with product innovation[8]. Given the consistent demonstration of their similarities across these academic boundaries and almost no significance placed on their differences when applying similar methods to indentify each, one has to ask, what is the difference between an entrepreneur, lead user and innovators? More importantly, by understanding their similarities and differences can we enrich the application of these different user types by labeling them accordingly? In addition to labeling, by highlighting the differences and similarities can we build a more comprehensive model of the application of the spectrum of innovators used for service innovation?

[5] Lead users face needs that will be general in a market place but face them years before the bulk of that market place encounters them; Lead users are positioned to benefit significantly by obtaining a solution to those needs. [3]

Initial Research
The first step is to build a user typology to provide a more comprehensive structure the spectrum of innovators. A thematic analysis[9] has been conducted; validating main overlapping themes and assisting in separate the distinguishing characteristics of different users. The typology is also intended to assist researchers in critically examining their users against prior research and other users – enabling them to make informed decisions when conducting comparative studies.
The second step in my research is to construct a frame work of attributes that can signal the abilities of an individual and help distinguish those abilities of each user type – providing more depth to the user typology and extend its practical application.

Research application
The application of the user typology and framework are intended to be applied when seeking innovators from large online communities.
Online user communities continue to grow in number and variety. Each community holds potentially untouched pools of information and innovators who self select in becoming part of a community that share their interests[10–12]. As communities grow these individuals, or even groups of users will be increasingly harder to find hidden amongst their peers in a pool of profiles, obscure user names and inconsistent user information[13].

Unlike traditional methods, this new frame work is indented to simplify the precise actions and elements that contribute to observed behavior and patterns so that it can be translated into common data types found and available from online communities. Applying this frame work to a large data set will enable the researchers and platforms owners to locate users that exhibit traits of those of an innovator. To actually confirm the individual's abilities and validate the findings will require a physical examination of the users. This limitation on the application of the framework is not a hindrance but necessary. In the spectrum of innovators some established abilities of these individuals, such as producing commercial viable products, can only be validated with expertise in that specific sector.

To decrease the time it has taken to find innovators from large user communities is challenging and limited due to the way in which innovation and people are necessarily assets. The main outcome of my research with be the construction of the framework, user typology and validating both using convergent reliability to ensure that this approach can be used and deployed within the research community with confidence.

Matthew Terrell

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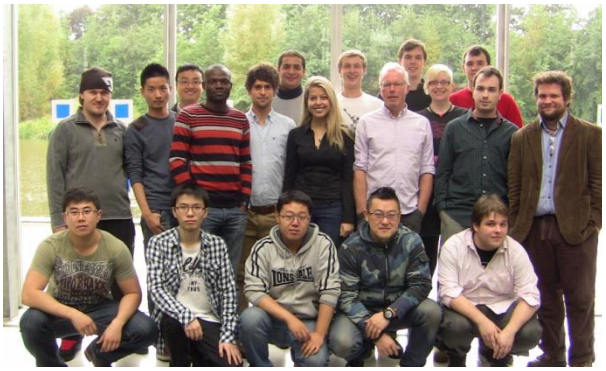
Cohort 2012

The Horizon DTC cohort 2012 commenced their studies in September 2012 and will complete their PhD in September 2016.

This year saw the launch of the International Doctoral Innovation Centre (IDIC), which will train 50 PhD students in the Digital Economy over the next six years. The programme is unique as the first year will be spent in Nottingham undertaking the same training programme as the DTC students then the next three years will be spent at the University of Nottingham Ningbo, China where the students will graduate. The IDIC is funded by The Chinese Ministry of Science and Technology (MoST) and Ningbo Municipal Government.

There are 19 students in cohort 2012 which includes 8 IDIC students. The cohort disciplines include Engineering, History, Law, Psychology, Sociology, GIS, Business and Computer Science.



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Richard Brown

PhD Title

Creative multimodal improvisation and performance.

Computer-aided improvisation is generally associated with music.
The Performing Arts, especially dance, tend to use technology as interpretive media rather than for live improvisation.
There is a gap in the use of technology for the production of live multimodal improvisation (voice and gesture : control and mediation)

Research Questions

What models and definitions of creativity and improvisation might be used in the context of technology and live performance?

What are appropriate system theories and paradigms?

What form might content and the underlying information structures take? (generative, emergent, stochastic, neural ..)

What type of technologies and techniques might be used to produce effective and creative live multimodal improvisation?

How might the effectiveness and veracity of technology enhanced improvisational performances be measured?

