Acknowledgements

The Horizon Centre for Doctoral Training (CDT) at The University of Nottingham was launched in September 2009 and is funded by EPSRC (Grant EP/G037574/1). The Centre's overarching research theme is Ubiquitous Computing for the Digital Economy.

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

The University of Nottingham has made every effort to ensure that the information in this brochure was accurate when published. Please note, however, that the nature of the content means that it is subject to change from time to time and you should therefore consider the information to be guiding rather than definitive.

Thank you to both Kyle Arch and Martin Porcheron (Cohort 2013), and Emma Juggins for designing, compiling, and proof-reading this brochure.

Contents

We are delighted to include in this brochure research highlights from 72 students from four Horizon CDT cohorts who commenced their PhD between 2010 and 2013.

Cohort 2010

The Horizon CDT 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.

Edward Anstead
psxeja@nottingham.ac.uk
Anthony Brown
psxab@nottingham.ac.uk
Chris Carter
psxcc@nottingham.ac.uk
Olga Fernholz
psxof@nottingham.ac.uk
John Harvey
psxjh2@nottingham.ac.uk
Adrian Hazzard
psxah6@nottingham.ac.uk
Paul Holmes
psxph1@nottingham.ac.uk
Annika Hupfeld
psxah4@nottingham.ac.uk
Mark Iliffe
psxmi@nottingham.ac.uk
Lorena Macnaughtan
psxlm@nottingham.ac.uk
Tim Pearce
psxtp5@nottingham.ac.uk
Abdur Rahman
psxar3@nottingham.ac.uk
Julian Rosser
psxjr@nottingham.ac.uk
Jianhua Shao
psxjs4@nottingham.ac.uk
Mercedes Torres
psxmt3@nottingham.ac.uk
Min Zhang
psxmz1@nottingham.ac.uk

Edward Anstead

The Design and Evaluation of Multiscreen Television Viewing Applications

My thesis is investigating multiple screens in the home, early literature and prototype development looked at the notion of display ecologies and how they could conceptualise the design of multiscreen deployments. More recently I have specifically focused on the paradigm of multiscreen television, which as an emergent phenomena of user behaviour, is an increasing area of interest for academia and industry. As part of this work I have completed an internship at the BBC and developed a television companion application which has been evaluated by users. My work is specifically focusing on the use of temporal trajectories as a conceptualisation of how multiscreen companion applications are used. I have designed and developed a dual screen television application supporting multi sport event coverage, specifically the London 2012 Olympics. 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 multi sport nature of the Olympics allows viewers to watch different sports unfold across TV channels and engage with additional statistics on an internet enabled device.

The watching of television programming whilst engaging with a second screen device, such as a laptop, mobile or tablet computer, has seen rapidly growing adoption over recent times. In a recent survey by the broadcast regulator in the UK, Ofcom, it was found that 54% of respondents were using the Internet whilst they were watching the television. These trends facilitate opportunities for television broadcasters to provide the viewer with holistic and joined up experiences where the TV and another device interface with each other to construct a richer interactive narrative.

The identity of this phenomena within the multiscreen paradigm provides an interesting research opportunity. Investigations involving these observed behaviours offer insight into user motivations and practices. In turn these findings may lead to better interactive experiences and applications. From the television industry perspective the draw away from the TV as a focal point of users attention is a significant concern and opportunity. Within the commercial sector, this potentially means less attention is being paid to advertising and product placement, for public service broadcasters the programming could be seen as less relevant and impactful. However the opportunities to engage viewers with additional content has potential benefit to both sectors, for example, increasing the educational value of a natural history programme with additional information, or providing links to an advertisers shop page, during the advertisement break. Additionally online discussion and debate about programming has become a feature of many television series and events, such as ITV's X-Factor or BBC's Question Time. Understanding the process by which this happens or being able to foster it through bespoke applications and channels, is of significant value to both sectors.

Anthony Brown

Domesticating Home Networks

My PhD aims to explore the domestication of computer networking technologies. The main focus is to explore the impact of treating the domestic network as a socio-technical system rather than a technical artefact. We will leverage the structure and agency inherent within the domestic environment to create a system that better integrates into the mundane everyday activities and routines of families. First, we will explore how the unique physical properties of the home provides affordances to enable better provision of networking technology.

Secondly, we will investigate how to convert the raw data available to the domestic router into a useful format accessible to users. Finally, we will experiment with number of novel ways to communicate network data to uses. These will be designed to enhance understanding of the domestic network, with an overall goal of supporting social interactions enabling negotiation of rules and the natural evolution of behavioural norms.

Multinet: Exploring physical security for home Wi-Fi networks

Chris James Carter

Informing Digital Reputation Management System Design through a Psychological Investigation of Professional Risk upon Social Media

In his science fiction novel 'Down and Out in the Magic Kingdom', Cory Doctorow [1] portrays a 22nd century society in which money has been supplanted by a reputation-based currency. As fantastical as this notion might seem, it is the prevailing thesis of my PhD that Doctorow's vision is already being realised in today's digital society; a contention supported by the burgeoning popularity of digital reputation management systems that purport to assist users in identifying the professional riskiness of their behaviour upon social media. However, crucial questions remain of how and why, psychologically, users may succeed or fail in identifying and regulating the expression of such behaviours. My thesis aims to draw upon original empirical data to demonstrate how a psychological understanding of digital reputation management can inform the development of alternative system designs to support this increasingly crucial self-regulatory process.

The first of these studies used semi-structured interviews to explore how academic and professional services employees ($n = 14$) within a UK-based university used social media to support their professional activity. A thematic analysis indicated that reputation management was a core concern for all interviewees in their use of various social media; achieved through both the regulation of social visibility and content management. Responses also reported a relatively consistent trend for diligent evaluation of professional risk prior to online

publication, though with some indication that individual differences in personality may play a role in determining the level of engagement with this strategy of self-regulation.

A second, online survey-based study addressed this possibility by exploring whether psychological and situational factors could predict the extent to which college, undergraduate and postgraduate students ($n = 246$) typically considered career-related consequences when using Facebook or Twitter. Though various personality variables did not account for variance in this outcome variable, a tendency towards regulating interactions, preventing threats to image and promoting work-related achievements were all significant predictors. Furthermore, undergraduates preparing to enter their final year of study reported significantly greater consideration of career-related consequences compared to college and first year undergraduate students — though not final year undergraduates close to graduation. This finding hinted towards a possible role for psychological, rather than actual, distance in perceptions of professional risk upon social media.

Indeed, a further online survey-based study tested this possibility with a sample of final year, job-seeking undergraduates ($n = 257$). As hypothesised, the psychological distance of employers looking at one's Facebook profile significantly predicted perceived riskiness of a set of professionally risky Facebook posts, in that closer distance was associated with greater perception of risk. A final interview-based study is currently underway with recently employed graduates, with the intention of identifying critical incidents that influence the onset of reputation management behaviours on social media. The study also involves a usability evaluation of existing digital reputation management systems, Reppler and Persona. The findings from this will feed into the development of user requirements and design prototypes for a novel digital reputation management system which will be evaluated in a final, small-scale usability study.

References

1. Doctorow, C. (2003). Down and Out in the Magic Kingdom: Tom Doherty Associates.

Olga Fernholz

Innovating for Today While Innovating for Tomorrow: Building Ambidexterity into Organisation

Given the fast paced pervasive change induced by modern digital technologies managers of any technology-based firm face the same crucial question: How to tap the value of today's capabilities and prepare for tomorrow's cutting edge innovations?

In my PhD research I approach this question in terms of innovation ambidexterity theory that states that in order to ensure long term performance and technological continuity, the firm has to exploit the accrued resources and competences while at the same time explore new technological and business opportunities for the future. The exploitation-exploration

framework has an immediate appeal for capturing different types of learning within the firm and the inherent struggle the firm experiences when it tries to orient itself towards multiple, often conflicting goals. Exploitation and exploration thrive under different organisational structures, require opposing managerial styles, and compete for the firm's limited resources. Ultimately, exploitation and exploration tend to crowd out one another, yet the organisation cannot achieve desirable performance outcomes without engaging into both of them. It is the positive effect on firm performance that has earned innovation ambidexterity theory vast academic and practitioners' attention.

In my research I focus on management of modern ubiquitous digital technologies, which arguably represent a new paradigm in the evolution of information and communication technologies and offer firms new possibilities for capabilities recombination and development. Fundamentally, the aim of my research is to understand organisational change in the firm spurred by the evolution of the underlying technology base or more narrowly: how firms that utilise these technologies build organisations stable, yet flexible to remain successful in the fast changing environment over long periods of time.

John Harvey

An Economic Anthropology of Computer-mediated Giving and Sharing Systems

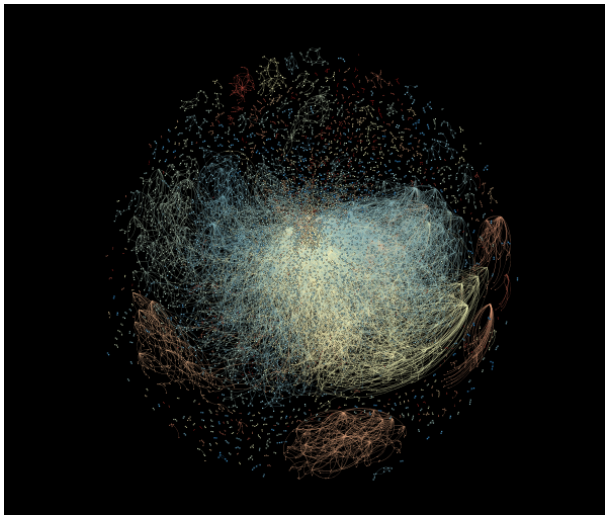
Gift giving has received an enormous amount of interdisciplinary attention over the past century. Since seminal work by anthropologists [1, 2] scholars in anthropology, sociology, economics, philosophy, and consumer research have examined the antecedents of giving. Much of this research is being revisited due to the emergence of new informal offline gift economies that are facilitated by the internet. People with common interests meet online before meeting offline for the purpose of exchanging, giving or sharing goods. Interestingly, many of these systems eschew or even prohibit monetary transactions, favouring 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. Researchers [3] have described the emergence of these systems as a form of hybridised exchange which do not correspond to a singular prototypical behaviour such as giving, sharing, or commodity exchange (see [4]), but instead demonstrate characteristics of each. There are a number of dimensions that can be used to classify types of giving, these include agency, structure, ritual and property [5]. These dimensions are considered to varying degrees in much existing research, but often the gift is viewed as a continuous act of reciprocity, whereby the act of giving creates a dialectical chain between dyads. These studies offer limited insight into the digital sphere due to the one-to-many forms of giving made possible by networked technologies (e.g. [6]).

The core research objective is to understand how technology mediates the ambiguities that arise from hybridisation in order to create and perpetuate structured, ritualised behaviour. Specifically, the thesis will answer: how do people use the internet and associated technologies to mediate gift economies? Secondary questions addressed will be: How

do people 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.

The first stage of research followed a form of participant-observational Netnography and depth interviews [7]. Three gift systems were examined for over a year, this included analysing the structural form of each system and how people created, captured, broadcast and disseminated data using the internet. 15 users of three freely accessible systems called Freecycle, Couchsurfing and Landshare were selected through purposive sampling for interviews. Four key themes were identified in the research relating to the clarifying role that technology plays, these included: self-curation, partner selection, property right negotiation, and ritual normalisation.

The second phase of the research has involved a partnership with the website streetbank.com. The research has involved social network analysis to examine the structural relationships that form through gift systems i.e. how economic relationships between people change over time. The key focus is how reciprocity and transitivity emerge in the network, particularly in the context of polyadic indirect reciprocity. Research often relies heavily on theory which emphasises the processual importance of dyadic ties [8], evidence of autotelic polyadic interactions can help to extend economic and anthropological theory alike.



References

1. Mauss, M. (1925/1967) The Gift: Forms and Functions of Exchange in Archaic Societies, ed. Ian Cunnison, New York: Norton.
2. Malinowski, B. (1922/1992), Argonauts of the Western Pacific, London: Routledge & Kegan Paul.
3. Dobscha, S & Arsel, Z (2011) Hybrid Prosocial Exchange Systems: The case of Freecycle". Presented at the ACR's Association of Consumer Research, St. Louis, MO.
4. Belk, R. W. (2010) Sharing, Journal of Consumer Research, Vol. 36, No. 5 (February 2010), pp. 715–734
5. Yan, Y. (2005) 'The gift and gift economy' in Handbook of Economic Anthropology edited by J., G. Carrier
6. Giesler, M. (2006) Consumer Gift Systems, Consumer Research, Vol. 33, No. 2
7. Kozinets, R. V. (2006) Netnography 2.0 - in Handbook of Qualitative Research Methods in Marketing Edited by Russell W. Belk.
8. Sherry, J. F. (1983) Gift Giving in Anthropological Perspective,, The Journal of Consumer Research, Vol.10,No.2

Adrian Hazzard

Influencing the Exploration of Public Spaces via Dynamically Adapting Musical Soundtracks

Music plays a vital role in accompanying all manner of our experiences. Soundtracks within films, performances and ceremonies can enhance a narrative, suggest emotional content and mark transitions, whilst in interactive computer games they drive our behaviours. The spread of mobile music technologies over recent decades, from the Sony Walkman to current smartphones, means that music is also increasingly embedded within peoples' everyday activities [1] and that mobility and locality are common drivers of musical experience [5]. People now routinely select music to accompany physical activities such as jogging or cycling and share music through their favourite locations [6]. Increasingly musicians are seizing on locative technologies as a tool for creating new kinds of musical experiences where location is both a canvas for creation and a platform for presentation [9].

These trends reveal an interesting question of how composers might set about creating musical soundtracks to accompany mobile experiences. What principles might guide them to establish powerful mappings between music and spatial experience that enhance both? There are potentially multifaceted relationships at play here. On one hand a body of research has explored the facility of music to invoke strong emotional responses. At the other, research has shown that the spatial placement of sound can help drive fine-grained navigation [2, 3] and that humans physical actions synchronise in response to musical pulse [7], an effect utilised in sports and exercise routines [4]. This research occupies a place between these two poles: the relationship between musical structure and guided walking. This thesis explores the question of whether the structural elements of music (melody, harmony, rhythm, timbre and dynamics) might guide key aspects of spatial walking, such as cueing users when they are approaching, entering, engaging, departing and transitioning between new spatial regions or points of interest. Guided walking refers to directed walks, tours and even pervasive games. Should this relationship exist, composers would be able to create new soundtracks that gracefully mesh into the fabric of location based walking experiences.

The research methodology applied within this thesis combines a set of complementary approaches that engage with both the creators of, and audience for, locative soundtracks and mobile experiences: a quasi-experimental study to expose how walkers — when free of stimuli other than music — respond to adaptations of the structural elements contained within the music; an in the field study — at a cultural heritage site — that draws on an emerging methodology within Human-Computer Interaction, specifically the 'design from within' investigative design methodology, which involves the practitioner engaging in an extended process of self-reflection, audience interaction and iterative revision as both artist and researcher [8]; and finally workshop(s) that further explore and evaluate the practitioners findings from the perspective of composers and creators of mobile experiences. The output of this research is to propose a set of recommendations to inform the composition of mobile soundtracks.

References

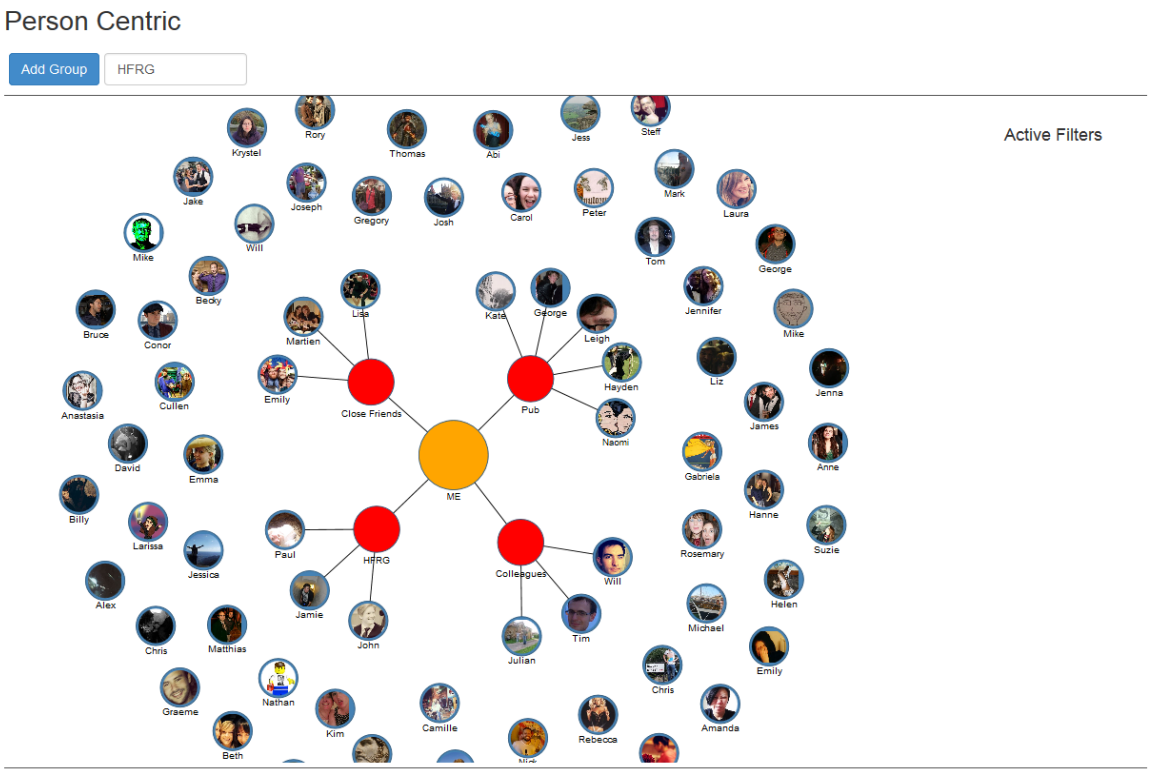
1. Bull, M., Personal stereos and the aural reconfiguration of representational space, in Sally Munt (ed.) TechnoSpaces: inside the new media, London: Continuum, 2001.
2. Etter, R., & Specht, M., Melodious walkabout-implicit navigation with contextualized personal audio contents. In Adjunct proc. of the third international conference on pervasive computing, 191 (204) (2005).
3. Holland, S., Morse, D. R. & Gedenryd, H., AudioGPS: Spatial audio navigation with a minimal attention interface. Personal Ubiquitous Computing, 6 (4) (2002), 253–259.
4. Karageorghis, C. I. & Terry, P. C., The psychological, psychophysical, and ergogenic effects of music in sport: A review and synthesis. In Bateman, A., Bale, J., (Ed(s)), Sporting sounds: Relationships Between Sport and Music, 1 (2008), 13–36.
5. Schematic labs, SoundTracking: Share the soundtrack of your lives. http://soundtrack ingblog.tumblr.com [Accessed 25 Jan 2012].
6. Spotisquare, http://www.spotisquare.com [Accessed 15th January 2012].
7. Styns, F., Van Noorden, L., Moelants, D. and Leman, M., Walking on music. Human Movement Science, 26 (2007), 769–785.
8. Taylor, R., Schofield, G., Shearer, J., Wallace, J., Wright, P., Boulanger, P., & Olivier, P., Designing from within: humanaquarium. CHI 2011, 2011.
9. Tanaka, A., Visceral Mobile Music Systems. In: Adams, R., Gibson, S. and Arisona, S. M. (Eds.), DAW/IF 2006/2007, CCIS 7, pp. 155–170, 2008.

Paul Holmes

Person-Centric Interfaces for Re-finding and Sharing Personal Information

We make strong associative links in our memory between people and the information we receive, generate, and share. However, these associations we make are not often exploited in the presentation nor organisation of information by computers. Using diary studies and mental model elicitation this PhD examines both the types and context of the links we make between people and our personal information, as well as the the forms of links we make between our digital contacts themselves. It then applies this knowledge through prototyping to explore how we might better exploit an understanding of both of these of types of associations for retrieval or sharing of information in interface design.

A screenshot of a prototype for grouping contacts can be seen overleaf.



Prototype for grouping contacts (Paul Holmes)

Annika Hupfeld

Books and E-books as a Social Technology

E-books have seen a significant proliferation over recent years. In the UK, about a third of the population today owns an e-reader with about half either owning an e-reader or tablet. Nevertheless, only about 4% of readers have moved to reading e-books only. These numbers suggest that, while e-books have caught on among a large number of users, they seem to complement rather than replace books. In light of the significance of books to past and contemporary cultures and societies it is little surprising that the emergence of e-reading technologies has sparked a plethora of writing on the topic, particularly in journalism and the humanities.

With a common focus on the relative merits of books and e-books, and ultimately, their respective futures (some writers go as far as either mourning or celebrating the death of the book), the debate largely suffers from a technological determinist stance, neglecting the role of social practice as a driving force in technology adoption and use. Regardless, the sheer volume of the discourse suggests that something important is at stake in the move from analogue to digital reading technologies and that books continue to be valued as physical artefacts in the digital age, if not with more fervour than ever. What is surprising then is the lack of empirical research aiming to understand how books and e-books are used and valued in everyday life.

Existing work in the area is almost exclusively concerned with practices of reading, with a particular emphasis on reading in academic

and professional environments, thereby not only disregarding the social and material nature of reading, but also the rich life of the books beyond its role as a reading technology.