Methodologies and Objectives

Research and evaluation of technology assisted performance art (literature, documentation, events)

Art as a mode of enquiry (Practise as Research PaR).

The admission of creative practice in a PaR PhD context is premised on the notion that research questions in the performing arts can be rigorously worked through in a range of practices (of which writing is only one).

Practice should be accepted as methodological process of research inquiry and a mode of dissemination of research in its own right.

(http://www.bris.ac.uk/parip/par_phd.htm)

Assess and identify suitable technologies, systems, information structures, content storage and generation for the production and testing of TELMI.

Live testing, iterative content production, system design and development.

Content production and testing in the wild.

Ethnographic or other applicable evaluation techniques.

James Burnett

PhD Title

Dynamically assess peoples use of space to determine interests, engagement and intents through modelling of body posture and movement, used to infer potential underlying mental state which could lead to understanding possible decision making approaches, either between individuals or when interacting with artefacts.

Abstract

My hope is to be able to model an individuals posture and gestures in space, using point cloud data collected from kinect cameras to try and find a simple representation of their mental state over a series of time steps. Considering movement, posture and gesture in a real time context I would look to assess levels of interaction, engagement and relate this to possible intention when interacting with individuals and objects in a given space.

Research questions:
- To what extent can body posture and simple gestural movement infer mental state and likely levels if interaction.
- How can levels of interaction, engagement and intent be drawn from combined body posture and gestural information.

Aims and Objectives:
Develop a robust system to capture and manipulate point cloud data, allowing for tracking and processing of individuals movement and gestures.
Define a set of metrics to begin quantifying and grouping posture in a time dependant manner.
Relate real time movement and gesture to a set of "action and reaction" states for modelling of interaction, engagement and intent.

Methodologies:
Applying psychology theory of representation of self and embodiment, socioolgy theory including proximity and "Game Theory", which can also be considered in an economic "risk/value" framework.

Peter Craigon

PhD Title
How does the translation of the real world into 'information' using fuzzy logic challenge or augment models of meaning and knowledge?

Proposed Supervisors –
Andrew Goffey – Department of Culture Film and Media
Christian Wagner - Horizon

Abstract
Existing models of knowledge are based around defining similarities or differences between groups of things or concepts. These similarities or differences are often based on arbitrary distinctions (such as setting 0.05 as a threshold for statistical significance, or the assumption of a shared meaning for a word) when these distinctions simplify the complex nature of the world and therefore the knowledge associated with it.

My project will seek to explore fuzzy logic as an approach to translating real world discourse into 'information' to preserve more of the complexity and contingency inherent in it. This will draw on the existing 'Computing with Words' paradigm and develop such aspects as the Interval Agreement Approach and alternatives to a continuous 'rating' scale for collecting real world 'data'. This will require development of an instrument to test these approaches in relation to a particular real world discourse as a proof on concept but this will need to be decided based on the approaches and methods that need to be tested.

This will be partnered by a thorough analysis of existing models of meaning and knowledge to see how fuzzy logic models may challenge or augment them. The scope of this will be decided but is likely to focus on post-structuralist philosophy and semiotics and their approach to the construction of meaning and knowledge.

These two strands will inform one another and be equally prominent in the final PhD which will contribute to the literature on 'Computational Culture' and fuzzy logic. I would also be interested in developing the fuzzy logic tested into a tool for the translation of real world discourse into 'information', knowledge and meaning with wider applications.

Dimitri Darzentas

PhD Title
Understanding, Defining & Exploring Object Trajectories

Abstract
This project aims to understand, define and explore Object Trajectories. The term 'Objects' includes physical, digital and hybrid entities. It will attempt to answer questions regarding the long term effects of provenance and heritage tracking on the value of objects and determine the impacts (individual,

societal and economic) of the detailed footprinting of objects.
The starting point for the project will involve Utilising the domain of Miniature Wargaming, which includes codified information structures and a user base familiar with the concept of provenance, in order to develop a framework for object trajectories.
The Wargaming example suits the purpose as it inherently contains, at a convenient scale, elements which can be generalised to a wider array of objects. These elements include provenance tracking, user involvement, engagement and investment and object development and 'growth' among others. Additionally there are several practical advantages such as industry contacts. Methodologies for this investigation would include prototype developments and long-term ethnographic studies in order to determine the far-reaching effects of determinable object trajectories.