The aim of this thesis then is to provide an understanding of the practices and values surrounding books and e-books in everyday life. Based on this understanding, it further aims to explore alternatives to the current e-reading ecosystem through designs that are sensitive to the some of the broader values people associate with books and e-books. To do so, it takes a situated approach to studying books and e-books as they are used over the course of their lifecycle inside and outside the home. Through a combination of a series of in-depth interviews, guided 'home tours', and participant diaries, context-rich data on people's uses of and orientations towards books and e-books is gathered. Subsequently, design responses are iteratively developed before being deployed to potential users for evaluation over the course of several weeks.

The contribution of this thesis is threefold:

1. The documentation of the socially and materially situated practices and values associated with books and e-books inside and outside the home
2. An explication of the ways in which personal and social goals are actualised through the use of books and e-books
3. The development and evaluation of a series of design exemplars in support of these goals.

Mark Peter Iliffe

Towards Improving Volunteered Geographic Information Quality In Developing Countries

This thesis takes a multidisciplinary approach to understanding the characteristics, quality and production of Community Mapping and Volunteered Geographic Information (VGI) in developing countries. While a good understanding exists on the nature of the characteristics, quality and production in developed countries there is little covering developing countries. This thesis reviews the state of the art and theoretical approaches in Geography, Human Factors and Geographic Information Science. Research methods of Human Factors, specifically Cognitive Work Analysis and geospatial quality assessment are also discussed.

Through a mixed methods approach, a typification of the emergent phenomenon of Community Mapping is examined, it being a subset of VGI. Consequently examining both the quality of data produced and its mode of production, cognitive work analysis is used as a tool to typify and examine community mapping and provide insights into various components of quality. This framework of a CWA for Community Mapping was tested during a study focusing on an area of Tandale, Dar Es Salaam, the outputs of which showed a vast gain in the quality of thematic geospatial quality, at the expense of topological quality. From this a case study on the development and deployment of 'Taarifa' tool to support community engagement and drive public service delivery in developing countries. Finally a case study on how the characteristics of Community Mapping should be considered in the use and reuse of spatial data by its

integration into Spatial Data Infrastructures (SDI).

By discussing the results and conclusions of these studies, this thesis provides an agenda for understanding geospatial quality in developing countries; specifically informal urban areas known by their more colloquial moniker of ‘slums’. By involving the community in data production and decision making it adheres to the principles and ethic of CWA of respectful, user centric design, in assessing the quality of the data produced and the needs of community members around tools we create design guidelines for the development of future tools.

In conclusion, specific contributions and avenues for further work are highlighted as well as pathways forward for the software and communities nurtured as part of this thesis.

Lorena Gabriela Macnaughtan

Collaborative Digital Healthcare Technologies: Raising (Un)Certainties

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 of three collaborative digital healthcare technology (CDHT) producers, the research aims to understand how these firms navigate varied ambiguities of a nascent fragmented field.

CDHTs are intended to support peoples 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.

This research takes a “problem driven approach” [1] and aims to contribute to a developing strand of work that combines institutional theories with strategy topics. The goal is to understand how CHDT 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 organisational boundaries in an emerging, institutionally complex environment? and What types of boundaries are dominant in such an environment?

Parallel to calls for research with more synergistic approaches to boundaries in social sciences, Santos and Eisenhardt [1, 2] call for research that goes 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 organisational level. Several studies [2, 3, 4] showed that the digital economic landscape needs to be explored through meta-theoretical approaches in order to be better understood and to bring practical and theoretical insights.

A multi-case study approach employs the logic of inductive inquiry suitable for investigating phenomena that are relatively poorly understood [5]. 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 [5]. 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 [2, 3, 5], at case level and across cases.

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. At the time of writing, the researcher is preparing for ethical approval submission and organisation recruiting.

Hospitals develop contagious apetite for dedicated mobile apps [6]

References

1. F. M. Santos and K. M. Eisenhardt. Organisational Boundaries and Theories of Organisation. Organisation Science, 2005, 16 (5), 491–508.
2. F. M. Santos and K. M. Eisenhardt. Constructing markets and shaping boundaries: Entrepreneurial power in nascent fields. Academy of Management Journal, 2009, 52(4), 643–671.
3. V. Rindova and S. Kotha. Continuous morphing: Competing through dynamic capabilities, form, and function. Academy of Management Journal, 2001, 44(6), 1263–1280.
4. Z. Zong and B. Demil. Boundaries creation in emerging activities: a first step in the categorization process of a sector. DRUID 2012, Copenhagen, Denmark, 2012, available at: http://druid8.sit.aau.dk/acc_papers/hjjx3rs19plgnmvfcupou1uvmhbl.pdf. Accessed 25 October 2012.

5. K. M. Eisenhardt and M. E. Graebner. Theory Building from Cases: Opportunities and challenges. Academy of Management Journal, 2007, 50 (1), 25–32.

6. M. Essany.mHealth: Hospitals Develop Contagious Appetite for Dedicated Mobile Apps.MobileMarketingWatch, 2013, available at: http://www.mobilemarketingwatch.com/mhealth-hospitals-develop-contagious-appetite-for-dedicated-mobile-apps-14600/. Accessed 25 Feruary 2013.

Tim Pearce

Search Behaviour and Strategies in User Generated Content Production Interfaces.

The increase in adoption of smartphones over recent years has meant that more people have the ability to capture events in their lives in video and upload them to the web, creating an explosion in the amount of event footage available online. This research has been inspired by this growth and the increasing use of User Generated Video Content (UGVC) by professional news organisations when compiling footage of breaking news events. Previous research [1, 2, 3] has identified the new tasks and roles that have been introduced to cope with user generated content as a supplementary source of news material, which is of varying quality, relevance and trustworthiness. Newsgathering with User Generated Content involves reconstruction of the reliable journalistic metadata (what, when, where, who, why and how?) that has been lost as a result of using material from citizen journalists over traditional correspondents. Mobile capture devices such as smartphones possess the sensors to extract this key contextual information, although standards for such video metadata have not widely been adopted. Previous research [4, 5, 6] has looked at ways of combining UGVC from events either by using audiovisual analysis or spatiotemporal metadata to cluster and order clips, providing some automation to the video editing process.

This research will focus on user interaction behaviour in the first cycle of the iterative process video post-production [7], the initial sift through the raw footage of the event. A new mobile application has been developed to increase the amount of metadata recorded at the point of capture, recording the location, time and orientation of the phone to determine a rough contextual geospatial footprint. The application has been used by participants at two local events to build a corpus of metadata and video. An online tool has been developed to visualise and explore the corpus of video from a given event geo-spatially, with the hypothesis that this will improve the efficiency of user exploration of the dataset. Through conducting a number of studies in which participants' interaction with the system were logged, identification of search strategies and behaviour can be identified in the presence and absence of such metadata. Drawing from informational retrieval literature, the process of video selection can be identified as an exploratory search [8], in which there is unfamiliarity with the content and a stage of interpreting it before reaching the task goal. The research will draw from Pirolli's work of applying Information Foraging Theory [9] to search behaviour on the world wide web. The research will develop an improved understanding of such behaviour and help inform design of systems that interact with videos enriched with metadata from mobile

device sensors.

References

1. Wardle, C. and Williams, A. Beyond user-generated content: a production study examining the ways in which UGC is used at the BBC. Media, Culture & Society 32, 5 (2010), 781–799.
2. Wahl-Jorgensen, K., Williams, A.J., and Wardle, C. UGC @ the BBC: audience revolution or business as usual? Journalism Practice 5, 1 (2009), 1–15.
3. Murray, A. BBC - Blogs - College of Journalism - BBC processes for verifying social media content. 18/5/11, 2011. http://www.bbc.co.uk/blogs/blogcollegeofjournalism/posts/bbcsms_bbc_procedures_for_veri.
4. Sundaram, H. and Campbell, M. Event Mining in Multimedia Streams. Proceedings of the IEEE 96, 4 (2008), 623–647.
5. Shrestha, P., Barbieri, M., Weda, H., and Sekulovski, D. Synchronization of Multiple Camera Videos Using Audio-Visual Features. IEEE Transactions on Multimedia 12, 1 (2010), 79–92.
6. Kennedy, L. and Naaman, M. Less talk, more rock. Proceedings of the 18th international conference on World wide web - WWW '09, ACM Press (2009), 311.4.
7. Rabiger, M. Directing the Documentary. Focal Press, 2009.
8. Marchionini, G. Exploratory search. Communications of the ACM 49, 4 (2006), 41.
9. Card, S. and Pirolli, P. Information foraging. Psychological Review 106, 1999, 643–675.

Abdur Rahman

The Influence Of Social Identity When Sharing Location

Overview

Identity is comprised of both a personal internal identity and a public social identity [1]. Further, social identity is not singular but rather multi-faceted [2]. In social situations, people project different aspects of their identity for others to perceive. For example, a person's behaviour in social, work and family contexts can vary significantly. Consequently, their sharing needs when performing each of these 'facets' will also differ. Conventional social media fails to recognise this phenomenon and assumes that users have a singular identity that fits all situations. This approach can have serious repercussions because content deemed appropriate in one context may be entirely inappropriate in another. Location-sharing software can exacerbate this problem because users are not only sharing social information, but also physical location.

The primary objective of this PhD is to develop a deeper understanding of how social-identity is manifested in location-sharing software. By doing so, the aim is to inform the design of future location-sharing systems.

PhD Studies conducted so far

A 5 page online survey was distributed to users of location-sharing software. The survey comprised of both open and closed questions and was completed by 189 respondents. It was found that users actively shared different locations to project different parts of their identity. Social identity was conveyed

through moods, activities, stories and overall experiences. They also acted as prompts to share location in the first place. Participants also engaged in 'impression management'. This was particularly the case with extraverted users. When managing facets of identity, there were anxieties about location being misinterpreted. Users employed customised techniques to avoid conflicts of identity. This included screening their content, being tentative about who to befriend and even using different software platforms for each facet i.e. social v professional.

Drawing upon these findings, an experimental study was conducted to assess the impact of designing location-sharing software around facets of identity. The study was comparative in nature, with two location-sharing apps being designed. In the first app, named 'Locshare', users shared to a generic 'friends' list as is the case with most location-sharing platforms. In the second app named 'FacetID', sharing was organised around three main 'life modes' namely social, professional, and family. The study lasted a total of 14 days.

Statistical analysis revealed that users shared more locations overall with the FacetID app as well as more social locations. These differences were found to be statistically significant. Post-study interviews showed that users generally felt more restricted when using the Locshare app and sharing to a general (mixed) audience. They found it difficult to share to everyone simultaneously and felt they had to 'tone down' their language and behave respectfully in every context. In contrast, when using the FacetID app, participants generally felt more comfortable. Sharing required less thought because they could be more open and intimate. They felt that they could behave 'how they were normally' and convey their 'true self', rather than having to adapt their personality to suit the audience.

References

1. Boyd, D. (2002) FACETED ID/ENTITY: Managing Representation In a Digital world. Science, A B Computer, Theses.
2. Farnham, S. D., Churchill, E. F. (2011). Faceted Identity, Faceted Lives: Social and Technical Issues with Being Yourself Online. Information Systems, 359-368.

Julian Rosser

Constraint-based Modelling of Building Interiors

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 and the increasing availability of sensors and methods for data capture, generating accurate as-built models of building interiors remains a challenging task. Different methods of data capture offer varying levels of precision and accuracy and result in a high likelihood of data conflicts and deficiencies when surveying indoor spaces. A need has been identified in how interior measurements may be integrated, inferred and refined to provide optimal models of indoor residential spaces.

This thesis considers the use of constraint-based modelling for improving building measurements to form the "best"

representation of interior geometry given imprecise or sparse data. We exploit existing knowledge of the building within a stochastic optimisation model. The model exploits high accuracy, external geospatial data in the form of the building's footprint, such as can be found in large-scale topographic mapping. In addition, we exploit knowledge of the topology of the space (connectivity of rooms and adjacency of walls) and likely wall thickness. Use of both external data and knowledge of a building's construction enables generation of geometrically valid and interoperable semantic building models.

In the first part of the thesis we demonstrate use of constraint-based modelling for the generation of residential building models from imprecise data captured with a smart-phone measurement application. In the second part of the thesis we consider a data-driven approach to predict the likely composition of a building layout and infer missing internal measurements. We describe a probabilistic model that encodes room measurements learned from a corpus of real-world building plans. All methods presented in this thesis are aimed at providing a semi-automatic, end-to-end system for indoor modelling. Quantitative evaluation of the improvements in positional accuracy arising from using the proposed constraint-based optimisation model is provided.

Jianhua Shao

The Valuation of Personal Data

It is commonly agreed that personal data is generally valuable in both academia and industry, however a less explored area is how personal data can both benefit and cost the providers and consumers of it. Many modern businesses, especially on the Internet, rely heavily on personal data in their business model, and the data their services are based around becomes an important asset, even in their IPO (like Facebook, Twitter, etc.). Although normal users (acting as data providers) are aware that their data is valuable, they feel powerless to capitalise on this because although individual benefits are very tiny at moment, it may be the case that a combination of such benefits may be more valuable. To investigate this, my PhD studies data consumers and data providers, and how the value of personal data can be increased and maintained. The PhD will contribute to the knowledge in the area of the valuation of personal data.

My major case study is on Android app markets, specifically the Google Play Store and Amazon App Store. There has been some data collected regarding how applications demand user data. The data spans from the very beginning of the app markets to present day, and so can provide a good overview of how the markets have changed. Apps have to request permission on Android devices in order to consume user data, and as our focus is on user data, we have been particularly collecting information about the permissions that each app uses. This data is collected over time, recording the way that permission usage has changed. Along with this, user reviews have been collected to benchmark consumer sentiment towards apps' changing permission requirements.

My findings include that user data is commonly demanded and consumed by app providers, and they in turn profit heavily on the data through various business models (for example the "freemium" business model). However, a majority of users cannot determine the real

value of their data, and therefore have less ability to control the use of their personal data in order to gain maximum benefit.

I have also found that user data is not only of benefit to data providers (users) and consumers (app developers), but also to the markets (app market platform owners). Platform owners want app developers to innovate on apps, and by doing so attract more users to join the platform. However, it is difficult for platform owners to examine each app to avoid unexpected user experiences which may deter potential customers. The solution would be letting users influence the app developers by indicating popular apps to the market platform so that they may be featured or promoted in some way. Apps with more promotion attract more users, who in turn contribute to the profits of both the app developers and market platform owners. This would create an environment that rewards and promotes good apps and reduces the need for market platform owners to inspect every app, because a social standard is set in place by the popular apps that the other developers can aspire to.

Mercedes Torres

Automatic Phase 1 Habitat Classification Using Ground-Taken Imagery

Habitat classification is an essential ecological activity for structuring knowledge and developing our understanding of the natural world. Currently, most successful methods employ human surveyors – a laborious, expensive and subjective process [2]. While approaches have been developed with the aim of automating the habitat classification process [1], 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 or satellite imagery. Given the level of detail that is necessary to distinguish between some of the habitats categorised in the Phase 1 Habitat Survey scheme, both aerial and satellite imagery have been proven to be insufficient [6].

An alternative source of information that has obtained promising results is ground-taken imagery [4]. Geo-referenced ground-taken photographs present two main advantages over aerial and satellite imagery. Firstly, ground-taken photography has a greater degree of detail. For fine-grained visual categorisation problems, such as habitat classification, this is a decisive trait, since details will be crucial to differentiate between similar habitat classes. Secondly, they can be obtained more easily than aerial and satellite imagery, since the only equipment necessary is a digital camera.

We have collected and annotated an image database, referred to Habitat 3K, with over 3000 geo-referenced ground-taken photographs from all over the UK. Moreover, Habitat 3K has over 11300 habitat instances from eight Phase 1 habitat classes: Woodland and scrub, Grassland and marsh, Tall herb and fern, Heathland, Open Water, Coastland, Natural Exposures and Miscellaneous. This is the first publicly available image database specifically designed for the development of multimedia analysis techniques for ecological applications.

We formulate habitat classification as a fine-grained visual categorisation problem and propose an image-annotation framework that uses geo-referenced ground-taken

photographs [3]. Our framework uses a novel automatic random-forest-based method, called random-projection forests, and takes into consideration low-level visual features, medium-level features and geographical location in the classification process. During training, low-level visual information and medium-level contextual information is extracted. Visual features include Coloured Pattern Appearance Model (CPAM) [5], Geometric Blur (GB), Global Image Descriptor (GIST), Pyramid Histogram of Oriented Gradients (PHOG), Scale-invariant Feature Transform (SIFT), Pyramid Histogram of Visual Words (PHOW) and Self-similarity Feature (SSIM) [7]. To extract contextual information, we follow a human-in-the-loop methodology. Human-the-loop is an interactive, hybrid human-computer method for object classification in which non-expert users answer a series of questions about the photographs used in the training set. We propose a set of thirty object-oriented questions aimed to be answered by non-ecologists. During testing, and considering that close regions have similar ecological properties, we weight the influence of the prediction of each tree in the forest according to their geographical distance to the unseen test photography.

We show experimental recall and precision results which illustrate that our image-annotation framework is able to annotate with a reasonable degree of confidence six of the main habitat classes: Woodland and Scrub, Grassland and Marsh, Tall herb and fern, Heathland, Coastland and Miscellaneous.

References

1. JNCC, (2010), Handbook for Phase 1 habitat survey - a technique for environmental audit.
2. Diaz-Varela, R.A., Ramil Rego, P., Iglesias, S.C., Muoz Sobrino, C., 2008. Automatic habitat classification methods based on satellite images: A practical assessment in the NW Iberia coastal mountains. Environmental Monitoring and Assessment, 144 (1-3), pp. 229–250.
3. Torres, M., Qiu, G., 2013. Automatic Habitat Classification using Image Analysis and Random Forest, Ecological Informatics. Available online 2 September 2013.
4. Torres, M., Qiu, G., 2013. Habitat classification using random forest based image annotation, IEEE International Conference on Image Processing (ICIP2013), September 15–18, Melbourne, Australia.
5. Torres, M., Qiu, G., 2012. Grass, scrub, trees and random forest, Proceedings of the 1st ACM International Workshop on Multimedia Analysis for Ecological Data, November 02–02, 2012, Nara, Japan
6. Torres, M., 2012. Automatic habitat classification using aerial imagery, GIS Research UK 20th Annual Conference (GISRUK 2012), 11 – 13 Apr 2012, Lancaster University, Lancaster, UK
7. Vedaldi, A., Gulshan, V., Varma, M., Zisserman, A., 2009. Multiple kernels for object detection. In Proceedings of the International Conference on Computer Vision (ICCV 2009).

Min Zhang

Exploring User Visual Query Expression: A Case Study of Search Painting by Drawing on Touch-screen Mobile Devices

The keyword query is usually ambiguous and thus cannot reflect users' search intents precisely, especially when the expected image is hard to describe using text. As a compensation, there are a significant number of studies on Content-based Image Retrieval (CBIR). However, reading through existing literature, the majority of computer vision researchers focus on the accuracy and efficiency of the visual retrieval algorithms. Little evidence had been found to support the usability of visual query expression tools from users' perspectives [1], especially for the free-hand drawing tools.

Using painting search as a case study, this PhD work explored the research questions "How to enable users to better express their search intents by drawing on the touch-screen mobile devices?" and "If people could draw from memory as visual query input?". The drawing-to-search mobile Apps were designed and implemented on Android Mobile phone and three user trials were designed to explore which drawing tool(s) works best for painting search by drawing colour patches:

- In the first study, four colour palettes including two discrete colour palettes with 256 colours and two continuous colour palettes were built into three systems on Android mobile phone. 37 participants conducted the task of producing drawings of a selected portrait painting as input to search. Based on the analyses of the recorded and observed user behaviour, we found that most participants preferred the colour palette with full-colour choices and they got the best retrieval performance by using the continuous colour palette.
- In the second study, we conducted a longitudinal study to test users' visual memory of both portrait paintings and landscape paintings. 18 participants took part in three memory study sessions: 15 minutes test after 30 seconds viewing paintings; 1 week delay free-recall test after 3 minutes viewing; and 1 month delay free-recall test after 3 minutes studying paintings. The results indicated that most participants could draw the painting out from their memories as visual query input.
- In the third study, the pure colour brush and the pattern brush were compared by 26 participants (at the time of writing). The motivation behind this study is to collect and analyse empirical data on the use of brush of search-by-drawing system.

The contributions of this PhD work include:

1. Build the search-by-drawing system that enable the general public without professional drawing skills to draw-and-search on the touch-screen mobile phone
2. Compare four different colour palettes on mobile phone by analysing users' qualitative opinions and quantitative search results
3. Conclude that the majority of participants could draw from their visual memories
4. Explore whether the brush with texture work better than the plain brush
5. identify the improvements based on the use of current system and propose the potential prototype that would facilitate real-world users in the future.

References

1. C. C. Venters, R. Hartley, et al. Query by Visual Example: Assessing the Usability of Content-Based Image Retrieval System User Interfaces. Second IEEE Pacific-Rim Conference on Multimedia, 2001.

Cohort 2011

The Horizon CDT 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
Jacob Chapman
psxjc5@nottingham.ac.uk
John Cunneen
psxjc6@nottingham.ac.uk
Lesley Fosh
psxlf@nottingham.ac.uk
David Hand
psxdh1@nottingham.ac.uk
Chrisminder Hare
psxch1@nottingham.ac.uk
Michaela Hoare
psxmh3@nottingham.ac.uk
Laura Kinley
psxlk@nottingham.ac.uk
Martin Kruusimgi
psxmk2@nottingham.ac.uk
Claire Murphy
lpxcm6@nottingham.ac.uk
Daniel Ratzinger
psxdr1@nottingham.ac.uk
James Sprinks
psxjs6@nottingham.ac.uk
Matthew Terrell
psxmt4@nottingham.ac.uk

Paul Brindley

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. 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 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 potentially 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 has constructed 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.

Methods have also been developed in order to extract the terms in which people may be referring to the areas – are they being called 'neighbourhoods', 'suburbs', 'part of the city' or something else? Such an approach is also useful in order to construct probabilistic settlement classifications (for example 50% of data extracted from the internet call this settlement a large rural village; 30% a former mining village; 20% a small market town). Census data and twitter data are being tied to the neighbourhood areas as examples of potential data aggregations. The twitter data will explore semantic differences in tweets about places compared to tweets from the same named place.

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

Expected Contribution to the Field

This body of work has the potential to revise the way in which we map our urban areas.

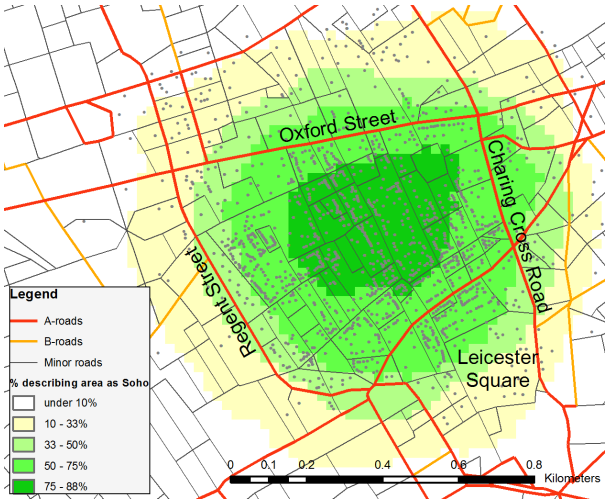
Wilson [12] argues that the geography of neighbourhoods provide a framework within which to observe and analyse social problems within society. Thus, they become units of analysis that are relevant to everyday life and more interpretable for the general public. Imagine data delivery systems that could 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 neighbourhood planning, Police intelligence, health effects, and social housing preference for tenants. The work would also contribute to semantic interoperability concerning vernacular neighbourhoods.

Progress to Date

Data collection for three case areas are almost complete – with information for Sheffield, Nottingham and the London districts of Westminster and Camden having been collected. Methods and coding have been implemented to collect the necessary data and extract neighbourhood names (including issues such as spelling). An example output map for Soho, London can be found in the included figure. Data analysis for the level of competing / differing views has been undertaken. Validation with existing gazetteers is complete for Sheffield but ongoing for the other areas.

The next few months will see repeat data collection for Sheffield – 18 months after the first trawl, in order to investigate if any potential change in neighbourhoods is identifiable. Data analysis and validation will continue up to Jan. 2015. This will allow for an ensuing writing up period with anticipated submission occurring Sept. 2015. Conference presentations will be given at GISRUK at Easter 2014 (accepted) and Sigspatial (summer 2014) and with subsequent journal publications.



References

1. Bentley, F., Cramer, H., Hamilton, W., Basapur, S. (2012) Drawing the city: differing perceptions of the urban environment. Presentation at CHI 2012, May 9th 2012.

2. De Certeau, M. (2000) The Everyday Practice of Life. University of California Press: Los Angeles.

3. Flemmings, R. (2010) Revealing the Fuzzy Geography of an Urban Locality. GISRUK 2010 Proceedings, pp 345–351.

4. Jones, C.B., Purves, R.S., Clough, P.D. and Joho, H. (2008) Modelling vague places with knowledge from the web. International Journal of Geographical Information Science 22 (10): 1045–1065.

5. Lynch, K. (1960). The Image of the City. The M.I.T. Press: Boston.

6. Montello, D.R., Goodchild, M.F., Gottsegen, J. And Fohl, P. (2003) Where's downtown? Behavioural methods for determining referents of vague spatial queries. Spatial Cognition and Computing 3: 185–204.

7. Pickles (2010) Eric Pickles' speech to the Local Government Association annual conference - 7 July 2010.

8. Purves R.S., Clough P., Jones C.B., Arampatzis A., Bucher B., Finch D., Fu G., Joho H., Khirini A.S., Vaid S., and Yang, B. (2007), The Design and Implementation of SPIRIT: a Spatially-Aware Search Engine for Information Retrieval on the Internet, International Journal Geographic Information Systems 21(7): 717–745.

9. Rosser, J. and Morley, J. (2010) Rate my place: a social network application for crowdsourcing vernacular geographic areas. GISRUK '10. University College London, U.K.

10. Twaroch, F., Jones, C.B. and Abdelmoty, A.I. (2009) Acquisition of vernacular place names from web sources in R. Baeza-Yates and I. King (eds) Weaving services and people on the world-wide-web. Springer: Berlin.

11. Twaroch, F. A., Purves, R. S., & Jones, C. B. (2009). Stability of Qualitative Spatial Relations between Vernacular Regions Mined from Web Data. Proceedings of Workshop on Geographic Information on the Internet, Toulouse, France, April 6th, 2009.

12. Wilson, R, E. (2009) 'Why neighbourhoods matter: the importance of geographic composition', Geography and Public Safety 2 (2): 1–2.

Jacob Chapman

Coupling Multi-Agent Stochastic Simulation of Occupants With Building Simulation

Deviations between the predicted and simulated performance of buildings have lead to the development of models addressing the stochastic nature of occupants behaviours: their presence, activities whilst present, activity-dependent behaviours and the consequent implications for their perceived comfort – see Robinson et al [1] for a review of progress.

To capitalise on the value of these models they should be integrated with building performance simulation software, such as EnergyPlus or ESP-r. Achieving this in a coherent and generalised way is important if these models are to gain widespread use in an industry which continues to use outdated methods to support building design.

But we are not starting from scratch here. Several attempts have been employed in the past to integrate behavioural models with building performance simulation software. These range from hard coded integration in the case of lighting behaviour models in Reinhart's [2] lightswitch2002 algorithm and Haldi and Robinson's [3] integration of window and blind models into CitySim, to Bourgeois et al's [4] integration of lighting and blind models with ESP-r via their SHOCC platform. Although these efforts have usefully demonstrated the impact of stochastic behaviours (and models of them) on building performance, they lack generality. The approaches adopted are software specific and do not support more complex features such as: the definition of archetypes and archetypal behaviours,

interactions between members of a population and behaviours that are conditional on other behaviours having already been exercised or indeed on proximity of the member of the population to the behavioural mechanism (e.g. the window).

With the objective of addressing these and other issues our approach is to use Multi-agent simulation (MAS); to combine stochastic models into a single package that can be used to support building performance simulation using a range of software. Multi-agent simulation is a tool that has developed in the social sciences field to effectively model human interaction [5, 6]. Agents are implemented as objects in software, each agent has rules and behaviours making them excellent at modelling group and individual interactions [7].

Agent based simulation in the social sciences has typically been used to study behaviours that emerge from bottom up interactions, allowing the creator to make judgements to what has caused them. It is important that the results have a high degree of certainty and therefore that agents' rules and behaviours are grounded with data based on reality [8]. In recent years there has thus been a move from models based on social theoretical rules and behaviours, to those derived from observation [9]. By using stochastic models of occupant behaviour previously developed it is possible to predict agent behaviours based on solid empirical evidence.

To this end, models of occupants' activities [10], metabolic heat gains, use of windows [11] and shading devices [12] have been integrated within a bespoke MAS framework that parses agents' characteristics to the EnergyPlus simulation program, which in turn parses environmental parameters to our MAS platform, to impact on future behaviours. We describe this new framework (from population generation, through parameter assignment to simulation (pre and runtime)), demonstrate its utility through a case study of a residential building and discuss modelling capabilities that will be integrated in the future.

Combining Agents with Building Performance Simulation

Our evolving MAS platform is coded in C++ and is currently designed to interface with EnergyPlus, as its source code is freely available and it is comprehensively documented. EnergyPlus has been developed to allow for coupling with other software to extend its functionality.

In our case this means that we do not need to modify the source code directly. Instead we simply override its ability to interface with the building control virtual test bed (BCVTB). This allows our agent platform to define input/output variable schedules via the EnergyPlus configuration files. Environmental conditions are retrieved where needed, as inputs, for the prediction of actions an agent may perform. The consequences of these actions are then set back in EnergyPlus at the end of the time step.

The MAS platform follows the process in the image. First an agent population is produced, at present our agents are assumed for simplicity to be adults that act independently, but whose activity choices may be influenced by household composition in the case of homes (e.g. couples may have different activity profiles than single adults living alone). A number of pre-processes are then executed. For residential buildings we model the activities that an agent may perform at each timestep and the locations they perform them in. These

are stored for later use. In the case of non residential buildings, a separate presence model is used to calculate if an agent is present or not at each time step. Once complete EnergyPlus is called to simulate the building's energy flows. At the end of each timestep, our MAS platform is called using the modified BCVTB interface. This parses the environmental conditions that are needed to predict our agents' behaviours. Each agent is called independently. For residential buildings they retrieve the pre-processed state and activity for the present timestep and use these to set their location and to calculate their metabolic gains. In non residential buildings only the pre-processed presence is retrieved to calculate metabolic gains. Next our agents' interactions with shading, windows and lighting are predicted. The outputs from all models are then parsed back to EnergyPlus, which resolves the energy consequences of these interactions, when simulating the building's energy flows during the next time step. This process continues until the end of the simulation time.

Future Work

Our immediate next steps are to consolidate the existing modelling capability. First, the activity model should be adapted to support the modelling of a wider range of subpopulations and procedures to assign the relevant archetypal household composition; perhaps based on economic factors such as job, education level and salary earned. These are likely to change the agents' activity profiles and associated behaviours. On a related note, the ePad group at Nottingham is currently developing models of electrical appliance ownership and usage (the former also depending upon household composition and related economic factors). This model will enable us to more faithfully predict electrical energy demands and the corresponding implications on heating and cooling demands.

With the basic energy modelling capability complete, we will proceed to acquire data on residential energy use, to compare predicted with observed energy performance. We will also conduct a comprehensive analysis of the sensitivity of predicted outcomes of changes to model parameters and uncertainties in the inputs to them. Looking further to the future, we will integrate procedures to represent interactions between agents and responses to stimuli destined to bring about behavioural change; in particular with respect to more frugal energy usage.

References

1. D. Robinson and F. Haldi, "Modelling Occupants' Presence and Behaviour–Part I," J. Build. Perform. Simul., pp. 3–5, 2011.
2. C. Reinhart, "Lightswitch-2002: a model for manual and automated control of electric lighting and blinds," Sol. Energy, no. 1, pp. 15–28, 2004.
3. F. Haldi and D. Robinson, "Modelling occupants' personal characteristics for thermal comfort prediction.," Int. J. Biometeorol., vol. 55, no. 5, pp. 681–94, Sep. 2011.
4. D. Bourgeois, C. Reinhart, and I. Macdonald, "Adding advanced behavioural models in whole building energy simulation: A study on the total energy impact of manual and automated lighting control," Energy Build., vol. 38, no. 7, pp. 814–823, Jul. 2006.
5. E. Bonabeau, "Agent-based modeling: methods and techniques for simulating

human systems.," Proc. Natl. Acad. Sci. U. S. A., vol. 99 Suppl 3, pp. 7280–7, May 2002.

6. T. Zhang, P.-O. Siebers, and U. Aickelin, "Modelling electricity consumption in office buildings: An agent based approach," Energy Build., vol. 43, no. 10, pp. 2882–2892, Oct. 2011.
7. R. Axtell, "Why agents?: on the varied motivations for agent computing in the social sciences," no. 17, 2000.
8. H. R. Gimblett, Integrating geographic information systems and agent-based modeling techniques for simulating social and ecological processes. Oxford University Press, 2002, p. 327.
9. M. Janssen and E. Ostrom, "Empirically based, agent-based models," Ecol. Soc., vol. 11, no. 2, 2006.
10. S. Jaboob and D. Robinson, "Modelling occupants' activities based on UK time use survey data," 2014.
11. F. Haldi and D. Robinson, "Interactions with window openings by office occupants," Build. Environ., vol. 44, no. 12, pp. 2378–2395, Dec. 2009.
12. F. Haldi and D. Robinson, "Adaptive actions on shading devices in response to local visual stimuli," J. Build. Perform. Simul., vol. 3, no. 2, pp. 135–153, Jun. 2010.

John Cunneen

How Has Ubiquitous Computing Changed the Organisation of UK Policing?

Abstract

"Consider now the police. On the one hand, they function as they have for some 177 years: they stand poised, ready to react to the emergent, the unexpected, and the unpredictable, that which cannot be fully anticipated, prevented, nor planned for in detail. On the other hand, they are being dragged into the information age, an age that imagines the future prior to executing it." [1].

The study will investigate how communication technology 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 and communicative change and development over time. The research process that will be used for the study is the case study method [2]. The case studies will therefore constitute a theoretical sample of the use of technology in police organisations. This will enable an increased understanding of both historic and contemporary applications and implications of technology and communication within the police service. The case studies have been selected to examine the different interactions between technology and organisations at different historical periods. As such, the communication processes can therefore be revealed at a more fundamental level, the challenges of integrating new technologies within the organisational and societal mission of policing in the United Kingdom that is

distinct to other national jurisdictions. It is envisioned that as the thesis progresses, that this largely historical approach will be expanded by conducting interviews with retired and serving police officers who have witnessed the different technological transitions over time and can thus add a rather unique and important contribution of knowledge based upon their personal experience within the organisation of policing. The final thesis will 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. The study will also enable an increased understanding of both historic and contemporary applications and implications of applying communication technology within the police service.

Keywords

ICTs, Communication, Organisation, Police, Criminal Justice Service, Digital Economy.

Disciplines

Computer Science, Human Factors, Criminology and Sociology. The project is supervised by a multi-disciplinary team from Human Factors, Horizon Research Institute and 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. A historical approach is required as the study shall be looking at technological change and development over time and what has gone before. In answering the main research question will enable the following aims to be achieved:

- To develop a greater understanding of both historic and future applications and implications of communicative technology and computing within the police service.
- 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.
- To develop an increased understanding of the behaviours, strategies, attitudes and adoption of communicative technology within the police service.
- To enable an increased understanding between technology and the police organisation that will potentially enable better protocols for procurement, design and deployment.

Background and Key Literature

Manning [1] in his research into the technology of policing states that there have been few studies that have been conducted in police settings that examine the technological and communicative usability features of technology for police officers. He describes that this is possibly due to the fact that the police as an organisation do not tend to disclose their activities publicly and thus research within this area has been restricted. As a result, police officers adoption of information technology is therefore not well identified and studied. In addition, he states that “technological innovations occur as a result of demands and needs based on measured results, systematic feedbacks, and rational evaluations, but there is also a need to understand usability of these innovations systematically.” Weatheritt [3]

supports these accessions and states that “the technological innovations in the police have been marked by a lack of rigorous scientific research, which has resulted in the repetition of mistakes and the turnarounds exhibited over the last 30 years. Poor quality research and planning in the police is one thing, and the police are not uniquely guilty of this, but it must be remembered that poor planning or poor research is often the outcome of the fact that as far as the police are concerned, much of the impetus behind the adoption of innovations, including IT, is politically motivated in a number of ways.”

In contrast, Yates and Van Maanen [4] argue that technology has revolutionised police practice and brought about dramatic changes in the organisation of police work and new public expectations of police services. As a consequence, there is now a growing body of research on technology based organisational change and the impact of information technology on police practice. As Manning [1] points out “research on technology has focused narrowly on the managerial potential of the systems rather than on employee morale or performance, control or management of crime, or delivery of enhanced services that improve the quality of community life and citizens satisfaction with policing.” Therefore, understanding more broadly the reasons why individuals accept or reject the information technology appears to be one of the most demanding issues currently facing researchers according to Premkumar and Bhattacherjee [5].

Holgersson and Gottschalk [6] describe the police service as an organisation that receives a large amount of information during the activities of its daily operation that is both overwhelming and underutilised. The police use information technology at all stages, such as directing the allocation of resources, patrolling, crime prevention, crime tracking, the apprehension of criminals, and crime solving. Therefore, Colvina and Goh [7] state that “knowing the factors that influence the police officers adoption of ICTs, identifies and predicts how technology contributes to police organisations social organisation of policing in terms of effectiveness and efficiency.”

Moreover, Chan [8] states that “information technology has contributed to policing by enabling the sharing of more information among officers, creating officer accountability, improving communication, providing co-operation, and creating positive work environments.” Therefore, if both the number of police officers using information technology in police organisations and the amount of investment for the establishment and development of this technology are taken into account, it becomes clear that police executives and policy makers should pay attention to identifying the optimum usage of these systems according to Holgersson and Gottschalk [6]. “Technological changes have the capacity to transform social and organisational life, it is important to recognise that technology is itself shaped by social and organisational conditions. This is true regardless of whether the emergence or the impact of technology is being considered. The development and adoption of a particular technology are rarely governed solely by technical criteria and often they are driven by social, political and moral considerations” [9].

Furthermore, Manning [1] argues that “in order to achieve more cost effective policing from the introduction of technology the management of change needs to be considered carefully

and upfront and strongly embedded in the programme with tight programme governance. Many programmes that the police service had sought to introduce over the previous decades have focused on the delivery of a product not the delivery of a change in the way that the police service goes about its business." Manning, suggests that the police service as a bureaucracy has been highly resistant to change and that instead of technology changing the police service, the police service has forced technology to adapt to it. In addition, "allocating any new information communication technology and embedding it to the present structure may have unintended consequences unpredicted by policy makers as a result of the resistance of users" [1].

Current Stage and Future Work

Complete Case Studies two and three and support/substantiate this with interviews with ex-police officers and current police constables to identify the social aspects/processes of the effects of communicative technologies that have not been fully identified or discussed.

- Dissemination: Submit journal article & conference paper — aim for a mid-high impact journal and or conference to disseminate key thesis findings thus far.
- Nottingham Police Service and Taser International have given approval to pursue research with these respective organisations. Developments are at present ongoing.

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.

Acknowledgements

The author is supported by the Horizon Centre for Doctoral Training at The University of Nottingham (RCUK Grant No. EP/G037574/1).

The author thanks his PhD supervisors for their ongoing support and academic direction.

References

1. Manning, P. (2008) "The Technology of Policing: Crime Mapping, Information Technology, and the Rationality of Crime Control." New York University Press.
2. Oxford Dictionary (2013) defines a case study as "a process or record of research into the development of a particular person, group, or situation over a period of time."
3. Weatheritt, M. (1986). "Innovations in policing." Published by Police Foundation.
4. Yates, J & Van Maanen, J. (2001). "Information Technology and Organisational Transformation: History and Rhetoric." Published by Sage.
5. Premkumar. G. & Bhattacherjee A. (2006). "Explaining Information Technology Usage: A test of competing models." The International Journal of Management Science.

6. Holgersson, S. & Gottschalk, P. (2006). "Patrolling Police Officers Professional Knowledge. An Empirical Study of Knowledge Types in Law." Information Technology and Organisational Transformation.

7. Colvin, C. A., & Goh, A. (2005). "Validation of the technology acceptance model for competing models. The International Journal of Management Science Enforcement, IPES, May 2006, Turkey.

8. Chan, J. (2001). "The Technological game: How information technology is transforming society." Technical Press.

9. Ackroyd, S; Harper, R; Hughes, J.A.; Shapiro, D and Soothill, K. (1992). "New Technology and Practical Police Work." Open University Press, Buckingham.

Lesley Fosh

Personalising Interpretations for Groups in Museums

Introduction

Galleries and museums are constantly seeking new ways of engaging visitors with the precious artefacts that they curate and conserve. Interactive technologies, from long-established audio guides to more recent tabletop [1], location-based [2] and augmented reality [3, 4] displays, offer a compelling route to achieving this, potentially allowing visitors to access large repositories of information throughout their visit. However, the successful deployment of such technologies needs to accommodate three major challenges:

1. Interpretation – the idea of interpretation lies at the heart of curation. Whereas the traditional role of the gallery or museum was to provide an official interpretation, the contemporary institution is typically more concerned with supporting visitors in engaging with multiple interpretations or in making their own interpretations [5]. Simon argues that visitors to museums should be active participants rather than passive consumers, and that participation involves visitors being able to "create, share, and connect with each other around content" [6]. Ciolfi and McLoughlin also found that visitors' engagement at an open-air living history museum was meaningful when connections were made between the museum content and their own lives [7].

2. Personalisation – a consequence of delivering multiple interpretations is that visitors may be confronted with increasingly large volumes of information. The capability of digital technologies to provide access to huge volumes of online information only serves to compound this problem, threatening to distract attention away from the artefacts themselves or even overwhelm the visitor. At the same time, the vast and diverse range of people who visit museums makes it difficult to design content for an 'average' visitor. This has stimulated an interest in personalisation, typically by automatically recognising visitor types or visiting styles and filtering or adapting information accordingly [8]. However, attempts to categorise visitors into different types or styles are often overly simplified and aren't of practical use to exhibition designers [9].

3. Socialisation – it is commonplace to visit a gallery or museum as part of a group of family or friends which raises further challenges, from the problems of sharing audio guides [10] to

the difficulties that arise from splitting attention between artefacts and information on the one hand and the needs of fellow visitors on the other, which in some circumstances can lead to a near constant state of interruption as visitors prematurely disengage from the former in order to keep up with the latter [11]. Studies of visitor behaviour have shown that collaborative interaction shapes how visitors experience museums and their objects [12, 13] and it is becoming more common for visiting technologies to incorporate social functions such as allowing visitors to share expressive responses [14] and make connections with others around objects [15].