Liz Dowthwaite

PhD Title

How do webcomics communities create and communicate value? The use of social media and networking platforms in the creative industries

Background

This PhD will look at online communities in the creative industries, specifically at the interactions between the creator and the user. It will be specifically looking at the webcomics industry, where many artists have successfully monetized their art, and where there are large, loyal communities of fans. The Internet provides many opportunities for beneficial interactions, and people in the creative industries are taking advantage of these new forms of engaging with their fans. Interactions within and between online communities can be seen as concerning the flow of value, a concept much discussed in the business model literature, in terms of total value for all concerned (creator, fans, third parties). There are many kinds of value flowing through these networks: financial, informational, educational, cultural, shared interests etc. and each are managed and prioritised in different ways depending on the shared goals and interests of the community. There are many different types of online community; most work so far about creative communities has looked at groups such as musicians and gamers, or has given a general overview, treating all communities the same. There has been little work on the growing communities of webcomic artists and fans as yet.
However, much has been written on the importance of the intimate relationship between comics creators and their readers, and this relationship can be enhanced by the web. Additionally, 'born digital' communities are an interesting organisational form; they are self-regulating, open, and relatively new. Networks of webcomics fans are distinct and powerful communities that can enable artists to monetize their work and fund their projects. Recently, on Kickstarter (a funding platform for creative projects), a project to fund the first printed collection of Dresden Codak, a webcomic by Aaron Diaz, was fully funded within an hour; as of writing it has 1,150% of its goal, has 4,883 backers, and there are still 11 days to go (16th March 2013). Social networking has also been used by fans to aid artists when their copyright and privacy has been violated; websites have been boycotted and even large retail chains have been targeted for stealing other people's artwork. For all of these reasons, webcomics communities can provide valuable insights into the flow of value in online networks.

Research Questions

- How do webcomics communities become established?
- What type of interactions occur within and between networks?
- How is value created, and what kind of value is it?
- When and why do these networks fail?
- How does technology affect all of these processes?

Aims and Objectives
This PhD will aim to establish a framework of general rules for creating and sustaining beneficial online communities that can be used for creating and communicating value of all kinds in the creative industries. It will help to develop a better understanding of how digital technologies create new possibilities for social action and value creation.
The overall aim is to examine how social networking platforms may be beneficial to the creative industries, as part of the User:Creator platform project within CREATe (Creativity, Regulation, Enterprise and Technology, www.create.ac.uk).

Methods
The project will combine qualitative methods such as content analysis, virtual ethnography, interviews, case studies, and focus groups, with quantitative data such as social network analytics, and measures of social media us). Some experiments will also be carried out.
This PhD will cover a range of subjects, including Business, Sociology, HCI and Psychology.

Adriana Gosuen

PhD Title
Wisdom of the crowd – an investigation of how eWOM influences trust and encourages purchases in Chinese e-commerce

Abstract
Electronic word-of-mouth (eWOM) communication refers to any positive or negative statement made by potential, actual, and former customers about a product and/or a company via the internet (Hennig-Thurau *et al.,* 2004). The advances of web-based technologies have created a fertile ground for eWOM, which not only empowers consumers, by allowing them to express their opinions and product information effortlessly reachable to the global community of internet users, but also add value to the economic activity. In fact, eWOM has potentially important implications for a wide range of activities such as brand building, customer acquisition and retention, product development, and quality assurance.

Given the importance of trust to overcome any reluctance on the part of the would-be consumer, I would like to investigate how eWOM affects trust and encourages purchases in the Chinese e-commerce.

Some possible research questions are described below:

- How helpful Chinese consumers perceive eWOM (e.g. product reviews, rates and comments) and to what extend do they rely on them before making a purchase?
- How trust is created in these online communities where customers are not capable to estimate the trustworthiness and goodwill of other members?
- What makes customer's review helpful and trustworthy and how much are consumers influenced by the length of comments and ratings?
- Do gender and subculture affect the relationship of online word of mouth and trust in e-commerce?

This project is relevant to Horizon as it can benefit with insights from HCI (how user interfaces can maximise perceived trustworthiness), computer science (online environments); business (e-commerce); sociolinguistics; economics (economics of decision-making); marketing (consumer behaviour) and psychology (trust).

Reference

Hennig-Thurau, T., Qwinner, K.P., Walsh, G., Gremler, D.D. (2004), "Electronic word-of-mouth via consumer-opinion platforms: what motivates consumers to articulate themselves on the Internet?" *Journal of Interactive Marketing*, Vol. 18 No.1, pp.38-52.

Sam Howard

PhD Title
Are 'Smart Inhalers' an effective Digital Health Monitoring Device for Adolescents with Asthma?

Abstract
Adolescents tend to be poorly accounted for as users during the design process of new medical devices (Geljins et al, 2005). This may at least be partially due to the difficulties surrounding gaining ethical approval to use such a sample (Hester, 2004).

Around 5.4 million people in the UK are being treated for Asthma. Like all chronic conditions non-adherence poses a major challenge for healthcare and in asthma non-adherence rates range from 30-70% (Horne, 2006). Adhering to inhaled corticosteroid (ICS) treatment is of great importance, with evidence indicating that failing to do so increases the risk of asthma attacks, hospitalisation and death (Horne, 2006).

This research will aim to investigate if 'smart inhalers' developed by Nexus6 could be an effective method of improving adherence to ICS treatment in adolescents with chronic asthma, focusing on any barriers to acceptance from a Human Factors perspective. For adolescents, smart inhalers may provide a new sense of independence, allowing them to monitor their treatment of the condition, as well as reducing the need for medical supervision if they are able to manage their asthma treatment responsibly.

Research Questions

1) What are participants' attitudes to having their behaviour and adherence tracked?
2) How and with whom should data be shared?
3) What are participants' attitudes towards the device itself?
4) How well does the device work?

Methodologies

Trial the Smart Inhalers. These will be acquired through the agreed collaboration with the company who produces them - Nexus 6.

This will firstly involve trialing their second generation smart inhalers, then later trialing their third generation smart inhalers (with smartphone integration) once they have been built and sent over from New Zealand.

Both trials will use a sample of Adolescents with chronic asthma. Data gathering will be through:

- Design workshops with asthma patients using the devices
- Surveys on positive and negative aspects of the technology
- Interviews with users and healthcare professionals

Outcomes

New research on adolescents with asthma with brand new smart inhalers

Knowledge on a new form of Ubiquitous Computing

Could smart inhaler data be combined with other data streams such as the weather, location, pollution, pollen etc to create a greater understanding of Asthma and to allow for personalisation of treatment?

Richard James

PhD Title
Does mobile gambling attract or create problem gamblers?

Background

The past decade has seen a considerable change in how people gamble across the UK. However, the research literature has only made limited progress at keeping up with these changes. The gambling literature has been overwhelmingly focused on whether these new gambling technologies (such as FOBT's or internet

gambling) convey a greater risk of problem gambling, but the research has been fundamentally inconclusive (Wood, Williams & Parke, 2012); it is not known whether the increased prevalence of gambling addiction is because of existing gamblers using a new modality or whether a new population is being created. The emergence of mobile gambling allows us to look at two issues. The first is whether mobile gambling represents a particular risky form of gambling. Both lay and research narratives of games have emphasised 'harder' forms of gambling, and internet gambling has been identified towards the more problematic end of this spectrum. The second is whether gamblers and problem gamblers who gamble using this modality are a novel population. There is circumstantial evidence to suggest this is the case; evidence from the gambling industry suggests that many of these gamblers are gambling using these devices for the first time.

Aims

The central question of my PhD thesis is whether problem gambling within mobile gambling is a result of a new population of problem gamblers being created, or whether it is being drawn from existing problem gamblers who are using novel modalities. The other aim associated with my PhD concerns the risk that behavioural features specific to this modality pose for gamblers. This will be specifically focused on in the context of judgement and decision-making behaviours.

Current Research

So far my research has consisted of a secondary analysis of a nationwide sample of gamblers (Wardle et al., 2010) in which remote gambling (which includes internet and mobile gambling) was compared against other gamblers along a number of variables, including problem gambling, amount spent and amount of time spent on gambling.

I have also conducted a survey of gambling behaviours and individual differences across different games and modalities. The survey probes aspect of gambling behaviour and individual differences that tap into the constructs of the predominant theoretical model of problem gambling (Blaszczynski & Nower, 2002).

Current research includes an experimental study involving non-linear subjective probability weighting functions (Tversky & Kahneman, 1974; 1992) across different outcomes and frames (gains/losses) and learning across repetitions of decisions.

Methodology

My research approach will be almost entirely quantitative. My thesis is intended to primarily consist of experimental research, with aspects of survey and qualitative methodologies, such as interviews. This has been selected on the basis of background knowledge and with a view towards the needs and requirements of the parties I am interested in communicating my research towards outside of the academic community.

William Knight

PhD Title

Can Hacktivism be understood as the Performance of a Collective Digital Identity?