Addressing any one of these issues is difficult enough, but the successful museum visit needs to accommodate all three simultaneously, enabling visitors to make rich interpretations from potentially large pools of information while also paying due attention to fellow visitors. It is this combined challenge that my PhD aims to tackle through an iterative process of user-centred design and evaluation.

Designing a Group Experience

The first study was based around the design and evaluation of a novel interactive experience for pairs of visitors at Rufford Abbey sculpture garden [16]. The design process involved the direct application of the trajectories framework from the outset [17]. A global trajectory was designed for the visitors' experience of the garden as a whole, while more detailed local trajectories were designed for the visitor's experience of each sculpture. This involved weaving together music, instructions and interpretation in an attempt to frame moments of deep personal engagement. The experience was designed for pairs of participants to experience together, and involved switching visitors between being isolated in an immersive experience with a sculpture, and being engaged socially with their partner. A series of user studies were carried out, where pairs of visitors experienced the trajectory we designed. They very often followed it but some interesting tensions arose.

The studies showed how existing trajectory concepts were helpful in designing the visiting experience, and how it was useful to extend the framework with our own contributions, such as global and local trajectories. The study also resulted in introducing the broader idea of designing trajectories through interpretation – leading the visitor through an interpretive process that involved states of being open to multiple interpretations before receiving a more closed, official interpretation to resolve the experience, a successful format which could be used in future studies.

Personalising and Gifting Experiences

For my second piece of work, I developed an approach to museum interpretation that allowed visitors to design an interpretation specifically tailored for a friend or loved one [18]. By studying this approach at a contemporary art gallery, I found that the gifting of these personalised experiences from one partner to another resulted in deeply personalised and powerful interpretations which were experienced by couples together.

The personalised experiences were based on a configurable structure for guiding pairs of visitors through a sequence of exhibits, previously deployed at Rufford sculpture garden. For each exhibit, visitors are presented with a piece of music, a voice instruction telling them how to engage with the exhibit (how to look, move around and gesture),

and a fragment of text to be delivered as they walk away from it afterwards. Visitors were invited to personalise this structure by choosing the sequence of exhibits and the music, instructions and text to accompany them, all of which were specifically tailored to their partner.

I found that for some partners the designed experiences went beyond being simply personalised interpretation for the art, to becoming intense shared experiences, such as by bringing up challenging issues and relating the experience to aspects of their lives or relationships. Overall I found that the gifting of experiences was a powerful way of achieving personalisation between people who know each other well. The experiences were generally well received by the recipients, who reported enjoyment and felt their partner's interpretation was communicated well through the experience. It was also rewarding for the gifters, who developed deep interpretations through their involvement in the design process and were also highly invested in seeing how the experience unfolded for their partner.

Future Work

The next challenge is how to scale this approach to larger and more diverse groups that are known to visit museums, such as families, tour groups, school groups or groups of adult friends. How can groups of three, four or more visitors create and share gift experiences amongst themselves? Is it possible to achieve highly personalised interpretations when gifting is no longer focussed from just one person to another? And how do these gift experiences fit into a group museum or gallery visit?

To explore these questions, groups of visitors will be invited to take part in a design workshop at the Nottingham Castle Museum. They will be introduced to the template design (from previous studies), then they will be asked to choose one object from the museum collection to use in an experience for each of the other group members. They will be taken through the process of choosing a piece of music, an instruction and a portion of text to go with each object. The participants' designs will be implemented into mobile experiences using the AppFurnace tool, ready to use when the groups return to the museum.

Looking further into the future, I aim to explore how the approach might be scaled even further. Could the initial design workshops be replaced with an online service to allow visitors to create experiences and download them to their smartphones prior to a visit? Could the experiences be collected and made more widely available for re-use by future visitors? Could these serve as templates for others or might it be interesting to experience someone else's gift, and, of course, would their owners be willing to share them?

References

1. Horn, M., Atrash Leong, Z., Block, F., Diamond, J., Evans, E. M., Phillips, B., Shen, C. Of BATs and APEs: an interactive tabletop game for natural history museums. CHI'12, ACM (2012) 2059–2068.
2. Satoh, I. Experience of context-aware services in public spaces. ICPS'08, ACM (2008), 81–90.
3. Miyashita, T., Meier, P., Tachikawa, T.,. Orlic, S., Eble, T., Scholz, V., Gapel, A., Gerl, O., Arnaudov, S., Lieberknecht, S. An Augmented Reality museum guide. ISMAR'08, IEEE Comp. Soc. (2008), 103–106.

4. Terrenghi, L., Zimmermann, A. Tailored Audio Augmented Environments for Museums. IUI'04, ACM (2004), 334–336.

5. Whitehead, C. Interpreting art in museums and galleries. Routledge, 2012.

6. Simon, N. The Participatory Museum. Museums 2.0, 2010.

7. Ciolfi, L., McLoughlin, M. Designing for meaningful visitor engagement at a living history museum. NORDICHI '12, ACM (2012), 69–78.

8. Ardissono, L., Kuflik, T., Petrelli, D. Personalization in cultural heritage: the road travelled and the one ahead. User Modeling and User-Adapted Interaction 22, 1-2 (2012), 73–99.

9. Serrell, B. Paying attention: The duration and allocation of visitors' time in museum exhibitions. Curator: The museum journal, 40 (2), (1997) 108–113.

10. Aoki, P., Grinter, R., Hurs, A., Szymanski, M., Thornton, J., Woodruff, A. Sotto voce: exploring the interplay of conversation and mobile audio spaces, CHI'02, ACM (2002) 431–438.

11. Tolmie, P., Benford, S., Greenhalgh, C., Rodden, T., Reeves, S. Supporting Group Interactions in Museum Visiting, CSCW'13, ACM (2013) forthcoming.

12. Grinter, R. E., Aoki, P. M., Szymanski, M. H., Thornton, J. D., Woodruff, A., Hurst, A. Revisiting the visit: understanding how technology can shape the museum visit. CSCW '02, ACM (2002). 146–155.

13. Vom Lehn, D., Heath, C., Hindmarsh, J. Exhibiting interaction: Conduct and collaboration in museums and galleries. Symbolic Interaction 24(2), (2001), 189–216.

14. Laaksolahti , J., Tholander, J, Lunden, M., Solsona Balenguer, J., Karlsson, A., Jaensson, T. The LEGA: a device for leaving and finding tactile traces. TEEI '11, ACM (2011). 193–196.

15. Cosley, D., Lewensterin, J., Herman, A., Holloway, J., Baxter, J., Nomura, S, Boehner, K, Gay, G. ArtLinks: fostering social awareness and reflection in museums. CHI '08, ACM (2008). 403–412.

16. Fosh, L., Benford, S., Reeves, S., Koleva, B., Brundell, P. See Me, Feel Me, Touch Me, Hear Me: Trajectories And Interpretation In A Sculpture Garden. CHI'13, ACM (2013), 149–158.

17. Benford, S., Giannachi, T., Koleva, B., Rodden, T., From Interaction to Trajectories: designing coherent journeys through user experiences, CHI'09, ACM (2009), 709–718.

18. Fosh, L., Benford, S., Reeves, S., Koleva, B. Gifting Personal Interpretations in Galleries. CHI'14, ACM (2014).

David Hand

What Role Does Technology Play in Facilitating How 'men seeking men' Meet, and What Interactions Does it Lead To?

Supervisors

Prof. Steve Benford
steve.benford@nottingham.ac.uk
Prof. Andrew Yip
andrew.yip@nottingham.ac.uk

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' [1]. 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, particularly where the experience of those using such services are concerned. These experiences are important to understand due to the differing forms of interaction involved, from the varying levels of interaction online through to interactions in person, and how the transitions between these are managed by the individuals concerned.

Progress to Date

A large part of the progress to date has had an emphasis on Gaydar and Grindr, most notably considering them in terms of trajectories of experience and design, which are areas that relate to each other. The focus on trajectories comes through adopting the trajectories framework, particularly the notion of the canonical trajectory which is the experience or user journey that the designer hopes comes from their application or service [2]. While it is the interactions that services result in that is of interest in this study, rather than the services themselves, utilising this framework could provide a useful route to understanding those interactions in a productive way.

Although there are some subtle differences, and perceived canonical trajectories of both Grindr and Gaydar are similar, and can be conceived as occurring over four distinct stages. The first of these stages is joining the service and creating a profile, which is the minimum level of interaction required in order to use the service. While paramaters are set in both services, either in terms of length of profile, or guidance as to what text boxes are intended to be for, the content is entirely user generated, allowing them control over their self-presentation. The second of these stages involves utilising the service's functions in order to browse or search for other members of the service, and this is arguably the key component of the services, as in both cases they are intended to be used to allow users to find other users. While it is possible that someone may register for the services and never browse, realistically this is the first point at which the trajectory can reasonably end, as users may just seek to do a form of 'window shopping' rather than interact with others. The third of these stages involves actually interacting with other members of the service through one of the in-service communication methods. While in many cases this is direct one to one communication with another user, and indeed this is the only option for communication available in Grindr, Gaydar also offers chatrooms which cover a range of topics from geographic regions to support groups. To focus on the one to one communication, it is perceived that this is a part of the process of users getting to know each other, which may or may not come to lead to a meeting. It is also possible that the trajectory can end at this step, and that interactions may not go beyond the online. Finally, the fourth stage is the point where users will arrange to meet another user, and so go beyond the distinct bounds of the service itself. Given the

emphasis on dating in the case of Gaydar or hooking up in the case of Grindr, it is safe to assume that this is the intended culmination of the trajectory even if it is not explicitly stated anywhere in the services themselves.

To turn to another major source of progress, as there is an increasing focus on health concerns in the usage of male/male dating services; specifically sexual health concerns. In part this has been given greater emphasis given the differing ways both Grindr and Gaydar approach the topic of sexual health, but also more recently because of potential developments with an internship that would focus on this area.

Perhaps the first thing to address in reviewing literature regarding male/male sexual activity is that to some extent research in this area is 'under the shadow of HIV infection and AIDS' [3]. In keeping with this, much of the limited body of literature that focuses on men seeking men online is in the sphere of health, and particularly on the topic of HIV and sexual risk. While to some extent this is so that men without HIV can take precautions to avoid contracting it, either through practicing safe sex or avoiding those who disclose their HIV status, it also enables HIV positive men to come together without a fear of the risks involved; not only the risk of transmitting or contracting HIV, but also the risk of rejection that such a disclosure might involve [3]. This very much highlights that notions of safety and risk are not necessarily an easy issue to unpack, as there is no homogeneous view on what is considered acceptable and what is not. It also raises the argument that although there is the ability to have anonymity online to a large extent, a movement towards in-person interaction requires a gradual exposure of information and identity, which in this case relates to HIV or other sexually transmitted infections, but could easily be seen to include things such as physical appearance, personality traits, and so on. It also emphasises that some identities are likely easier than others to manage and disclose than others.

Regarding Grindr and Gaydar where sexual health is concerned, it is something that Grindr raises more prominently than Gaydar, at least at times. Due to being a mobile service which takes advantage of the users location, Grindr offers occasional location-specific alters as to where nearby sexual health screening services may be upon opening the app, requiring the user to close the pop-up that this displays on in order to continue. While it is unknown at this point how effective this method of raising sexual health is, it is undoubted that it will be seen by more users than if it was instead offered on menu that a user had to navigate to find. Gaydar by comparison does not offer anything so prominent, instead seeming to rely on a support-group kind of mentality within the community. While this differing approach to sexual health may be indicative of the emphasis on 'hooking up' versus dating, the question of how prominent it should be, and what level of responsibility male/male dating services should take on providing information and support about sexual health.

Next Steps

The most obvious next step is to press on with data collection and analysis. Most importantly, this will occur in the primary study that involves exploring the experiences of men seeking men who use one or both of Grindr and Gaydar through a combination of interviews and diary studies, and the internship briefly mentioned above will be useful in this regard if it comes to fruition. Alongside this, there is some consideration being given to a smaller

secondary study which will involve evaluating the use of features on Grindr and Gaydar, such as how complete profiles are and whether users upload pictures, to determine if the feature set is appropriate, and to identify potential improvements.

Thinking longer term, a short piece of design work will follow the completion of these studies, which is intended to both provide useful output in terms of potential design recommendations for future apps and services, and to give me hands on experience with the design process, mostly likely using a form of participatory design in order to achieve this, and in keeping with the user-centric approach of the PhD at large. Beyond this, it is yet undecided which out of a larger piece of design work will be conducted, or a second large study, although both options will be explored and considered in due course.

References

1. G. Kannabiran, J. Bardzell and S. Bardzell. How HCI Talks about Sexuality: Discursive Strategies, Blind Spots, and Opportunities. In CHI 2011 May 7-12, 2011, 695-704
2. S. Benford, G. Giannachi, B. Koleva and T. Rodden. From Interaction to Trajectories: Designing Coherent Journeys through User Experiences, Proc CHI 2009, 2009 ACM Press, 709-718
3. J. Weeks. Against Nature: Essays on history, sexuality and identity. London: Rivers Oram Press, 1991
4. M. Davis, G. Hart, G. Bolding, L. Sherr and J. Elford. Sex and the Internet: Gay men, risk reduction and serostatus. Culture, Health & Society, 2006, 8 (2) 161-174

Chrisminder Hare

Designing External Representations for Complex Data Systems in Naturalistic Decision Making Contexts

In recent years, there has been a growing research interest, in both theoretical and applied fields of decision-making. There are a number of widely accepted models and frameworks which look at the decision making process and how to extract decision requirements from highly complex situations. However, there is limited literature, which focuses on how decision-making theory should influence the design of system interfaces to support the operator's decision making process. The research looks to bridge this gap by creating a design framework for system developers, which integrate decision-making theory for Naturalistic Decision Making (NDM) interfaces.

NDM is a descriptive decision theory, which looks to understand and improve decision making in field settings, particularly by helping operators more quickly develop expertise and apply it to the challenges they face [1]. The three emphasising factors that influence decision making are associated with the decision maker's knowledge and experiences, the task's level of complexity and with the environment (i.e. the organisation in which the decision is operated). NDM not only examines decision-making but also other cognitive functions such as sensemaking, situation awareness and planning. This research will primarily look at the traditional fire and rescue and aviation NDM domains. There are eight key features that distinguish NDM contexts from other types of decision making they are; ill-structured problems, uncertain dynamic environments, shifting, ill defined,

or competing goals, Action/feedback loops, time stress, high stakes, multiple players and organisational goals and norms.

There are several models of NDM, they are categorised into two main types, process and typological models. Process models include Nobel: Situation Assessment, Recognition-Primed Decisions, Pennington and Hastie: Explanation-Based Decisions, Montgomery: Search for Dominance Structure and Beach and Mitchell: Image Theory. Typological Models include Rasmussen: The Cognitive Control of Decision Processes, Hammond: Task Characteristics and Human Cognition, Connolly: Decision Cycles and Lipshitz: Decision Making as Argument-Driven Action [2].

Decision-Centred Design (DCD) is an example of a framework, which looks to highlight decision requirements. DCD is based on the recognition-primed model and focuses on the development of technologies, which support decision making in challenging situations. The framework emphasises the use of cognitive task analysis methods to discover expertise and decision requirements. DCD is made up of five stages which are described as preparation, knowledge elicitation, analysis and representation, application design and evaluation [3].

The aim of the PhD is to create a design framework for system developers of NDM interfaces. The design framework will highlight how interfaces should be designed to incorporate the decision making process. The objectives of the PhD include:

- To understand how to enhance and support decision-making in NDM contexts.
- To understand how interfaces should be designed using decision making theory.
- To create a design framework for system developers/interface designers which supports the creation of interfaces which enhance decision making in the field
- To validate design framework in aviation and fire and rescue service

Study One

The first study aimed to understand the fire and rescue service domain in the United Kingdom. Based on Critical Decision Method (CDM) interviews [4] with firefighters, the research provides an overview of a complex data system currently used in the Fire and Rescue service. This study relates the findings to issues of designing visualisations and the potentials for cognitive overload with a view to supporting the design and procurement of future systems. The aims of the research were three-fold;

1. To get an understanding of the evolving complex data system being used to support decision-making during an emergency incident in the FRS.
2. To understand the challenges of using the system in an emergency situation, with focus on mental workload.
3. To recommend how the system should visualise information to support decision-making for the design and procurement of future systems.

Study Two

The second study aims to understand the domain in aviation. The study investigates what is needed to create a new cockpit interface (fuel format), which supports the pilot's decision making during emergency scenarios. The study undertook CDM interviews and looked

to understand how to integrate hardware switches from the overhead panel of a traditional commercial cockpit as part of a new interface.

A new prototype interface was created and tested. A comparison between a “classic” aircraft system management with control panel and monitoring display, vs. an integrated approach where system management is effected via software controls integrated in the monitoring display was implemented. The objectives of the study included:

1. To understand what is needed for pilot decision-making. The study will get an insight into how and where pilot’s access information to aid decision-making in the cockpit. In addition, the study aims to get an understanding for what is needed for good situation awareness.
2. What is needed for the design of software buttons in a cockpit
3. A prototype interface will be created and tested to see if the integration of switches in the new interface supports the pilot’s mental workload, situation awareness and usability. The interface will be tested using significant

References

1. Klein, G. A. (Ed.). (2001). Linking expertise and naturalistic decision making. Psychology Press.
2. Klein, G. A., Orasanu, J. E., Calderwood, R. E., & Zsambok, C. E. (1993). Decision making in action: Models and methods. In This book is an outcome of a workshop held in Dayton, OH, Sep 25–27, 1989.. Ablex Publishing.
3. Hoffman, R. R., & Militello, L. G. (2012). Perspectives on cognitive task analysis: Historical origins and modern communities of practice. Psychology Press.
4. Klein, G.A., Calderwood, R., & MacGregor, D. (1989). Critical decision method for eliciting knowledge. IEEE Transactions on Systems, Man and Cybernetics, 19(3), 462-472

Michaela Hoare

DIY in a Digital Age: an Ethnographic Study of Amateur Musicians and their Shared Practices

Observing the DIY music scene on a micro-scale, this project aims to explore the practices and methods of amateur musicians and their shared values and activities within a local DIY arts space. In particular, the project will focus on the handcrafted nature of the ‘aesthetic experiences’ [1,2,3] produced in these DIY music and arts spaces, and these musicians’ contribution. Here there appears to be a mutual commitment between the artists, promoters and fans to a handmade, grassroots, mutual aid production of music. Promoting the aesthetic value of music, it is the tangible artefact which importantly accompanies the live gig and membership to a DIY space. The artefact often becomes the event itself, a chance for musicians and fans to come together and celebrate the music as a ‘sacred object’. There is a sense of ownership, creative control and belonging achieved here, and unique physical aesthetic experiences (both the handcrafting of the music artefact and the music performance) plays an important role in the establishing of a distinct music scene identity which operates in a digital

age. Alongside this there appears to be a shared promoting of the use of urban space for creative practices. With a combining of observation and interview data, this project will aim to contribute to current Sociological and HCI discussions on DIY amateur practices in a digital age and perhaps provide further understanding of the existing values and activities in these DIY music spaces, with interviewing exploring the experiences of these musicians promoting DIY, engaging with the local community and sharing creative space; uncovering in particular the importance of the aesthetic experience, their values and motivations. In relation to cultural legacy, exploring the handcrafted, tangible approach and a celebration of more primitive forms of music distribution and experience shared by those musicians attached to DIY spaces may stimulate HCI discussions on ways in which the relationship between the live, tangible experience and the digital might be strengthened.

Summary of PhD Progress

This year I have commenced data collection, first selecting two distinct case studies and then carrying out both interviewing and observational work to explore the DIY methods of amateur musicians based in Cambridge and Nottingham who are collaborating with other musicians in shared performance and recording spaces. An ongoing thorough literature review has supported the development of the project aims and focus which I will outline below.

Case Study Selected and Project Carried Out in Cambridge

During my internship at Microsoft Research Cambridge last summer I conducted a study of amateur musicians in Cambridge who are networking with other promoters and musicians locally, nationally and internationally and adopting DIY methods. This involved observational work of performance spaces and online activities followed by in-depth interviews with 14 amateur musicians. Using a screener, these musicians were selected on the basis of their key role within the regional Cambridge DIY music scene (working with promoters and strengthening ties with other DIY spaces in the UK) and their adopting of DIY methods to promote and distribute their music. Both data collection in Nottingham and in Cambridge has involved an iterative analysis of the data and then relating any key findings back to my original research questions and the literature review. This has lead to a further defining of the research themes, the project focus and further developments of thematic research questions.

Reporting Our Findings of the Cambridge Study (and Design Recommendations) to the CHI 2014 Conference

A paper reporting the findings of our study in Cambridge entitled, ‘Coming in from the Margins: Amateur Musicians in the Online Age’ has been accepted at CHI 2014 [4]. The paper argues that HCI currently lacks a sufficiently nuanced view of the serious nature of amateur practices and of the distinctive challenges that amateurs face online. By drawing together the wider literature on amateurs from sociology and cultural studies alongside HCI and the findings from our case study of amateur musicians, we reflect more broadly on the distinctive nature of the amateur in the online age and articulate new challenges to be addressed by future HCI research. Our findings propose design recommendations for event-oriented promotion tools; community-oriented analytics; tangible

and embedded products; and limited edition digital experience.