Abstract

The protection afforded by the inherent anonymity of online interaction facilitates the abandonment of individual identities and allows the adoption of any number of online personas. When hacktivist groups carry out their "attacks" on various online targets, it is often the actions of very many individuals all working anonymously under the same guise – the collective identity.

Traditional media sources have attempted to understand these groups by separating them into individuals; by singling out potential "ringleaders" or imposing an overt "hierarchy" onto the community, but sources within the community itself recognise this to be a fruitless effort. The hacktivism community without structure or leadership, characterised by a *doology* ethic (Jordan and Taylor, 2004), with a low threshold for participation and no identifiable membership requirements.

So, there is a dissonance between the traditional schema super-imposed onto the community by journalistic literature, and the views of the community held by those within it.

Aims:

An initial aim will be to understand the process of collective identity negotiation, orientation and performance across a demographically disparate community such as "hacktivists".

Additional aims might be to understand how, at the individual level, the role of "hacktivist" is performed through the medium of this collective identity and how the people involved feel that this identity has changed in light of the recent changes around the movement itself.

Methodologies:

Influenced by E.Goffman, the project will seek to understand the collective identity as a "performance". This philosophy has significantly influenced the ontological and epistemological approach of the study.

Main methods used will be in-depth interviews, digital and real-life ethnographic observation with the potential for employing a multi-method approach by utilising survey or content analysis methods.

Summary of activities:

Beginning with a significant literature review and informed by in-depth digital ethnography, the first phase of the study will involve establishing the boundaries between the objects of study: where does hacktivism diverge from its epidemiological roots (hacking and activism)? Who, for the purposes of the study, might we identify as "hacktivists" or involved in the movement as a whole? These are important questions to answer before the study begins, as if they aren't clear, then employing any investigative methods could turn out to be difficult.

Once these questions are effectively answered, the next phase of the study would involve contacting potential participants for initial in- depth interviews and case study. Hopefully, through a snowball sampling method, this initial contact might act as a gatekeeper to facilitate further potential participants to be identified and approached.

Additional methods employed might be content analysis of website/social media content, questionnaire/survey methods.

Xia Li

PhD Title
Simulation Based Dynamic Multi-Viewpoints Port Operation Performance Evaluation Modeling

Abstract

Research Questions

Can we evaluate operation performance of a port system:

- consider different viewpoints and aspects
- dynamics of the system over time

Aim

Build a model to operation performance evaluation model for a port system, examine its possibility to apply to other transportation systems.

Methodology

Performance is viewed differently from different viewpoints and different aspects. Viewpoints can be from different stakeholders:

- Port Authority's view
- Government's view
- Local community / urban community's view

Viewpoints can be from different aspects:

- Socio-Economic cost-benefit aspect
- Ecological impact aspect (ecological footprints, eco-friendly)
- Energy consumption aspect
- Risk management aspect

A dynamic multi-viewpoints evaluation model is built based on simulation modeling, so that by given one a multiple viewpoints, model simulates the performance measure result of port operation. Data collected for port operation is used to train the model to improve the accuracy of the performance measure.

Contribution

A multi-viewpoints operation performance evaluation model.

Yao Li

PhD Title

Smart Infrastructure -Dynamic modelling system:
How can we use simple measurement and modelling techniques to evaluate infrastructure?
Objectives

Abstract

Use limited data get from sensors and modelling techniques to get a overall evaluation of infrastructure. It will affect major transformations in the approaches to the design, construction and use of complex infrastructure.
Methodology

1. Compare usability of existing sensors. cost, accuracy, types of data can collect. Find several potential sensors can be used in longtime period remote measurement.
2. Lab experiment. use concrete and steel beam to model infrastructure. Use sensor to monitor the beam. Find the accuracy of sensors using the system compared to engineering measurement.
3. Build numerical model to model the beam that combined with temperature, load, material effects. Input the measured data to evaluate the behavior in different time period and compared to engineering measurement methods.
4. Apply the system in complex infrastructure (eg, tunnel, bridge). It could be also done in Lab if no corresponding project available. Use bridge model to simulate complex structure and working conditions.

Horia Maior

PhD Title

Identifying how user interfaces affect Mental Workload using non-invasive brain monitoring devices.

Research Questions:
Research question: How can we measure Human Mental Workload (MWL) using non invasive monitoring devices?
Research question: How can we use these measures to evaluate user interfaces?

Our aim is to identify and quantify human MWL using non invasive monitoring devices (devices that are ecological valid to HCI studies). We want to explore the validity of our findings in terms of MWL (Wickens and Hollands, 1999). We then want to investigate how these devices may serve

as an auxiliary mechanism to develop and evaluate user interfaces.
We are currently using a brain monitoring technology called Functional Near Infrared Spectroscopy (fNIRs).
Our method will include a series of lab experiments with participants, where we measure participant's physiological data with fNIRs.
Ultimately we want to develop a quantitative tool for HCI (using the non-intrusive monitoring devices) that serves:
As an auxiliary mechanism to develop and evaluate user interfaces;
As a HCI Concepts validation tool for;
Supervisors:
Max L. Wilson
Sarah Sharples

Felix Osebor

PhD Title

Managing the Urban: A System Approach to Intelligent Urban Modeling and Analytics for Cities in Transitional Economies

Summary Of Interest and Research Objectives:

We are currently experiencing a dramatic shift in urbanization: significant increments in urban population and economy are being experienced in alarming rates particularly in developing regions. More than 80% of the world's population currently live in less developed regions, and urbanized areas in Asia and Africa are forecasted to grow most rapidly doubling in population between 2000 and 2030. With such growth potentials, come major concerns of climate change, resource consumption, unemployment, poverty, etc.
Furthermore as our cities continue to grow, thanks to the Ubiquitous computing vision, new technologies will unlock massive streams of data about cities and their residents. As these forces collide, they will turn every city into a unique civil laboratory, a place where technology is adapted in novel ways to meet local needs (Institute for the Future, 2010).

This calls for 'novel' ways of managing and designing cities to productively leverage these growth potentials. My research interest seeks to leverage data from our individual and collective digital footprints, to enhance our understanding and development of smarter cities. Particularly am interested in data-driven analysis, modeling and visualization of economic activities to understand how people use the city' infrastructure i.e. mobility patterns, and resource consumption in order to inform an evidence-based process for the strategic design and management of cities.

Research Questions:

- What parameters need to be considered in managing the urban?
- How will urban planning and design respond to increasingly high-resolution urban data about the city?
- How do we optimize urban growth through data-driven modeling & analytics?

Tentative Research Methodologies:

- In-depth and extensive Literature Review
- In-Situ Ethnographic Studies
- Modeling and Data Analytics
- Design Prototyping and Evaluation

Yiming Quan

PhD Title

A multi-constellation GNSS integration system

Abstract

In the near future, many new satellite signals from Galileo, GPS (L2C and L5), Compass, and GLONASS (CDMA) will be available. The combination of constellations can increase the positioning performance. How to make a better use of these multiple constellation signals need to be carefully researched to achieve the optimization. Some previous research works have been conducted regarding combination of GPS, CLONASS and Galileo, but limited in terms of China's Compass system. The aim of my this project is to develop a

multi-GNSS data process system which can integrate different GNSS data including single, dual, and three frequency signals from Compass, Galileo and GPS to optimize positioning quality. The methodology of research will be based on the qualitative and quantitative analysis of experimental data. User observation data will be acquired from the high-end geodetic GNSS receiver. Data analysis and algorithm development will be based on VC++ and Matlab. As for data validation, static and kinematic tests will be conducted. The former test is intended to validate algorithms and the latter will test systems in real scenarios.

Liam Sloan

PhD Title

Exploring immersion in dynamic storytelling through social signal processing

Abstract

A number of projects have been undertaken to enhance the research into the ways in which we interact with media (both physical and digital) such as the Bronchomatic (a mechanical bull like ride controlled by a user's breathing via respiration sensors) and Tug-O-Matic (A virtual tug of war game were user interaction was derived from brain activity monitored with EEG sensors). These projects relied on users controlling constantly monitored bio signals as the direct method of interaction.
The aims of this project are to explore the validity of various data sources e.g.

- Audio
- Visual
- Gestural
- Physiological (ECG, EEG, GSR, etc.)

As an auxiliary method of input to make interactional media more dynamic. By exploiting affective or affected state, stances and relations as defined by social and bio signal processing, interaction with agents and environments may become more natural and immersive.
A series of preliminary participatory experiments will need to be conducted to explore these various interaction methods. These experiments will include:

- Ethnography – exploring different types of interactive media, both digital and physical examining the approaches used to make these dynamic and immersive.
- Capture SSP and BSP data from existing interactive media (both physical and digital).
- Workshops – Discussing what components of interactive media enhance the immersion of an experience.
- Developing new forms of interactive storytelling, by constructing a new grammar used to determine the scripting effects of BSP/SSP.
- Experiments – to test hypothesis for ecological validity (does affective data reliably represent and measure what it is assumed to do).