Co-design Workshop Conducted in Cambridge

A follow-up workshop conducted in January with three of the amateur musicians interviewed in Cambridge aimed to explore any potential design opportunities for further developing online networking tools for artists. Analysis of the workshop data has provided insight into the experiences of musicians networking both online and offline practices, in particular the purposeful differences in approach to communicating with both fans and other artists when organising gigs and promoting their music themselves.

Further Development of the Research Questions

With an ongoing iterative analysis approach, the research questions have been developed to reflect initial findings from fieldwork, co-design workshops and interviewing carried out in Cambridge and Nottingham. Whilst the naturally occurring observation data aimed to provide a public face account of the DIY space (and the interactions in this space), the interviewing will aim to further explore the experiences and motivations of these musicians, with particular focus on:

- How are musicians and promoters attached to a DIY space motivated by shared social and artistic values and how do these influence their experiences when creating and performing music.
- How are these musicians adopting traditional, DIY forms of music making alongside digital technologies whilst promoting a DIY ethic and cultural legacy?
- The factors and contexts of DIY music spaces and how they combine to motivate and affect the musician's relation with their work, their peers and their audience.

Methodology

Initial data collection carried out in Cambridge has informed the development of a methodological approach for further data collection to be carried out this year in Nottingham. A new ethnographic combined with an ethnomethodological approach has been adopted to further explore the methods carried out by musicians and organisers to sustain and define the DIY space, document its legacy as well as produce meaningful music artefacts and performances in a shared performance space. In particular, by aiming to be true to the lived realities of these musicians with a new ethnographic approach and understanding that these lived realities are many, further data collection will seek to explore the ways in which interactional work between the musicians is 'equipmentally affiliated' and the ways in which meaning behind a shared DIY ethic and the artefacts and performances produced is actively constructed by the community members [5, 6].

Design of an Interview Study Involving Musicians in Nottingham

An interview study has commenced this year, aiming to support fieldwork and observational analysis conducted so far of the musicians' collective activities in their shared DIY performance and recording space. With a focus on how musicians are practicing and appropriating a DIY ethic and method with other musicians as part of a shared DIY space, semi-structured interviewing will aim

to uncover the personal experiences of the artists and organisers/promoters attached to the Nottingham DIY space and from the wider DIY network (labels, promoters and other DIY spaces). By combining interview data with observation, I am currently seeking to explore both the private and public perceptions of a DIY music space.

By gaining understanding of the setting, observation data collection is acting as a guide to conducting the interviews. On a broader level a combining of observation and interview data is exploring to what extent the fostering of a shared DIY space and these musicians' collective adopting of a DIY ethic suggests evolving countercultural methods for local arts practice and micro-scale music production. Gaining access to the workspace and pre-show activities of these artists out of public view seeks to uncover how these musicians 'do DIY' and appropriate both DIY technologies and methods to suit their own needs.

Discussions for Further Co-design Workshops Involving Other HCI Researchers

As I explore in-depth the practices of the Nottingham DIY space, there are current discussions as to how there might be an opportunity to consider and develop further design recommendations as a result of my interview data analysis and findings. This might involve follow-up interviews and co-design workshops during the summer, hence collaborations with other researchers based in the lab are currently being considered.

References

1. H. Becker. Art Worlds. California, University of California Press, 1984.
2. J. Tanenbaum. A. Williams. A. Desjardins. K. Tanenbaum. 2013. Democratizing Technology: pleasure, utility and expressiveness in DIY and Maker Practice, CHI '13 Proceedings. 2603-2612.
3. C. Taylor. Sources of the Self: the making of the modern identity, Cambridge, MA, Harvard University Press, 1989.
4. M. Hoare. S. Benford. R. Jones. N. Milic-Frayling. 2014. Coming in from the Margins: Amateur Musicians in the Online Age. CHI '14 Proceedings.
5. A. Crabtree. M. Rouncefield. P. Tolmie. Doing Design Ethnography. London, Springer, 2012.
6. P. Saukko. Doing Research in Cultural Studies: An Introduction to Classical and New Methodological Approaches. London, Sage, 2003.

Laura Kinley

Detecting and Accounting for Uncertainty in Ecological Datasets: Using VGI with Remotely Sensed Imagery

Supervision Team

Prof Mike Jackson (Nottingham Geospatial Institute)
Prof. Giles Foody (School of Geography)

This research evaluates passive geographic information (not for purpose, pre-existing crowd data) and directed crowdsourced geospatial information (focused crowd sampling) as ancillary data to assist in the creation of spatio-temporally accurate land cover maps. It focuses upon the level of certainty we can place in the accuracy of such data and methods by which crowdsourced GI can be weighted to assist in the classification of high resolution aerial imagery. Whilst the field of ecology provides an ideal use case, the key objective is to research how crowd data may be able to improve (or validate) classification accuracy using remotely sensed imagery especially in areas where ground truth is expensive or difficult to obtain.

Key Terms

Volunteered Geographic Information, Image Classification, Ecology

Scope of Research

- Comparing trends in the distribution of ecological phenomena between crowd and authoritative data sets (in the cases of habitat connectivity and land cover mapping).
- Establishing the variance in the utility of directed Volunteered Geographic Information (VGI) and passive GI within Spatial Data Infrastructures (SDIs) - in an ecology context.
- Assessing and enhancing the utility of VGI as training data in remote sensing classification to recognise changes in ecological distributions (using active learning classification techniques).

Background and Research Need

Crowdsourcing is of particular value in areas of change. There will always be a necessity for the National Mapping Agency in surveying persistent geographical information. Many use cases for GI denote that an authoritative representation of the ground truth is required to provide an explicit statement of reliability. In the UK the Ordnance Survey is mandated to provide a high resolution map of the UK to a consistent resolution under a continuous revision policy whereby new features are mapped within six months of their completion; authoritative mapping can thus be relied upon for instances where precision and currency is key. Using crowdsourced data for these applications is a legal grey area and extensive work on quality assurance and optimisation would be required for VGI to be deemed as fit for all purposes with a permanent and substantial role within GI data collection and management [1].

VGI can play a real role in areas where surveying would not otherwise be completed (such as the surveying of highly detailed, transient and low economic priority features), or where it can help inform and prioritise authoritative mapping efforts. VGI could be of particular value in the context of

using VGI as change intelligence for the mapping of the natural environment where, in the UK, a cyclic revision system denotes that rural and moorland areas are only authoritatively inspected systematically on a 5 year basis.

Mapping the distribution of ecological phenomena is key to understanding and managing the environment, but many authoritative species, habitat and land cover maps lack the sufficient spatio-temporal resolution to enable the regular monitoring of species transition gradients [2]. VGI presents opportunities for improving current practices of data collection and annotation, providing many broad-scale samples inexpensively. Problematically, VGI typically exhibits considerable quality variance ranging from imprecise digitisation to poor label accuracy. As such, off the shelf usage for planning and scientific purposes is challenging from a data quality perspective. VGI is often used in validating existing raster and vector datasets [3] but there is scope for passive data and directed VGI to be used within image classification - generating raster maps. In combination with machine learning, appropriately weighted VGI, (e.g. with emphasised contributions of accurate annotators) could yield regular outputs of appropriate thematic accuracy.

Assessing the feasibility of using passive GI

Work based upon an Ordnance Survey Research internship project (2012) looked into the feasibility of using passive crowdsourced LC data from Geograph (a landscape photo sharing site) to complement authoritative Centre for Ecology and Hydrology Land Cover Map data for Hampshire. Grid square comparison and Python word matching scripts were used to determine the extent to which the data varied in terms of attribute quality and distribution. Spatial word matching of VGI strings with an authoritative dataset indicated that passive GI could assist in providing an additional source of high quality land cover information and an analysis of terms showed the potential to scrape highly detailed information from passive sources.

Coverage: There are 1 (68 cases) - 1932 described landscape images per grid square. 15% of the grid squares have more than 50 descriptions, showing VGI to have a moderately good coverage in the case of Geograph. OpenStreetMap is particularly poor in terms of spatial coverage with only 9.83% of the extent of Hampshire covered by land cover information.

Temporality: 86.8% of grid squares have information that is temporally suitable for ground truth (taken May-Sep during the ‘leaf-on’ period). 1.8% of grid squares have a maximum recency value below that of the most recently available CEH survey date showing that passive sources can provide data with high currency.

Attributes: Approximately 20% of Geogprah points have a tag that spatially matches the authoritative Land Cover Map data showing that the crowd can identify relevant LC classes passively. An attribute ‘level of detail’ analysis showed that the crowd is more inclined to use specific terms to describe places than broad ones and also that there is a great deal of species specific data (26% of terms) that go above and beyond the capture specification of traditional classification systems.

Directed Approaches to VGI

Broad and sub hierarchical level VGI habitat classifications of ground-based images were

gathered via a web application using the Phase 1 Habitat Survey nomenclature. Interpretations for 150 sites in 3 difficulty sets (initially classified by a professional ecologist) were tested for accuracy to determine VGI's utility as training data for the classification of remotely sensed imagery. Initial results show VGI to complement authoritative data collection well in the context of habitat mapping. User confidence is shown to be a suitable indicator of the accuracy of the data contributed.

150 georeferenced photographs taken within the New Forest (UK) were classified by an ecologist (as assumed gold-standard classifications) using the Phase-1 Habitat Survey [4]. The area has a high diversity of flora and one of Europe's most extensive areas of heathland signifying timely habitat change detection is important. Broad and sub-level habitat classifications were sourced from 83 participants ranging from the amateur-enthusiast to professional ecologists. A total of 2,547 habitat classifications have been analysed against the authoritative interpretations. Label certainty ratings, the time spent looking at a training web page and the time taken to perform each classification were recorded to establish any associations with classification accuracy that could be used to detect high quality or spurious annotations. The crowd classifications will be used within further studies alongside the collected accuracy metrics to understand how the classification algorithms perform when using VGI as a training sample in classifying high resolution remotely sensed imagery.

Some findings:

- Inter-group broad scale accuracies varied by up to 16.32% with ecologists and ornithologists as the most accurate annotator groups.
- There are statistically significant correlations with both the accuracy of the broad and sub level classifications with label confidence suggest that user confidence could be a good predictor of accuracy.
- There is significant inter-class variance in classification accuracy at the sub hierarchical level. For most broad classes the crowd data agreed moderately with the authoritative data (overall Cohen's Kappa agreement: 0.55, p=¡0.01) showing the VGI to be moderately accurate.
- The probabilities of association of each pixel within a remotely sensed image of the same area with each habitat class were analysed using the reflectance values of each pixel and the known truth. Classes where the statistical classifier is most uncertain do not match where the crowd is most inaccurate suggesting potential merit in the use of crowd classifications.

Future Work

Current and future work seeks to establish whether passive GI and directed VGI can be useful in classifying LC from high resolution aerial imagery. Training samples will be weighted using metrics of annotator accuracy and label confidence to optimise the accuracy of classification. Collaboration with the Citizens Observatory Web project (which aims to utilise VGI to collect data within the world's biosphere reserves) will investigate the merits of using crowd participation where directed crowdsourcing approaches are required to perform image classifications which require iterative in-field data collection approaches.

Summary

The proliferation of geo-technology and popularity of citizen-sensing suggests that ecologists can access valuable additional data. Datasets can be synthesised that, whilst not reaching the accuracies of authoritative data, could be seen as an asset to monitoring and inventory in the domains of land cover mapping and ecology. Importantly, there are opportunities to move beyond the use of VGI for validation, instead weighting VGI according to indicators of accuracy prior to integrating the annotations within the remote sensing classification process to quickly produce VGI derived image classifications.

References

1. Heipke, C. (2010), Crowdsourcing geospatial data. ISPRS Journal of Photogrammetry and Remote Sensing, 65(6), 550-557.
2. Dickinson, J., Zuckerberg, B., & Bonter, N. (2010), Citizen Science as an ecological research tool: challenges and benefits. Annual review of ecology, evolution, and systematics, 41, 149-172.
3. Goodchild, M.F. & Li, L. (2012), Assuring the quality of volunteered geographic information. Spatial statistics, 1, 110-120.
4. JNCC, (2010). Handbook for Phase 1 habitat survey - a technique for environmental audit, ISBN 0861396367

Martin Kruusimägi

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 [8]. As well as achieving 80% below 1990 levels

mark by 2050 [29]. Much work on current thermostats has revealed vast shortcomings in design [18], 19, 20, 23] and the numerous project in designing smart homes [2, 3, 7, 10, 15, 21, 30, 31] 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 minimise energy use whilst minimising discomfort?
- How can discomfort be characterised 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" [28] 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 [27], that can be "run like a computer simulation allowing an individual to explore and test different possibilities mentally before acting" [17] 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 cańt fully appreciate why, what effects to expect, or what to do if things go wrong[̈22], 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 ([1], 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." [16], p. 6.

Even the more successful projects in designing automated building controls [25] 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 [4, 11, 12, 13, 14, 15, 24, 33]. 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 [5, 6, 9, 26, 32]. 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.

Acknowledgements

The author is supported by the Horizon Centre for Doctoral Training at The University of Nottingham (RCUK Grant No. EP/G037574/1)

The author thanks his PhD supervisors Darren Robinson and Sarah Sharples for their ongoing support.

References

1. Ackerman, M.S., 2000. The intellectual challenge of CSCW: the gap between social requirements and technical feasibility. Human-Computer Interaction 15, 179-203.
2. AIRE Group MIT, 2012. MIT Project AIRE [WWW Document]. URL http://aire.csail.mit.edu/ (accessed 5.30.12).
3. Amigo Project, 2012. Amigo Project [WWW Document]. URL http://www.hitech-projects.com/euprojects/amigo/ (accessed 5.30.12).
4. Bahadur Rijal, H., Tuohy, P., Humphreys, M.A., Nicol, J.F., Samuel, A., 2012. Considering the impact of situation-specific motivations and constraints in the design of naturally ventilated and hybrid buildings. Architectural Science Review 55, 35-48.

5. Baker, N., Standeven, M., 1996. Thermal comfort for free-running buildings. Energy and Buildings 23, 175-182.

6. Black, F.W., Milroy, E.A., 1966. Experience of air-conditioning in offices. Institution of Heating and Ventilating Engineers 34, 188-196.

7. Brown, T., Wyatt, J., 2010. Design Thinking for Social Innovation. Stanford Social Innovation Review 8, 30-35.

8. DEFRA (Department for Environment Food and Rural Affairs), 2008. UK Climate Change Programme: Annual Report to Parliament. London.

9. Fishman, D.S., Pimbert, S.L., 1982. The thermal environment in offices. Energy and Buildings 5, 109-116.

10. Georgia Institute of Technology, 2012. Aware Home Research Initiative [WWW Document]. URL http://awarehome.imtc.gatech.edu/ (accessed 5.30.12).

11. Haldi, F., Robinson, D., 2008. On the behaviour and adaptation of office occupants. Building and Environment 43, 2163-2177.

12. Haldi, F., Robinson, D., 2009. Interactions with window openings by office occupants. Building and Environment 44, 2378-2395.

13. Haldi, F., Robinson, D., 2010. On the unification of thermal perception and adaptive actions. Building and Environment 45, 2440-2457.

14. Haldi, F., Robinson, D., 2011. The impact of occupants' behaviour on building energy demand. Journal of Building Performance Simulation 4, 323338.

15. Herkel, S., Knapp, U., Pfafferott, J., 2008. Towards a model of user behaviour regarding the manual control of windows in office buildings. Building and Environment 43, 588-600.

16. Jaffari, S.D., Matthews, B., 2009. From occupying to inhabiting a change in conceptualising comfort. IOP Conference Series: Earth and Environmental Science 8, 12008.

17. Jones, N.A., Ross, H., Lynam, T., Perez, P., Leitch, A., 2011. Mental Models: An Interdisciplinary Synthesis of Theory and Methods. Ecology and Society 16, 1-13.

18. Meier, A., 2012. Facilitating Energy Savings through Enhanced Usability of Thermostats.

19. Meier, A., Aragon, C., Hurwitz, B., Mujumdar, D., Peffer, T., Perry, D., Pritoni, M., 2010. How People Actually Use Thermostats. Controls and Information Technology 2, 193-206.

20. Meier, A., Aragon, C., Peffer, T., Perry, D., Pritoni, M., 2011. Usability of residential thermostats: Preliminary investigations. Building and Environment 46, 1891-1898.

21. Mozer, M.C., 2012. The Adaptive House Boulder Colorado [WWW Document]. URL http://www.cs.colorado.edu/ mozer/index.php?dir=/Research/Projects/Adaptive house/ (accessed 5.30.12).

22. Norman, D.A., 1988. The psychology of everyday things. Basic books.

23. Peffer, T., Pritoni, M., Meier, A., Aragon, C., Perry, D., 2011. How people use thermostats in homes: A review. Building and Environment 46, 2529-2541.

24. Rijal, H.B., Tuohy, P., Humphreys, M.A., Nicol, J.F., Samuel, A., Clarke, J., 2007. Using results from field surveys to predict the effect of open windows on thermal comfort and energy use in buildings. Energy

and Buildings 39, 823-836.

25. Rogers, A., Maleki, S., Ghosh, S., Jennings, N.R., 2011. Adaptive home heating control through Gaussian process prediction and mathematical programming. In: Second International Workshop on Agent Technology for Energy Systems (ATES 2011). Taipei, Taiwan, pp. 71-78.

26. Rowe, D.M., Lambert, S.G., Wilke, S.E., 1995. Pale green, simple and user friendly: occupant perceptions of thermal comfort in office buildings. In: Nicol, J.F., Humphreys, M.A., Sykes, O., Roaf, S. (Eds.), Standards for Thermal Comfort: Indoor Temperature Standards for the 21st Century. Spon, London, UK, pp. 59-69.

27. Rutherford, A., Wilson, J.R., 2004. An ergonomist-psychologist dialogue. In: Moray, N. (Ed.), Ergonomics Major Writings: Psychological Mechanisms and Models in Ergonomics. Taylor & Francis, London, UK, pp. 309-323.

28. Stevenson, F., Leaman, A., 2010. Evaluating housing performance in relation to human behaviour: new challenges. Building Research & Information 38, 437-441.

29. UK Parliament, 2008. Climate Change Act 2008. The Stationery Office Ltd., London.

30. University of Essex, 2012. Intelligent Environments Group [WWW Document]. URL http://ieg.essex.ac.uk/ (accessed 5.30.12).

31. University of Florida, 2012. Gator Tech Smart House [WWW Document]. URL http://www.icta.ufl.edu/gt.htm (accessed 5.30.12).

32. Williams, R.N., 1995. Field investigation of thermal comfort, environmental satisfaction and perceived control levels in UK office buildings. In: Healthy Buildings.

33. Yun, G.Y., Steemers, K., 2008. Time-dependent occupant behaviour models of window control in summer. Building and Environment 43, 1471-1482.

Claire Murphy

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.

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

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 second study addressed in more detail the issue of how social media users are handling the privacy of their personal data, and also how they handle their relationships in the context of privacy and conflict management. It also served to further explore some issues relating to use and understanding of privacy settings that were not fully answered in my first study. This was examined using a combined survey and diary study.

My current study focuses on how current social media interfaces serve to help or hinder

social interaction and privacy management. Sensitising interviews will be conducted with a variety of users in order to assess their needs and desires when going forward in social media. The data gleaned from this study will be used to generate best-practice design guidelines for existing and future social networking websites, which will undergo usability testing in my next study.

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 a wide variety of users.

Progress to Date

At the time of writing, data collection and analysis are ongoing. The generation of design guidelines will begin once a full requirements analysis has been conducted and user testing is hoped to commence during the summer of 2014, extending into my fourth 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

Acknowledgements

The author is supported by the Horizon Centre for Doctoral Training and the School of Psychology at the University of Nottingham

The author thanks her PhD supervisors Claire O'Malley, Derek McAuley, and Alexa Spence for their ongoing support.

References

1. I. Altman, A. Vinsel, and B. B. Brown. Dialective conceptions in social psychology: An application to social penetration and privacy regulation. Advances in Experimental Social Psychology, 1981, 14, 107-160
2. J. Fogel, and E. Nehman. Internet social network communities: Risk taking, trust, and privacy concerns. Computers in Human Behavior, 2009, 25(1), 153-160.
3. G. Hull, H. R. Lipford, and C. Latulipe. Contextual gaps: privacy issues on Facebook. Ethics and Information Technology, 2011, 13(4), 289-302

Daniel Ratzinger

What Influence do Universities have on Internet Startups?

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 recognised 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 commercialisation 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 influence of universities on Internet startups by focusing on the human as well as social capital theory. The thesis is going to explore 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 utilising 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 recognised that there are difficulties to be overcome in order to collect reliable data about entrepreneurial activities [12:396].

This thesis is aiming to explore entrepreneurial activity by using an existing crowd-sourced data 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.

References

1. Bates, T. Entrepreneur Human Capital Inputs and Small Business Longevity. The Review of Economics and Statistics 72, 4 (1990), 551—559.
2. Batjargal, B. Internet entrepreneurship: Social capital, human capital, and performance of Internet ventures in China. Research Policy 36, 5 (2007), 605–618.
3. Chapman, D., Smith, H.L., Wood, P., Barnes, T., and Romeo, S. University enterprise: the growth and impact of university-related companies in London. Industry and Higher Education 25, 6 (2011), 483–492.
4. Davidsson, P. and Honig, B. The role of social and human capital among nascent entrepreneurs. Journal of Business Venturing 18, 3 (2003), 301–331.
5. Dean, D., DiGrande, S., Field, D., et al. The Internet Economy in the G-20: The $4.2 Trillion Growth Opportunity. Boston, 2012.
6. Hughes, A. and Kitson, M. Pathways to impact and the strategic role of universities: new evidence on the breadth and depth of university knowledge exchange in the UK and the factors constraining its development. Cambridge Journal of Economics 36, 3 (2012), 723–750.
7. Kalapesi, C., Willersdorf, S., and Zwillenberg, P. The Connected Kingdom: How the Internet Is Transforming the U.K. Economy. London, 2010.
8. Madsen, H., Neergaard, H., and Ulhi, J.P. Knowledge-intensive entrepreneurship and human capital. Journal of Small Business and Enterprise Development 10, 4 (2003), 426–434.
9. Martin, B.C., McNally, J.J., and Kay, M.J. Examining the formation of human capital in entrepreneurship: A meta-analysis

of entrepreneurship education outcomes. Journal of Business Venturing 28, 2 (2013), 211–224.

10. Marvel, M. and Lumpkin, G. Technology Entrepreneurs' Human Capital and Its Effects on Innovation Radicalness. Entrepreneurship Theory and Practice, 270 (2007), 807–828.

11. Mosey, S. and Wright, M. From Human Capital to Social Capital: A Longitudinal Study of Technology-Based Academic Entrepreneurs. Entrepreneurship Theory and Practice 31, 6 (2007), 909–935.

12. Rae, D., Martin, L., Antcliff, V., and Hannon, P. Enterprise and entrepreneurship in English higher education: 2010 and beyond. Journal of Small Business and Enterprise Development 19, 3 (2012), 380–401.

13. Research Councils UK. Cross-Council Research. http://www.rcuk.ac.uk/research /xrcprogrammes/Pages/home.aspx.

14. Research Councils UK. What do Research Councils mean by 'impact'? http://www.rcuk.ac.uk/kei/impacts/Pages /meanbyimpact.aspx.

15. Research Councils UK. Impact Report 2011. Swindon, 2012.

16. Robinson, P.B. and Sexton, E. a. The effect of education and experience on self-employment success. Journal of Business Venturing 9, 2 (1994), 141–156.

17. Schultz, T.W. Investment in Human Capital. American Economic Review 51, 1 (1961), 1.

18. Stewart, W.H., Watson, W.E., Carland, J.C., and Carland, J.W. A proclivity for entrepreneurship: A comparison of entrepreneurs, small business owners, and corporate managers. Journal of Business Venturing 14, 2 (1999), 189–214.

19. Stuetzer, M., Goethner, M., and Cantner, U. Do balanced skills help nascent entrepreneurs to make progress in the venture creation process? Economics Letters 117, 1 (2012), 186–188.

20. Swinney, P. Starter for ten: Five facts & five questions on the relationship between universities & city economies. London, 2011.

21. Wang, C.K. and Wong, P.-K. Entrepreneurial interest of university students in Singapore. Technovation 24, 2 (2004), 163–172.

22. Wexelblat, A., Jones, Q. (Gad), Abrams, H., Konstan, J.A., and Vernick, M. Ph.D. vs. startup. CHI '01 extended abstracts on Human factors in computing systems, ACM (2001), 229–230.

23. Wright, M., Hmieleski, K.M., Siegel, D.S., and Ensley, M.D. The Role of Human Capital in Technological Entrepreneurship. Entrepreneurship Theory and Practice, 817 (2007), 791–806.

James Sprinks

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 1960s 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 and 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 took place in April 2013 to discuss further development and the overarching aims of the project.

References

1. Citizen Science Alliance (online). Accessed 18th March 2013. Available on World Wide Web: www.citizenscienceall iance.org
2. Galaxy Zoo (online). Accessed 18th March 2013. Available on World Wide Web: www.galaxyzoo.org
3. Lintott C, Schawinski K, Slosar A, Land K, Bamford S, Thomas D, Raddick M, Nichol R, Szalay A, Andreescu D, Murray P, Vandenberg J, 2008. Galaxy Zoo: morphologies derived from visual inspection of galaxies from the Sloan Digital Sky Survey, Monthly Notices of the Royal Astronomical Society, 389(3), pp1179–1189
4. Planet Four (online). Accessed 18th March 2013. Available on World Wide Web: www.planetfour.org
5. Raddick M J, Bracey G, Gay P, Lintott C, Murray P, Schawinski K, Szalay A S, Vandenberg J, 2010. Galaxy Zoo: Exploring the motivations of Citizen Science volunteers, Astronomy Education Review, 9(1)
6. Zooniverse (online). Accessed 18th March 2013. Available on World Wide Web: www.zooniverse.org

Matthew Terrell

Constructing a Framework to Inform Service Innovation on Identification of Rare Subjects

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 utilise their abilities and networks, which have continued to enable positive service innovation. Recognised 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 user-innovation provides initial evidence that stronger ties between these subject areas exists- specifically between their identify as an innovator and their indicators researchers use to locate these subjects. If we collate indicators used by researchers over time and under different conditions, we start to see patterns emerge, distinguishable characteristics, behaviour and even personality traits consistently direct researchers to their desired subjects. 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 in 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, and while trying to match users to these characteristics, have used other measures of behaviour and patterns, acting as proxy to determine if they match these underlying attributes, that are becoming increasingly valued [4]. Today the behaviour 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 development. Observed to be involved in both self-initiated projects and in collaboration with larger companies – all utilising their communities and networks to achieve the desired goal [6, 7]. Academics have consistently described these three user types with the same characteristics, behaviour 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 'influentials' 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 identify 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 labelling them accordingly? In addition to labelling, 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?

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 behaviour 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.

Related Work and Applications

The observation of reflexivity between users and the ability for a user to ascend their current position on the scale of innovation, from a consumer to lead user or influential may also be observable through a characteristic driven typology, as new or less used attribute could indicate learning and growth of the individual within their community. User communities, differ from social networks, as the users form around a specific subjects and themes. A characteristic driven frame work and user typology could be used in the initial design stages of these platforms to help structure communication channels and build in various features that capture these characteristics. This would then help platform owners in identifying various types of users and assisting in the development of others. Knowing the areas where, and what user types, lack certain attributes, can help platform owners in assisting the learning process for these users. This could potentially result in a larger number of more informed, comprehensive users, who will then be more valuable to the platform owner and the platform communities.

References

1. E. Von Hippel, "Successful Industrial Products from Customer Ideas," Journal of Marketing, 1978.
2. E. Von Hippel, N. Franke, and R. Wilhelm Prugl, "Pyramiding Efcient search for rare subjects," Research Policy, vol. 38, no. 9, pp. 1397–1406, 2009.
3. E. Von Hippel, "Lead Users: An Important Source of Novel Product Concepts," Management science, vol. 32, no. 7, pp. 791–805, 1986.
4. E. Von Hippel, S. Thomke, and M. Sonnack, "Creating Breakthroughs at 3M Job Sculpting: The Art of Retaining Your Best People A New Way to Manage Process Knowledge," Harvard Business Review, 1999.
5. J. Schrammel, C. Kffel, and M. Tscheligi,

“Personality Traits , Usage Patterns and Information Disclosure in Online Communities,” pp. 169–174, 2009.

6. S. Shane, “Prior Knowledge and the Discovery of Entrepreneurial Opportunities,” Organization Science, vol. 11, no. 4, pp. 448–469, 2000.
7. C. Hienerth and C. Lettl, “Exploring How Peer Communities Enable Lead User Innovations to Become Standard Equipment in the Industry: Community Pull Effects,” Product development & Managment Association, vol. 28, pp. 175–195, 2011.
8. E. Keller and J. Berry, The Influentials, vol. 25, no. 5. New York, NY: Simon & Schuster Ltd, 2003.
9. V. Braun and V. Clarke, “Using Thermatic analysis in psychology,” Qualitative Research in Psychology, vol. 3, pp. 77–101, 2006.
10. J. Fuller, K. Matzler, and M. Hoppe, “Brand Community Members as a Source of Innovation,” Product Innovation Management, vol. 25, pp. 608–619, 2008.
11. G. Marchi, C. Giachetti, and P. de Gennaro, “Extending lead-user theory to online brand communities: The case of the community Ducati,” Technovation, vol. 31, no. 8, pp. 350–361, Aug. 2011.
12. N. Agarwal, H. Liu, L. Tang, and P. S. Yu, “Identifying the influential bloggers in a community,” in Proceedings of the international conference on Web search and web data mining - WSDM ’08, 2008, p. 207.
13. J. Schrammel, C. Kffel, and M. Tscheligi, “How Much do You Tell? Information Disclosure Behaviour in Different Types of Online Communities,” pp. 275–284, 2009.

Cohort 2012

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

September 2012 saw the launch of the International Doctoral Innovation Centre (IDIC), which will train 50 PhD students in Digital Technologies 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 CDT 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 17 students in cohort 2012 which includes 6 IDIC students. The cohort disciplines include Engineering, History, Law, Psychology, Sociology, GIS, Business, and Computer Science.

Richard Brown
psxrbdr@nottingham.ac.uk
James Burnett
psxjrbu@nottingham.ac.uk
Peter Craigon
psxpjc@nottingham.ac.uk
Dimitri Darzentas
psxdpda@nottingham.ac.uk
Liz Dowthwaite
psxld3@nottingham.ac.uk
Sam Howard
psxsh3@nottingham.ac.uk
Richard James
lpxrj2@nottingham.ac.uk
Will Knight
psxwk2@nottingham.ac.uk
Xia Li (IDIC)
xiali@nottingham.edu.cn
Yao Li (IDIC)
yao.li@nottingham.edu.cn
Horia Maior
psxhama@nottingham.ac.uk
Felix Osebor (IDIC)
felix.osebor@nottingham.edu.cn
Yiming Quan (IDIC)
yiming.quan@nottingham.edu.cn
Liam Sloan
psxls1@nottingham.ac.uk
Lachlan Urquhart
psxlu1@nottingham.ac.uk
Ning Xue (IDIC)
ning.xue@nottingham.edu.cn
Chao Zhang (IDIC)
chao.zhang@nottingham.edu.cn

Richard David Brown

Multimodal Performance and Improvisation

Overview

My PhD research is led by practice and informed by contemporary critical theory on performance and technology; it is an interdisciplinary enquiry located at the intersection of Computer Science and the Performing Arts. The Computer Science/HCI research focuses on the use of natural computing interfaces such as gesture and voice combined with high performance multimodal delivery - audio, video, text and 3D graphics. The research further examines the necessary software and systems platforms that can provide engaging content production and performance delivery.

Intended outcomes of the practice led research are the production and delivery of performative demonstrations to be evaluated “in the wild”. Methodologies informing the research are drawn from Practice As Research In Performance (PARIP) [1] and Performative Research (Haseman 2006) [2].

The outcome of the research are documented at http://kinectic.net/; the website includes a historical context for the research, an artistic audit of similar practises, an overview of current research technologies and an ongoing research blog documenting videos of experimental demonstrations and reflective autoethnographic analysis.

Research Questions

- Can multimodal technologies be used to produce new and innovative forms of live improvisational performance?
- How might real-time improvisation between a performer and multimodal technology produce an engaging audience experience?
- By what mechanisms might the performative concepts of the uncanny [3], liveness and mediation [4] impact upon and inform the research practice?

Progress

In November 2013 the first working prototype of a performative system was realised using a Microsoft Kinect and a modified version of the Japanese MikuMiku software [5]. A performer wearing a white bodysuit and video glasses see themselves overlaid with a projection of a virtual character that closely mirrors their movements. The visual feedback of the projected character mapping has the effect of immersively transforming the performer into another character.

Video documentation and a textual commentary can be seen at: http://kinectic.net /miku-morphia-experimental-performance/

Image 1 is a still taken from the video documentation of the MikuMiku experimental performance.

The effect of viewing myself as a male transformed into an idealised female anime character produced a strange sense of the uncanny and a somewhat disturbing feeling of otherness. The concept of the uncanny is a familiar term within literature and was first analysed by Jentsch in 1906 [6] and then taken up by Freud in 1919 [7]. The uncanny has recently made an impact on computer graphics and robotics research in the form of “The Uncanny Valley” [8] where a representation of the human form appears almost human but not quite, producing a sense of disturbance and uncomfortableness in the perceiver.

Feedback from my supervisors suggested that the sense of the uncanny might be better achieved by the use of more realistic human characters and moving away from the limited cartoon anime aesthetic of the MikuMiku software.

In January 2014, a prototype system supporting a range of aesthetic renderings, including greater degrees of realism, was successfully implemented using the Unity Game Engine [9] and plugins for the Kinect SDK. The Unity Engine supports the import of a variety of characters and the programming of 'intelligent' and autonomous behaviours and interactions between characters and scenes. In addition the functionality of the Unity Engine can be extended by plugins and software scripts enabling the additional of modalities such as voice recognition. It is currently envisaged that the Unity Engine will provide a suitable platform for the ongoing development of a series of practice led performative research scenarios.

In order to assess whether more realistic characters do create a greater sense of the uncanny, a range of characters have been sourced from copyright free characters on the net and two different character modelling packages – DAZ Studio [10] and the highly realistic and flexible Open Source project MakeHuman [11]. The varying degrees of realism of the characters are illustrated by the stills taken from video footage of the projected characters. Image 2 is a fairly unrealistic Unity model, image 3 is a semi-realistic DAZ Studio character and image 4, from the MakeHuman software is the most realistic.

One of the challenges in sourcing characters was determining whether the models possessed the correct internal skeleton rigging that matched the Kinect model. Many free semi-realistic characters sourced from online libraries had to be rejected as their internal structures differed from the Kinect model. To rectify rigging inconsistencies I investigated the use of 3D graphics tools such as Blender, Maya and 3D Studio Max; however this turned out to be a non-trivial exercise requiring both expertise in using the software tools and skills in rigging and skinning characters.

MakeHuman though producing highly realistic characters in a suitable format, currently provides little in the way of clothing which have to be added using Blender, whereas DAZ Studio offers a vast library of clothing and accessories. Due to time constraints and the availability of reasonably priced models and accessories in the correct format from DAZ Studio, the use of 3D modelling tools to modify existing models has been put on hold.

A number of performance experiments have been carried out in the Mixed Reality Lab by myself and invited participants with a range of virtual characters ranging from a cartoon anime aesthetic through to highly realistic human representations of the human form. Anecdotal feedback from performer participants and viewers has been positive, confirming the potential of the system as a vehicle for creating a new type of performance with the ability to disturb and evoke a sense of the uncanny.

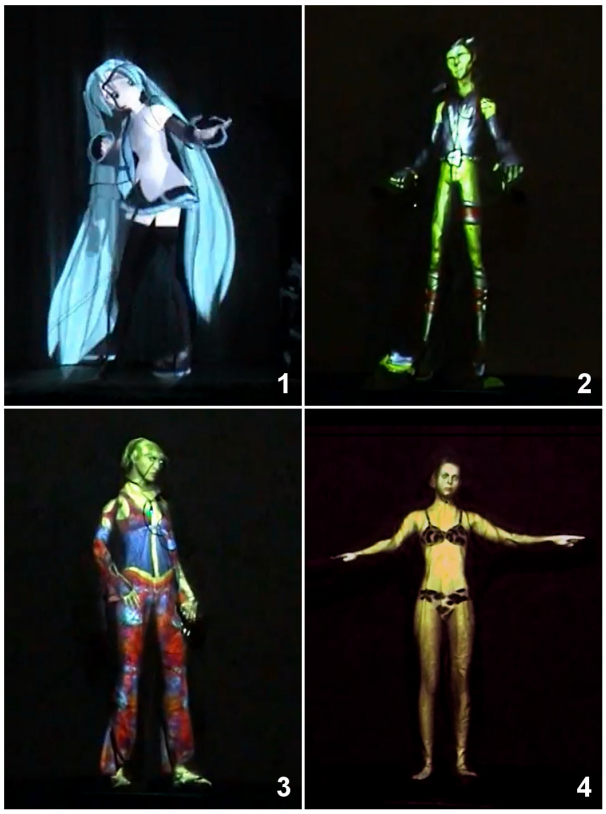
In order to critically assess the conceptual and creative potential of the system, a number of workshops will be carried out with invited groups of practising performers. In addition a number of additional modalities such as voice recognition and interaction with virtual objects will also be demonstrated at the workshops. The workshops will be recorded and key points drawn out through group dialogue and feedback. Interviews may be later carried

out on selected participants. Papers will be produced based on the findings of the workshops.

The first workshop is planned for April 2014 and will be held at Nottingham University whilst a second workshop is scheduled to be held at the Fascination Conference, Falmouth in August 2014 (subject to confirmation) [12]

Future research possibilities include the investigation of how:

- Improvisation might be supported through the scripting of random, neural, emergent and autonomous actions in scenes.
- Two or more performers might work with a multimodal performance system.
- Methodologies might be devised that enable performers to create interactive multimodal scenarios.



References

1. Practise As Research in Performance (PARIP) http://www.bris.ac.uk/parip/faq.htm [7/3/2014]
2. B. Haseman. A manifesto for performative research. Media International Australia incorporating Culture and Policy, 2006, 118, 98-106.
3. M. Causey. The Screen Test of the Double: The Uncanny Performer in the Space of Technology. Theatre Journal, 1999, 51/ 4, 383-394.
4. P. Auslander. Liveness: Performance in a Mediatized Culture. New York, Routledge, 1999.
5. MikuMiku dance software. http://www.geocities.jp/higuchuu4/index_e.htm [7/3/2014]
6. E. Jentsch. On the psychology of the uncanny. 1906.
7. S. Freud. The Uncanny. 1919.
8. M. Mori. Bukimi no Tani Gensh. 1970.
9. Unity Game Engine. https://unity3d.com/ [7/3/2014]
10. DAZ Studio. www.daz3d.com/ [7/3/2014]
11. MakeHuman. www.makehuman.org/ [7/3/2014]
12. Fascinate conference and showcase. http://www.fascinateconference.com/ [7/3/2014]

James Burnett

Simulation of Exhibition Spaces to Inform More Engaging Experiences

My work is attempting to model the use of museum and gallery spaces through a computing approach known as Agent Based Modelling (ABM) [1], to accurately represent the actions and interactions of multiple visitors each with their own tendencies and preferences for how to move around and interact with exhibits. An ABM allows me to create a set of basic templates for different visitor profiles i.e. Elderly, Middle Aged, Young Children etc. which can then be superimposed with a range of behavioural variables (personality), such as comfortable personal space or dwell time at exhibits etc. The combination and interaction of these variables between agents, as well as within the agents own decision making, results in emergent behaviours that could not be predicted or coded for if the program were constructed procedurally. The subtleties of these interactions should then allow me to adjust the Agents profiles as well as the configuration of the space to test the effects of visitor type [2] as well as the layout of exhibits.

To understand the manner in which people move around spaces I am currently reading literature focusing on interactions around public displays. This work considers location and configuration of displays in public and semi-public settings, specifically addressing Approach and Interaction behaviour of individuals and the social mechanisms used to manage these engagements [3,4,5]. This is a rich vein which presents underlying Psychological models of human interaction, where I am hoping to draw out a set of differences in behaviour and key actions within these engagements to inform the variables within the Agents interaction model. To further address the behaviour of Agents I am additionally approaching the problem from a Sociological perspective by looking at Museology literature, which considers interaction of individuals with exhibits and the manner in which group behaviour plays a role in forming an experience for the visitor [6,7]. The drawback of this approach is that the majority of the literature considers the local interactions with exhibits relating to bodily orientation, gesture and conversation and does not consider the movement between exhibits or around the space. However, the information does convey group behaviours and the underlying effects of heterogeneous layout in relation to an overall experience [8]. An understanding of experience may provide an interesting metric when considering the effectiveness of a certain layout.

To construct my model I am currently using the RePast Simphony ABM Software Development Kit (SDK) [9], which leverage's NetLogo, Java and C++ depending on your needs. This is a well established piece of software which is used extensively in Social Simulation as it is very accessible for non-programmers, however, the resulting documentation is not orientated to established coders and is lacking in depth and clarity. However, the prolonged use of this code base has resulted in a range of examples being available to begin developing my own model.

The current model is extremely simple and allows Agents to move around a pre-defined space whilst having a rudimentary awareness of their surroundings. Currently this extends to wall segments i.e. representing equally spaced

markers along wall surfaces, however, from this awareness the Agents are capable of building up a local picture of the Spatial Configuration and making decisions about their movement as the result of the layout of the walls. The next step would then see Agents identify other Agents for basic avoidance behaviour, as well as observation of exhibits. Once Agents are capable of locating Points of Interest they would be able to facilitate route planning and it is at this stage I would begin to consider group interactions and the effect of group composition on movement and engagement, as it will impact upon the way routes are decided upon and how the group as a whole will move around the space. It is important to consider the effects of a group as it is very rare that people will visit exhibits, or engage with artefacts as individuals, it is much more common to see these interactions between groups (80%) [3].

As part of my future development I will also be considering the use of real world data to improve the accuracy of my model. This will involve a simple approach of finding a Proximity and Orientation relationship between people toward Spatial Configurations i.e. Walls, Corners, Pillars [1] in a real world setting, as well as the same metrics across inter- and intra- group relationships when interacting and engaging with artefacts, levering the principles of Kendon's f-formations for competitive and collaborative stances during face-to-face interactions [10]. By knowing these relationships in a given context the underlying model will be more accurate and will also allow for a more detailed understanding of behaviours in known population distributions.