In practice, experiments will be performed through the development and/or modification of videos games, as these serve as excellent dynamic storytelling platforms.
The projects multi disciplinarily will come from the use of knowledge from various research areas such as computer science, psychology and social sciences. These each have a stake in existing affective computing, SSP and BSP research.

Lachlan Urquhart

PhD Title

Effective governance of ubiquitous monitoring systems in surveillance societies

Research Question: In surveillance societies, to what extent are existing European governance mechanisms capable of protecting information privacy in the context of emerging ubiquitous monitoring environments, and how can the framework be reconceptualised to ensure fitness for purpose?
Context and issues: The UK is a surveillance society where a guiding organisational principle for managing populations is collection, sorting, management and risk assessment of data. Whilst surveillance is always grounded in power, it has become

normalised, mundane, every day, routine and conducted for a range of purposes (not just discipline or security). It exists across state and non-state entities with the invisibility of sites of surveillance increasingly challenging the efficacy of data protection and privacy laws (especially from the perspective of the subject). These laws are predicated on European human right jurisprudence and legal constructs pertaining to individual *control* over personal data. The EU Data Protection reforms continue this trend with new rights to deletion and data portability. Existing ICTs already expose frailties with these concepts, but emerging ubiquitous computing systems pose further, fundamental challenges.

Pervasive computing technologies are in a unique position as surveillance/monitoring tools. They have the ability to combine detailed physical and electronic monitoring whilst concurrently being less visible. This makes establishing the intermediary in control of infrastructure and tracking the path of information between systems difficult. They contribute to socio-technical systems where subjects have limited scope to: shape and change surveillance practices, control their individual identity as represented by data footprints and to rely on aforementioned legal rights. This is not sustainable and conceptual reformulation is necessary to: address how rights are guaranteed in these new contexts, to understand the range of regulatory tools available, and to reassess the overall European framework of individualised privacy.

Aims and objectives: To critically assess the impact of ubiquitous computing concepts on law and regulation within surveillance societies, whilst identifying inadequacies and potential solutions. Formal command and control governance, like the EU DP Framework is no longer enough because legislative change cannot keep pace with emerging technologies. Therefore this PhD will develop a conceptual, modular framework of complementary regulatory and theoretical tools fit for purpose in this context (particularly for end user). This framework will build on approaches like: Co-regulation (Marsden 2011); 'Collective/networked' rights ('networked privacy' Boyd 2013) and collective identity; 'privacy as social policy' (Raab 2006); social shaping of 'social sorting' (Lyon 2001) soft law & technological solutions eg privacy - by design (PbD), impact assessments (PIAs) and enhancing technologies (PETs)

Methodologies: This will adopt a socio-legal approach drawing on law, surveillance studies, empirical qualitative work and critical theories. The proposed framework will be developed and tested using feedback/input from qualitative expert interviews (policymakers/regulators, academics, technologists) and public opinion surveys.

Multidisciplinarity: law (human rights & information technology law, regulation theory), surveillance studies (sociology, criminology, communications theory, politics), science and technology studies, all framed within context of ubiquitous computing.

Relevance: A critical perspective on ubiquitous computing technologies will highlight the challenges to legal governance and issues for sustainable proliferation of these technologies. It is essential to address regulatory inadequacies and assess implications of increasing the digital footprint from the perspective of surveillance and social control mechanisms. The resulting framework will increase legal and regulatory certainty, allowing regulators, designers and users to engage with new technologies in a manner consistent with relevant European law/policy

Ning Xue

PhD Title
Information Visualization of Big Traffic Data

Problem:
ITS stands for intelligent transportation system, it could be public or private, the public one usually owned by government, such as transportation department of a city, while the private one is usually operated by personal travel Company. The data source that generated by ITS are: text file and audio file that generated by static sensor, navigation devices, GPS loggers, PDAs, mobile phones or image and video that recorded by monitors. To divide a ITS into many sub application is not a bad idea since it is easy to management, however, it will make the decision maker hard to get the whole view of traffic situation timely and clearly.

Aim:
To apply information visualisation on massive and heterogeneous traffic data that generated by ITS.