References

1. Penn, A., & Turner, A. (2001). Space syntax based agent simulation.
2. Silverman, B. G., Johns, M., Cornwell, J., & O'Brien, K. (2006). Human behaviour models for agents in simulators and games: part I: enabling science with PMFserv. Presence: Teleoperators and Virtual Environments, 15(2), 139-162.
3. Peltonen, P., Kurvinen, E., Salovaara, A., Jacucci, G., Ilmonen, T., Evans, J., ... & Saarikko, P. (2008, April). It's Mine, Don't Touch!: interactions at a large multi-touch display in a city centre. In Proceedings of the SIGCHI conference on human factors in computing systems (pp. 1285-1294). ACM.
4. Ten Koppel, M., Bailly, G., Mller, J., & Walter, R. (2012, May). Chained displays: configurations of public displays can be used to influence actor-, audience-, and passer-by behavior. In Proceedings of the

SIGCHI Conference on Human Factors in Computing Systems (pp. 317-326). ACM.

5. Hindmarsh, J., Heath, C., Vom Lehn, D., & Cleverly, J. (2005). Creating Assemblies in Public Environments: Social interaction, interactive exhibits and CSCW. Computer Supported Cooperative Work (CSCW), 14(1), 1-41.
6. Heath, C., & vom Lehn, D. (2004). Configuring reception (dis-) regarding the 'spectator' in museums and galleries. Theory, Culture & Society, 21(6), 43-65.
7. Pink, S. (2008, September). Mobilising Visual Ethnography: Making Routes, Making Place and Making Images. In Forum: qualitative social research (Vol. 9, No. 3).
8. Tzortzi, K. (2011). Space: interconnecting museology and architecture. The Journal of Space Syntax, 2(1), 26-53.
9. http://repast.sourceforge.net/
10. Kendon, A. (1992). 13 The negotiation of context in face-to-face interaction. Rethinking context: Language as an interactive phenomenon, (11), 323.

Peter John Craigon

Is it Possible to Accurately Represent Social Issues on Map / in a Spatial Context?

My overall research interests are in how the 'real world' is translated into knowledge and how the processes involved in this translation process shape and influence understanding of the world. My project takes this interest and focuses on two types of knowledge, geospatial knowledge in the form of maps and GIS and social 'knowledge', relating to social and cultural issues. My project therefore focuses on critically examining the processes involved in representing social issues in a spatial context, often across a map, and how this influences the knowledge of the area and issue represented. Considerations of accuracy in this process will underlie all my investigations and act as a useful focus to understand how accuracy is defined and used in different contexts. This will provide an answer to the question 'Is it possible to accurately represent social issues on a map/ in a spatial context?'

This has been inspired by my previous study of History and in particular the work of the literary critic Hayden White with respect to the study of History [3]. In opposition to those who argue that History can achieve the status of a science revealing 'what really happened in the past' White argues that selecting, necessarily partial evidence, interpreting and writing this in a narrative form is not a neutral process, but has a content which influences the account of the past presented. History as written in narrative form therefore cannot be considered scientific but has more in common with literary representations and knowledge about the world. The narrative form has content, hence the title of White's collection of essays 'The Content of the Form'. White's critical attention is focused on how Historians translate the world into knowledge in their work. I have therefore been inspired to examine how representing social issues in spatial context may have a 'content' of its own and thereby influence the knowledge produced and represented, and consequently users' understanding of the place and issue represented. If White revealed the content of the form of narrative History then I am interested in attempting to reveal the content of the form of representing social issues

‘accurately’ in a spatial context.

This requires a multidisciplinary approach, which includes GIS, History, Critical Theory and Computer Science. In order to work towards an answer to my research question my project will have a significant historical component to illuminate elements of the genealogy of social mapping, which has lead to contemporary representations of social issues in a spatial context.

This historical element will focus on two main case studies. The first of these will examine what is known as Booth’s Poverty Map, a social map produced as a part of a survey of the living conditions of the people of late Victorian London. This visually represented the streets by colouring the buildings according to the ‘class’ of their inhabitants who were divided into seven categories according to income and other factors. I am interested to see what lessons can be drawn from this map in creating social mapping and addressing my research question.

I also plan to examine the role of mapping social issues in the Partition of India, the complex process whereby British India was granted independence in 1947 and divided into the states of India, Pakistan and East Pakistan (later Bangladesh). This was done along religious lines based on census information with India comprising areas with a Hindu majority and Pakistan areas with a Muslim majority. This will give an insight into the potential consequences of mapping social issues as it is estimated that the Partition of India resulted in the migrations of 14.5 million people [1] and between 200,000 and 1,000,000 deaths [2].

I will also analyse contemporary uses of social measures and mapping to inform my project. Present day measures such as the Indices of Multiple Deprivation, combining seven factors are used to measure deprivation by census area and are used by the British government and local authorities to inform policy and distribute funding. These will be examined along with other instances of social measures and mapping in Britain and elsewhere to show how knowledge of social issues is constructed and then represented in a spatial context.

Underlying this analysis and all aspects of my PhD will be a strong critical element to help reveal how representations of the world are constructed and how they shape and convey spatial knowledge to users of the maps and other representations. This critical approach will depend on what is most pertinent to my research but I am particularly interested in the approaches to space and representation of figures such as Michel Foucault and Gilles Deleuze. I am also interested in the philosophy of pragmatism that focuses on use as critical to understanding concepts. Considering the use of social mapping as examined in the case studies will be crucial to understanding the concepts and meanings associated with the examples of social mapping surveyed.

The examination of these examples of contemporary and historical social mapping will ultimately inform the development of a new representation of social issues in a spatial context, over a map if appropriate. This is intended to combine the findings from the examination of previous social mapping to produce a more satisfactory or ‘accurate’ representation of social issues. This will use computational methods, particularly GIS, potentially using Ordnance Survey data identified during my internship. I am also interested in investigating the use of computational methods such as Fuzzy Logic

to potentially more ‘accurately’ represent social issue data by accommodating uncertainty that is so present in the real world yet appears so lacking in the representations of social issues I have examined to date. The test of this new representation will be a user study to reveal how users understand the knowledge represented in my new spatial representation of social issues. This will ultimately allow me to bring together the multidisciplinary strands of my PhD to provide my answer to my overall research question as to whether it is possible to ‘accurately’ represent social issues in a spatial context.

The most recent period of work completed towards my PhD has been the Internship required by the Horizon CDT programme. Between November 2013 and February 2014 I spent 12 weeks working at the head offices of Ordnance Survey in Southampton. Ordnance Survey is the UK’s national mapping authority and they fulfil a statutory requirement to maintain and update national geographic data for use by government, business and public customers. Whilst at Ordnance Survey I pursued two projects to contribute to my overall PhD.

The first of these projects compares how four different methods of visualisation used to convey data uncertainty affects users understanding of an abstract map showing deprivation. This study is delivered via online survey software and when complete the findings of this survey will inform the method I choose to represent and visualise data uncertainty on the new ‘social map’ that I intend to produce as an outcome of my PhD.

Alongside this study I also conducted data collection for an Ethnographic study of Ordnance Survey. As my interests are centred on translating the world into knowledge I was interested to investigate how Ordnance Survey goes about translating the world into knowledge in the forms of its geographic data, which often forms the spatial basis for the representation of social issues. This Ethnographic study included participant observation, reflecting on all aspects of my experience and the environment of Ordnance Survey, collection a review of documentation relating to the work of Ordnance Survey as well as a series of observations and interviews. Due to the scale of the organisation and my research interests I chose to focus my work and interviews on the process from capturing data in the real world through to the database and then to its use in Ordnance Survey products. I interviewed or directly observed 14 members of staff involved in this process in order to understand their job and the process of capturing data and making products in more detail as well as gaining an insight into the culture of OS. The findings from this study will inform all aspects of my PhD. The first stage of analysis will focus on producing a detailed explanation of the process involved in capturing data and producing products, renowned for their quality and accuracy, giving insight into how ‘accurate’ geospatial representations of knowledge of the world are created in practice.

My internship has given my project a lot of momentum and my task over the next few months will be to analyse my findings from the two projects alongside working on the other strands of my work to identify the aspects of the spatial representation of social issues that I need to address in creating my new ‘social map’ and providing an answer to my research question.

References

1. Bharadwaj, Prashant and Khwaja, Asim Ijaz and Mian, Atif R., The Partition of India: Demographic Consequences (June 2009). Available at SSRN: http://ssrn.com/abstract=1294846 or http://dx.doi.org/10.2139/ssrn.1294846
2. http://necrometrics.com/20c300k.htm#India accessed March 2014
3. White, H. (1987). The Content of the Form. The John Hopkins Press.

Dimitrios Paris Darzentas

The Lives of Objects — Exploring the Effects of Traceable Provenance and Narrative on the Value and Meaning of Physical Objects

Abstract

The following research focuses on the investigation of the value of singularised physical objects and how that value may be influenced by taking into account the traceable provenance caused by their footprint in a ubiquitous computing enabled world. The chosen context is that of Wargaming Miniatures as they encompass a wide array of properties that are suitable to the investigation, both in their inherent makeup as well as in the community that surrounds them.

Research Question

Currently, the research question that will serve as the motivating force can be distilled thus: "How can the detailed tracing of provenance, heritage and history of physical objects, affect their value?" This question can be further disambiguated into the following sub-topics:

- "What comprises the provenance of an object and how is it formed?"
- "How is this provenance preserved, transferred and recounted?"
- "How do interested parties examine and evaluate the provenance of an object?"
- "What effect does the provenance of an object have on its value and how is value defined?"
- "What would be the impact of detailed traceable provenance on the value of objects?"

Introduction

Over their lifetime, physical objects accumulate value (monetary, sentimental, etc.,) via their provenance. Straightforward examples include unique items such as pieces of artwork or particular antiques. More often than not in such cases, the monetary value of these items is for the most part created by their individual histories. Objects known to have belonged to historical or famous individuals, or to have been used in historical events etc. are thought by society to be of much greater value than others. Entire disciplines and industries exist surrounding this phenomenon, but it is also observable on much smaller scales, and in situations that the majority of people can relate to, in the form of sentimental value. Most people attach greater value to personal objects, and it seems an intrinsic part of human nature to grow attached to the objects that surround us in our daily life, assigning personal value to them, in the form of memories, experiences and associations. Examples could include mementos, souvenirs and meaningful gifts,

such as family heirlooms. Commonly, people will cherish such objects and express this in terms of sentimental attachment and emotional meaning rather in the form of monetary value.

Currently, the world is moving, with increasing rapidity, towards an age where the vast majority of the physical objects that surround us have a digital identity, or presence, that creates a digital footprint or trace over their lifetime. As concepts like ubiquitous computing and the internet of things gain ground, physical objects are increasingly becoming able to collect data over, and about, their lifetime. There is a shift from the extrinsic collection and application of data to objects by their owners or users, to an intrinsic ability for objects themselves to capture and create data and "tell their own story". The required technology is being continuously developed, refined and miniaturised and the only real limit to its use is the imagination. The resulting data can form rich narratives from the point of view of the objects, creating performances that may potentially influence the way we interact with the objects around us.

For the purposes of the research, the chosen physical object medium that will be used is that of Wargaming miniatures. These objects feature distinct advantages with regards to the concept as they represent and embody elements such as identity, experience, abilities and point of view. Furthermore they are surrounded by a large and active community that comprises of Creators, Collectors and Games.

Context

For the purposes of exploring the evolving phenomenon described above, an approach had to be utilised devised that was be based on a flexible theoretical model and utilised a coherent practical context.

The theoretical framework of trajectories has been explored thoroughly in the case of User Experiences [1] and it is potentially applicable in the form of object trajectories. Similar to the trajectory of a user's experience, the trajectory of an object through space, time and interactions can be envisioned and explored. In a sense the 'stories' that the objects have to tell, as for instance, in the case of the popular 18th century literary concept of It-Narratives [2], can be illustrated utilising the concept of historic trajectories [1].

On the practical side, it was determined that this research would benefit from being carried out by examining objects in a context that lends itself to the concept. There are innumerable options for choosing the object to use as a vehicle for this research. Virtually every physical, and digital, object surrounding us is eligible as the object of interest. The context that has been chosen to begin the investigation of object trajectories is that of Miniature Wargaming.

Miniature Wargaming constitutes a handy and convenient medium for the purposes of this research for a variety of reasons. As an activity, it stands as a timeless and effective form of entertainment and training. The explicit and implicit codification of rules and possible actions could potentially act as a useful guideline for the data gathering process.

Practically, miniature Wargaming involves physical objects in the form of figurines and constructs that facilitate gameplay. These present interesting elements as they represent very complex entities that inherently possess many of the qualities that can facilitate the exploration of object narratives and provenance. They represent such properties

as identity, abilities, and experiences and throughout their existence gain provenance, history, and personal meaning. Players display personal investment by creating and heavily customising the miniatures, curating them and, in some cases, maintaining detailed provenances of their lifetime. The 'it-narratives' of the involved objects, augmented by their intrinsic identity, are potentially a powerful method for expressing the trajectories of these objects. The rich data the miniatures represent are expected to be of great value in deriving conclusions for this avenue of research.

Therefore, miniature wargaming displays and encapsulates ideal characteristics for the investigation of assigned object value but crucially includes many technical advantages. The nature of the physical miniatures is well suited to potential physical augmentation, such as integrating data gathering sensors and digital identifier, and there are numerous endeavours, both academic and commercial, focused on digitally augmenting Wargaming that can be of great assistance during the research. Furthermore, the value and meaning that their owners assign to them is also vital characteristic. In effect, Miniature Wargaming is a collector and hobbyist practice, with accompanying vibrant communities, community practices and evolution which is expected to provide a rich source of information and a scaled context to investigate effects and hypotheses.

The combination of the theoretical framework of object trajectories and the practical context of Wargaming sets the stage for a concentrated research endeavour that can potentially be expanded and applied to many other domains and applications. Similar gaming and collecting contexts can be examined and the further reaching domains of cultural heritage and historical artefacts can be investigated. The following section identifies a number of potential domains to which the results of the proposed research may be applied.

Methodology and Progress so Far

The first step of this research was to conduct an in-depth ethno-methodologically inspired ethnographic investigation of the Wargaming community in order to establish the actual common practices revolving around the miniatures and to gain an understanding of the motivations and potential requirements of the community.

So far, this investigation has delivered substantial results, with many of the hypotheses regarding the community and their treatment of the miniatures, being validated and indeed expanded. Themes of curation and narration are evident throughout as well as those of creation and customisation and lifelong tracking. The relationship of the miniatures to their creators and/or owners is both complicated and colourful, leading to a rich repository of data and a strong launching point for further studied and technological development.

Pertinent to this, the first steps are being made in the design of frameworks to clarify this situations as well as implementations of technological enablers rooted in the concepts of the Internet of Things.

Expected Contribution

This research would aim to attain a deeper level of understanding of the oncoming changes to the physical objects that surround us. The relationship between object provenance, history and meaning (effectively its trajectory), and its sentimental and monetary value, would potentially be identified.

This could have effects on a wide variety of domains ranging from design and manufacture to legislation and social practices.

Additionally, entry into the complex concept of object trajectories could establish an identifiable and utilisable context and frame of reference for further academic and entrepreneurial endeavours in the domain. The approaches and findings of the research will be formed in such a way as to be generalisable to other applications and contexts. Indicative examples of such could include tangible areas such as medical records, traceability applications in the food industry, etc. and others such as trajectories of design, ideas, movements and archiving. As the definition of what constitutes an "object" is loosened, so can the number of potential applications grow, from the physical to the digital and beyond.

References

1. Benford, S., Giannachi, G., Koleva, B., and Rodden, T. From interaction to trajectories: designing coherent journeys through user experiences. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM (2009), 709–718.

2. Blackwell, M. The Secret Life of Things: Animals, Objects, And It-narratives in Eighteenth-Century England. Bucknell University Press, 2007.

Liz Dowthwaite

Online Interactions Between Webcomics Artists and Readers: Social Media and Crowd-funding

Abstract

Webcomics are comics made by an independent creator and posted online for free. Those that make money do so through selling books and merchandise, advertising, and patronage through crowd-funding. Social media is used extensively in crowd-funding campaigns; this PhD focuses on how artists use their online communities for this purpose, also looking at issues of ownership and attribution. It is hoped that the results can be applied to other creative groups and individuals trying to make their living in similar ways.

Introduction and Background

Webcomics are comics that an independent creator posts on the internet for free [2]. There are many thousands on the Internet at any one time, most of which do not have a large readership or make any money. However, many do make some form of income, and a few artists are able to support themselves full-time through their webcomics. The relationship between creators and readers of comics has been recognised for many years [5], and webcomics are able to embrace Web 2.0 (and newer) technologies for this purpose: "One

of the greatest things about Webcomics is the immediacy, frequency, and intensity of your interactions with readers. You can talk to them, and they can talk back" [3 p.104]. Artists develop meaningful relationships with their audience over time, often several years, forming extremely dedicated communities that are willing to spend time and money supporting them [1, 3, 4, 6, 7, 8]. Alongside these critical relationships, artists must also manage the use of their work online, ensuring that their rights are maintained. Illegal hosting of content on the Internet is a problematic area, and whilst most creators accept that this is somewhat inevitable, webcomics communities have been known to take to the social networks in great numbers to protest when work is copied or re-posted without attribution.

The basic webcomics business model is to "offer free-to-the-consumer, ad-subsidised content, which then trades on audience loyalty by selling books, t-shirts, merchandise and original art" [3 p.121]. This audience loyalty is cultivated through social media. As well as advertising and merchandise, a third, related business model is emerging which could be termed 'patronage', where creators use crowd-funding platforms to raise money for projects or to elicit subscriptions, whilst their comic content remains free-to-view. Specifically, crowd-funding websites such as Kickstarter [9] and Patreon [10] are incredibly popular in the webcomics community, and are allowing more and more artists to make money from their work. Many artists self-publish books and this is one reason that Kickstarter has been such a success, essentially acting as a pre-order system for some creators. 'Dresden Codak' artist Aaron Diaz funded the printing of his first book within an hour, ending with 1783% of his target amount from over 7500 backers [11]; likewise 'Dumbing of Age' and 'Shortpacked' creator David Willis has run three successful campaigns, each earning between 118 and 370% of the goals [15]; Kate Ashwin of 'Widdershins' and 'Darken' has successfully run 2 campaigns gaining 213% and 325% funding respectively [16]. Other webcomics-based projects that are getting funded in this way include games, toys and figurines, animated shows, and entirely new comics; practically every webcomics-based Kickstarter campaign has succeeded, often hugely over-target. Patreon has only recently begun to make waves in the industry, with more artists joining every day. Jonathan Rosenberg, creator of 'Goats' and 'Scenes from a Multiverse' currently has 816 patrons bringing in $2482.25 per month of comics [17]; Zach Weinersmith of 'Saturday Morning Breakfast Cereal' has 2878 patrons bringing in $7722.95 per month of comics [18]; Joel Watson of 'Hijinks Ensue' began his campaign barely a week ago and already has 118 patrons bringing in $858.30 a month [19].

PhD Contribution

It is fascinating that an increasing number of artists are able to support themselves full-time using the merchandising and donation models described above. This PhD is concerned with how creators use social media sites to build communities and use them to their benefit, both financially and in terms of ownership rights. Social media is used extensively in crowd-funding campaigns such as those discussed above, and in disputes over attribution. The example of such a niche group as webcomics, who are only going from strength to strength, may be used to aid other groups and individuals who more and more are turning to the Internet to help them succeed in the creative industries.

Progress to Date

In order to begin the examination of social media use in the webcomics community, a questionnaire was compiled and distributed to webcomics creators and readers, asking about which websites people use and for what purpose. The preliminary results have been analysed, although the questionnaire remains live. A brief overview is given next. 202 respondents were split into two groups: 'Creators' who also create comics (90), and 'Readers' who do not (112).

Readers tend to read more comics than creators, but over a quarter of both groups regularly read more than 21 titles. Most creators had been maintaining their current webcomic for 2 years or less, have created 1 comic, and update once a week. Around 15% receive more than 5000 unique visitors a week, and 6 of the creators who responded consider themselves to make a living wage. Creators and readers make use of many different websites to engage with each other in different ways, and almost without fail (after the comic's own website) the most used sites are social media sites: Twitter, Facebook and Tumblr. Reddit, Google+, DeviantART, Pinterest, Instagram were also mentioned relatively frequently.

Behaviour surrounding merchandise was also questioned. Only half of the creators who responded sell any kind of merchandise; most commonly books and artwork. Most respondents have however bought merchandise of some kind; again the majority was books, which are bought by a lot more creators than readers. It is interesting that people buy book collections and prints of comics that they have already read for free online, especially as it can be assumed that books may include e-books, and art includes prints of comics which have already run. Clothes are also a very popular purchase; this is potentially related to a desire to be part of a 'niche group' – only those who also read the comic are likely to recognise a t-shirt based upon it. Further analysis of this buying and selling behaviour would be interesting; it is likely that readers who are more engaged with webcomics creators through social media will spend more money on a comic and buy more items.

At the time of questioning, only around a quarter of the creators said that they take donations. Far fewer took subscriptions; however since then, as mentioned above, Patreon has become highly popular so these numbers may not be representative. A relatively high percentage of respondents have however given a donation or subscription suggests that readers are quite happy to reward an artist that they feel deserves it, and to pay for things they already receive for free. It is also interesting to note that more creators donated or subscribed to their fellow artists than asked for money themselves.