Methodology:
Big data visualisation is a hot research topic now and widely applied in commercial business ERP and already obtained good results. The visualisation of big data technology is come down to High-dimensionality data visualisation. Besides that, another method that should be considered to is geovisual analytics, because transportation data is temporal and spatial data that have a number of properties that distinguish them from other types of data. As mentioned by Tobler's first law of geography - everything is related to everything else, but near things are more related than distant things. (Benjamin B. Bederson and Ben Shneiderman ,2003)

Chao Zhang

PhD Title
Object recognition for dynamic tracking of cities' Monitoring Systems.

Abstract
The research question is decided as How the object recognition technology can contribute to a high performance tracking system for security usages with the participation of geospatial information.
The aim of this project is to set up a platform that could integrate different monitoring video cameras that enable cross-camera recognition and tracking. One basic idea is that with the geospatial information of each camera, there could build up a "visible zone" on the map. And if all these "visible zones" could be integrated effectively, a single object that appears in one camera could be easily tracked in others as well with its own characters.
There are also several problems with this idea. The first one is how to detect and decide the "visible zones" with their locations on the map, and how to apply the algorithms to enable such cross-frame processing. Therefore, objectives of this work covers integrating different cameras with their location, applying object recognition process, achieving a cross-frame tracking system, and making predictions for the selected suspects.

Lin Zhang

PhD Title

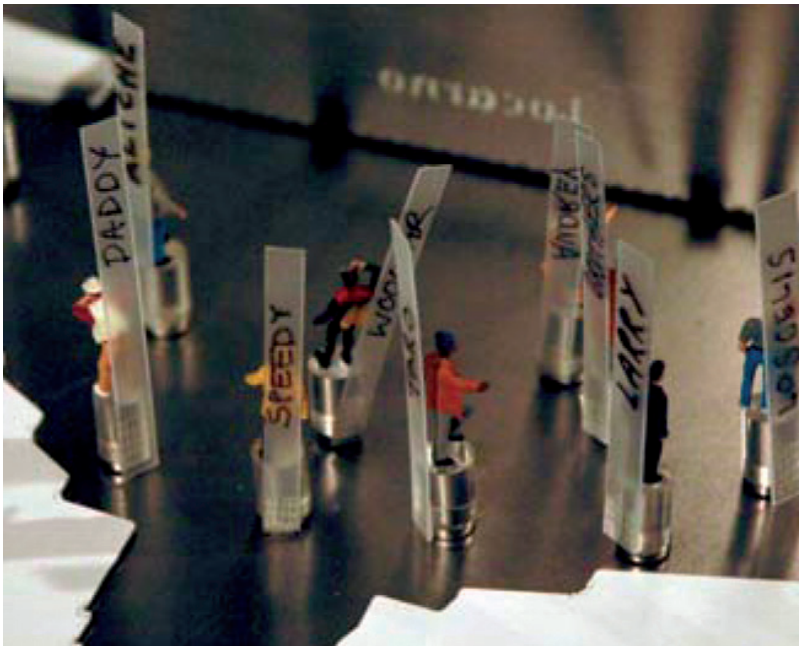
Transportation control through object detection and AI technologies

Research question:
The problem of traffic jam has troubled both drivers and passengers for a long time. It drives people unhappily and uncomfortably. Could we find a method to predict the crowded degree of a road to make driver to avoid the traffic jam through situations of other nearby roads which could be captured from the traffic camera or latest update from other users.

Aim:
The aim of this research to find a less busy road to make the driver able to avoid traffic jam by using AI technologies to predict the car's number of a road according to the car's number of near roads which are captured from traffic camera using the object detection technologies and users' feedback of road crowded information.

Objectives:
1. Using object detection to detect the average number of cars from traffic camera.
2. Using AI technologies to predict the number of cars of a particular road with the information of other roads (include cars number of other road captured by traffic camera and user's feedback of some roads).
3. Users could use mobile device to update the latest traffic information of a particular road to the system. The system will predict again with all the collected information and then feedback to all the users.

Methodologies:
1. Traffic simulation: simulate the traffic information under a virtual road which will help to solve the problem of AI part.
2. User feedback: the user could use mobile phone to update information of the road to the system.
3. Sub-goal: the total research is divided into 4 sub-systems. The first sub-system is the detection system which is used to detect the number of cars through a camera. The second sub-system is the prediction system which is used to predict a number of cars of a particular road in the road simulation. The third one is the detection-prediction system which can predict the number of cars through the information from the information captured by cameras. The final one is the user feedback system which is to collect the users' feedbacks as additional information for the prediction.


DADDY
SPEEDY
HAPPY