Three UK Comic Conventions have also been attended [12, 13, 14], and a series of 11 interviews with creators have been carried out. They were asked about their experiences with social media, copyright and IP, and crowd-funding. These interviews have been transcribed and are currently being analysed, looking at how artists use different social media sites, and documenting issues and the different types of interactions that occur.

Going Forward

Future work will investigate whether there are significant links between social media use, reader engagement, and the ability to monetise a free-to-view work. It appears that social

media allows artists to interact with their readers more meaningfully, and in turn this makes them more likely to spend money.

Further studies will be designed on the basis of the results of the questionnaire and interviews. They are likely to include qualitative studies such as case studies of artists who are financially successful; monitoring of Patreon and Kickstarter campaigns; and further interviews. These will be combined with other methods such as corpus linguistics and social media mining, particularly of Twitter. It is also hoped that some of the issues raised by artists will be looked at from the reader's point-of-view. Mapping the online social networks of some artists and readers, using social network analysis, may also be beneficial.

The overall outcome of this research will be to understand how creators of webcomics have managed to find success on the Internet, and to help other creative groups and individuals to do the same through social media and crowd-funding.

References

1. Allison, J. Post-webcomics. A Hundred Dance Moves Per Minute, 2013. [Online] Available from http://sgrblog.blogspot.co.uk/2013/03/post- webcomics.html [Accessed 07/03/2014].
2. Fenty, S., Houp, T., and Taylor, L. Webcomics: The Influence and Continuation of the Comix Revolution. ImageTexT: Interdisciplinary Comics Studies, 2004. [Online] Available from http://www.english.ufl.edu/imagetext/archives/v1_2/group/index.shtml [Accessed 07/03/2014].
3. Guigar, B., Kellett, D., Kurtz, S., and Straub, K. How to make Webcomics. Image Comics, Berkeley, CA, 2011.
4. Jacques, J. Comics comics comics. LiveJournal, 2009. [Online] Available from http://qcjeph.livejournal.com/100732.html [Accessed 07/03/2014].
5. McCloud, S. Understanding Comics: the invisible art. HarperCollins, New York, 1993.
6. Rohac, G. Copyright and the Economy of Webcomics. Master's Thesis, Graduate School of Arts and Science, University of New York, 2010.
7. Watson, J. 4 Year Experimentiversary, 5 Year Anniversary & More Experimenting HijiNKS Ensue - A Geek Comic, 2012. [Online] Available at http://hijinksensue.com/2012/05/07/4-year-experimentiversary-5-year-anniversary-more-experimenting/ [Accessed 07/03/2014].
8. Watson, J. The Comic, The Experiment. The Whole Story. HijiNKS Ensue - A Geek Comic, 2013. [Online] Available at http://hijinksensue.com/experiment/story/ [Accessed 07/03/2014].
9. Kickstarter. 2013. [Online] Available at http://www.kickstarter.com [Accessed 07/03/2014].
10. Patreon: Support the creators you love. 2013. [Online] Available at http://www.patreon.com/ [Accessed 07/03/2014].
11. The Tomorrow Girl: Dresden Codak Volume 1 by Aaron Diaz. Kickstarter, 2013. [Online] Available at http://www.kickstarter.com/projects/156287353/the-tomorrow-girl-dresden-codak-volume-1?ref=live [Accessed 07/03/2014].

12. Nerd Fest Comic Con. 2013. [Online] Available at http://www.nerdfestcomiccon.com/ [Accessed 07/03/2014].

13. The Lakes International Comic Art Festival. 2013. [Online] Available at http://www.comicartfestival.com/ [Accessed 07/03/2014].

14. Thought Bubble - The Leeds Comic Art Festival. 2013. [Online] Available at http://thoughtbubblefestival.com/ [Accessed 07/03/2014].

15. David Willis. Kickstarter, 2014. [Online] Available at https://www.kickstarter.com/profile/326540223 [Accessed 07/03/2014].

16. Kate Ashwin. Kickstarter, 2014. [Online] Available at https://www.kickstarter.com/profile/1403226937 [Accessed 07/03/2014].

17. Support Jonathan Rosenberg creating Comics. Patreon, 2014. [Online] Available at http://www.patreon.com/jonrosenberg [Accessed 07/03/2014].

18. Support Zach Weinersmith creating SMBC Comics and Books. Patreon, 2014. [Online] Available at http://www.patreon.com/ZachWeinersmith [Accessed 07/03/2014].

19. Support Joel Watson (HijiNKS ENSUE) creating Comics. Patreon, 2014. [Online] Available at http://www.patreon.com/hijinksensue [Accessed 07/03/2014].

Sam Howard

Electronic Monitoring Devices in Asthma: Patient & Stakeholder Perspectives on Use and Implementation

Background

Asthma is a chronic respiratory condition with symptoms including wheezing, dyspnoea (shortness of breath) and cough. A patient is diagnosed with asthma based on the presence of such symptoms along with evidence of variable obstruction to their airways [1]. In the UK around 6% of the general population is diagnosed with asthma [2] and in the US this figure lies at around 8.3%; roughly 24.6 million people [3]. Despite asthma being a highly treatable condition with short-term and long-term medication available to control symptoms and relieve asthma attacks [4], the healthcare costs associated with asthma are staggering. In the UK current estimates suggest around 1 billion is spent every year on asthma care [2].

A robust finding in asthma research is that adherence to treatment is variable and often poor, with rates of non-adherence in patients ranging from 30-70% [5]. This is a major problem as for effective control of asthma and it's symptoms, a patient needs to adhere to at least 80% of their prescribed medication [6].

The consequences of poor adherence in asthma are clearly demonstrated across two studies. Firstly, an investigation carried out over 10 years with 30,569 adults and children with asthma revealed a significant positive correlation between proper use of inhaled corticosteroids (long-acting preventer

medication) and a decreased risk of death from asthma [7]. Secondly, a similar study over 7 years with 12,301 patients with asthma aged 5-54 found a significant positive correlation between overuse of inhaled 2 agonists (short-term reliever medication) and an increased risk of death from asthma [8].

This clearly highlights the importance of adhering to prescribed treatment for asthma. By adhering to their daily preventer medication, a patient can relieve asthma symptoms and control their condition. By not adhering, a patient will struggle to control their asthma, usually leading to severe symptoms and asthma attacks for which they need their reliever or 'rescue' medication. The end result is that by being non-adherent and relying on their reliever medication, a patient is at a greater risk of hospitalisation and death. These findings have made researching methods of measuring and improving adherence in asthma a top priority [9].

Electronic Monitoring Devices for Asthma

For measuring adherence in asthma, electronic monitoring offers the most accurate and practical measure available and is the method by which other methods of monitoring adherence should be compared [10–12]. For this research, the 'SmartTrack' Smart Inhaler (Fig.1.) developed by Nexus 6, Auckland, New Zealand will be used as an example of an electronic monitoring device (EMD) for asthma treatment. This device clips around a standard metered dose inhaler (MDI) and has an LCD screen capable of displaying information to the patient on last dose of medication taken, battery level, time/date and settings [13].

The SmartTrack records the date and time of every actuation of the inhaler and stores this in its internal memory [14]. It can later be connected to a PC and through dedicated 'connection centre' software can upload actuation logs to an online database where patterns of medication use over a period of time such as a week or month can viewed by the patient, clinician, researcher, or other person with granted access [13,15].

To date, research on EMDs for asthma has largely been clinical in nature. Studies have tended to focus on assessing the accuracy and reliability of these devices as this is of key importance before there is consideration of their widespread introduction into both clinical and research practise. However, factors including barriers to adoption, varying user needs and stakeholder involvement have been greatly overlooked.

Going forward in EMD research, a user-focused perspective is required, to investigate whether patients and key figures/stakeholders in asthma treatment such as GPs and asthma nurses believe EMDs could have a positive impact on asthma care. This should help highlight factors otherwise overlooked in studies investigating reliability and accuracy of such devices, helping to inform future research and development of user needs and requirements in the design of EMDs for patients with asthma.

Research Aims

1. Investigating patient attitudes towards EMDs including major factors such as data monitoring, data sharing, device appearance, social acceptability, and portability and practicality. Adolescents with asthma will be used as a sample for this, as asthma is one of the most prevalent conditions in children and adolescents worldwide [16] and adolescents tend to

be overlooked in the design of medical devices [17].

2. Consideration of attitudes and perspectives of key stakeholders in asthma care e.g. asthma nurses, GPs, pharmacists etc. How would they feel about implementation of EMDs? What do they see as the costs/benefits? Important issues will be assessed here such as; with the availability of adherence data at what point do these stakeholders feel like they have an obligation to intervene? How far above/under prescribed daily dose?
3. A systematic review of who makes the decisions in asthma care. If EMDs were to be introduced in the UK, how would this happen? Who would it involve?

Current Progress

Significant steps have been taken towards the start of the first study. This will consist of a one-month trial of the SmartTrack device with 10 adolescents with asthma recruited from the Children's Respiratory Service, QMC. Over this period, participants will complete three questionnaires, three interviews and keep an error log diary over the month of the study. A parent of legal guardian for each participant will also complete three questionnaires on their own attitudes towards their child's care, potential use of an EMD and issues surrounding this.

Stages for this study completed so far include:

- NHS ethical application – highly detailed application submitted to the research ethics committee (REC) and fully approved after attending a committee review and later re-submitting with minor amendments based on committee feedback. Application also submitted to research and development (R&D), currently awaiting approval before full ethical clearance for study is given.
- Nottingham University Hospitals (NUH) Honorary Contract obtained – allowing research in hospitals with patients to go ahead.
- Young Persons Advisory Group (YPAG) Workshop at the Medicine for Children Research Network (MCRN) at QMC hospital – Workshop with 11 young people aged from 9-17 years who read over participant information sheet for the first study and gave detailed feedback on anything they didn't understand or any suggestions for things they would like improving. The workshop was a very positive experience, with all young people stating that they would like to be participants in a study like this if given the opportunity and all agreeing that it was important research to carry out.

Other PhD related work carried out:

- Review article titled "Electronic Monitoring of Adherence to Inhaled Medication in Asthma" to be submitted shortly to the Current Respiratory Medicine Reviews journal. This is a literature review of all EMDs for standard MDIs in asthma care. For each device, it's features and limitations are discussed as well as any associated literature. Then the article considers future issues pertaining to the use of EMDs in asthma care including barriers to adoption, stakeholder involvement, novel methods of communicating adherence data, recording of data and cloud storage.

References

1. Tattersfield AE, Knox AJ, Britton JR, Hall IP. Asthma. Lancet 2002;360:1313–22.
2. NHS Information Centre. HSE 2010: Summary of Key Findings 2010.
3. Akinbami LJ, Moorman JE, Liu X. Asthma prevalence, health care use, and mortality: United States, 2005-2009. Natl Health Stat Report 2011;32:1–14.
4. Stern L, Berman J, Lumry W, Katz L, Wang L, Rosenblatt L, et al. Medication compliance and disease exacerbation in patients with asthma: a retrospective study of managed care data. Ann Allergy, Asthma Immunol 2006;97:402–8.
5. Horne R. Compliance, Adherence, and Concordance: Implications for Asthma Treatment. Chest 2006;130:65S–72S.
6. Lasmar L, Camargos P, Champs NS, Fonseca MT, Fontes MJ, Ibiapina C, et al. Adherence rate to inhaled corticosteroids and their impact on asthma control. Allergy 2009;64:784–9.
7. Suissa S, Ernst P, Benayoun S, Baltzan M, Cai B. Low-dose inhaled corticosteroids and the prevention of death from asthma. N Engl J Med 2000;343:332–6.
8. Suissa S, Ernst P, Boivin JF, Horwitz RI, Habbick B, Cockroft D, et al. A cohort analysis of excess mortality in asthma and the use of inhaled beta-agonists. Am J Respir Crit Care Med 1994;149:604–10.
9. Cutler DM, Everett W. Thinking outside the pillboxmedication adherence as a priority for health care reform. N Engl J Med 2010;362:1553–5.
10. Bender B, Wamboldt F, O'Connor SL, Rand C, Szefler S, Milgrom H, et al. Measurement of children's asthma medication adherence by self report, mother report, canister weight, and Doser CT. Ann Allergy, Asthma Immunol 2000;85:416–21.
11. Burgess SW, Sly PD, Morawska A, Devadason SG. Assessing adherence and factors associated with adherence in young children with asthma. Respirology 2008;13:559–63.
12. Ingerski LM, Hente E a, Modi AC, Hommel K a. Electronic measurement of medication adherence in pediatric chronic illness: a review of measures. J Pediatr 2011;159:528–34.
13. Chan AHY, Reddel HK, Apter A, Eakin M, Riekert K, Foster JM. Adherence Monitoring and E-Health: How Clinicians and Researchers Can Use Technology to Promote Inhaler Adherence for Asthma. J Allergy Clin Immunol 2013;1:446–54.
14. Foster JM, Smith L, Usherwood T, Sawyer SM, Rand CS, Reddel HK. The reliability and patient acceptability of the SmartTrack device: a new electronic monitor and

reminder device for metered dose inhalers. J Asthma 2012:657–62.

15. Patel M, Pilcher J, Travers J, Perrin K, Shaw D, Black P, et al. Use of Metered-Dose Inhaler Electronic Monitoring in a Real-World Asthma Randomized Controlled Trial. J Allergy Clin Immunol Pract 2013;1:83–91.
16. Mallol J, Crane J, von Mutius E, Odhiambo J, Keil U, Stewart a. The International Study of Asthma and Allergies in Childhood (ISAAC) Phase Three: a global synthesis. Allergol Immunopathol (Madr) 2013;41:73–85.
17. Lang AR, Martin JL, Sharples S, John A. A case study for the inclusion of adolescents in medical device design. Adv. Hum. Asp. Healthc., 2012, p. 1–10.

Richard James

Does Mobile Gambling Attract Existing Problem Gamblers, or is it Creating a New Population of Problem Gamblers?

My PhD research project is tasked with understanding whether there is the possibility that the way in which new gambling technologies are used predispose users to prolonged, harmful or addictive gambling behaviours. My research this year has primarily focused on whether the context in which applications on mobile devices are likely to be used can produce demonstrable behavioural effects that indicate that the patterns of reinforcement that are typically found in mobile gambling predispose users towards maladaptive or pathological behaviours.

Mobile gambling is an emerging market within the also emerging remote gambling sector. Mobile gambling is specifically identified as a key growth area within this by the gambling industry. Approximately 4% of the UK population will have gambled using a smartphone over the previous four weeks [1]. As has been the case with internet gambling [2], there is the need to understand whether there is reason to hypothesise that the technology that users gamble upon may affect their behaviour in a manner that is harmful to the users themselves and society in general. Although gambling is overwhelmingly a recreational activity, it is also recognised that gambling has the potential to become addictive, and that on average between 1 and 2.5% of the population across the world meet the criteria for problem gambling [3]. Problem gambling is idiosyncratic as the only recognised addiction that is purely behavioural [4].

My research over the past 12 months has consisted of three discrete research activities. The first was to conduct a psychometric analysis of two commonly used problem gambling assessments to determine whether the latent problem gambling construct that is being measured by these assessments is categorical or continuous. There is an extant debate within the problem gambling and the wider addiction and psychopathology literatures concerning whether these disorders are best represented as being categorical or dimensional [5]. Whether a disorder is categorical is to claim that a problem gambler or substance dependent individual qualitatively differs from recreational users. Alternatively, these disorders may be best represented as the extremes on a continuum – problem gamblers being defined as those who score above a threshold on an assessment

that is statistically meaningful and has clinical utility as a heuristic, but is ultimately an arbitrary discrimination. My PhD is based on assumptions that are derived from the Pathways Model [6]. The view that problem gamblers qualitatively differ from other gamblers has typically been synonymous with an addiction model of problem gambling, and the Pathways Model specifically claims that problem gambling is categorical; problem gamblers have lost control of their gambling behaviour, and that there are three qualitatively distinct classes of problem gambler, defined by associative learning, life stressors and antisocial/impulsive traits. The alternative viewpoint explicitly claims that problem gambling is defined by excessive gambling, which is represented on a continuum of harm. To answer this question, I conducted a taxometric analysis of two problem gambling scales from the British Gambling Prevalence Survey 2010 [7]. Taxometric analysis is a class of statistical analyses that are designed to test whether a series of indicators (i.e. questionnaire responses, behaviours) are best represented as a category or a dimension [8]. The findings of the analysis strongly supported a categorical interpretation; indices of fit indicated a categorical structure with both measures.

The second research activity has involved conducting an experiment to look at gambling behaviour and to model the first steps of problematic gambling, focusing on loss chasing. Mobile gambling (and gaming/application use more generally) is particularised by periods of play that are punctuated by delays - mobile content and user behaviour has been referred to as ‘snacking’, ‘skimming’, or observational evidence that smartphone users repeatedly checked on apps habitually. [9-11]. Research into app usage generally suggests that smartphone users only use a small number of apps, but engage with the apps they do use on a regular basis [12]. This is important as there is a longstanding series of findings in the associative learning literature which have demonstrated that when the length of the delay between reinforcements is long, it is liable to produce conditioned behaviours that are difficult to extinguish [13]. In addition, it has been previously found that pathological gamblers have an attenuated partial reinforcement extinction effect to gambling stimuli [14] and it is been previously hypothesised [15] that partial reinforcement may explain the perseverance of gambling even when the gambler repeatedly loses. As such, there is plausible reason to predict that this effect may explain aspects of loss-chasing behaviour. Loss-chasing is generally defined as the cycle of continuing and escalating gambling behaviour [16] that is the tipping point between recreational and problematic gambling behaviours [6]. To this end we designed an experiment that manipulated how frequently players won (i.e. rate of reinforcement) and the delay between an instance of gambling finishing and the opportunity to initiate gambling (the inter trial interval) to test whether the schedule of reinforcement that has been typically associated with mobile gambling demonstrates an attenuated partial reinforcement extinction effect. We further tested whether this pattern of behaviour affected people’s cognitions about gambling – we designed a contingency judgement task in the context of testing whether a fictitious drug was effective or not to test whether it affected participants’ judgements about the effectiveness of the drug, a behavioural measure of the illusion of control. The illusion of control is a cognitive bias [17] associated with a distorted expectation of the

success of a future outcome that has been demonstrated to translate to other domains in problem gamblers [18].

The experiment I am currently designing is intended to expand upon this experiment. One variable that was not controlled that may affect people's behaviour is the proportion of near-misses participants were exposed to. Near-misses are gambling outcomes that are losses that share strong but meaningless similarities with successful outcomes. The classic example of a near miss is demonstrated on a slot machine, where the first two reels of the machine display the same icon, and the third is different, particularly if the reel shows that the congruent icon is very close to the payline. Previous research has demonstrated that a machine that has a high proportion of near-misses (approximately 30% of outcomes) is preferred by gamblers to machines with fewer near-misses [19], and that gamblers play for longer on the machine when it stops paying out . What has not been investigated is whether the type of near-miss may differentially affect behaviour. One particular case of near-miss in the game of blackjack is ideal for this scenario; if a player reaches 21 using more than 2 cards and the dealer has drawn a blackjack, the player loses the hand despite meeting (all but one of) the criteria of winning. Blackjack also allows the opportunity to quantitatively manipulate the extent of a near miss in a similar way to a slot machine (i.e. distance from payline in slot machine compared to distance from 21 in blackjack). To this end we are conducting an experiment that manipulates the proportion of wins (as in the previous experiment), but also the type of near miss loss participants are presented with. It is predicted that these particularly salient outcomes will be associated with an attenuated extinction curve in comparison to less salient near-miss outcomes.

The findings of these studies are designed to guide subsequent experiments that will be conducted on smartphones to directly test whether these behavioural effects can be found with mobile users on the devices themselves.

References

1. ICM/Gambling Commission. Gambling participation: activities and mode of access, 2013. Available from http://www.gamblingcommission.gov.uk/pdf/Survey%20data%20on%20gambling%20participation%20-%20January%202013.pdf
2. Gainsbury, S., Russell, A., Hing, N., Wood, R., Lubman, D. & Blaszczynski, A. How the internet is changing gambling: Results from an Australian prevalence survey, Journal of Gambling Studies, 2013, in press.
3. Williams, R. J., Volberg, R. A. & Stevens, R. M. G. The population prevalence of problem gambling: Methodological influences, jurisdictional differences and worldwide trends. Report prepared for the Ontario Problem Gambling Research Centre and the Ontario Ministry of Health and Long Term Care, 2012.
4. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (5th Ed.). Arlington, VA: American Psychiatric Publishing, 2013.
5. Widiger, T. A. & Trull, T. J. Plate Tectonics in the Classification of Personality Disorder. American Psychologist, 62(2), 71-83.
6. Blaszczynski, A. & Nower, L. A pathways model of problem and pathological gambling. Addiction, 97, 487-499.

7. Wardle, H., Moody, A., Spence, S., Orford, J., Volberg, R. A., Jotangia, D., Griffiths, M., Hussie, D. & Dobbie, F. British Gambling Prevalence Survey 2010. Report prepared for the Gambling Commission, 2011.

8. Meehl, P. E. MAXCOV-HITMAX: A taxonomic search method for loose genetic syndromes. In Psychodiagnosis: Selected Papers (pp. 200-224). Minneapolis, MN: University of Minnesota Press, 1973.

9. Schuurman, D., De Marez, L., Veeveate, P. & Evens, T. Content and context for mobile television: Integrating trial, expert and user findings. Telematics and Informatics, 26, 293-305.

10. Neilsen. State of the Media: US Digital Consumer Report Q3-Q4 2011. Available from http://www.iab.net/media/file/Nielsen_Digital_ Consumer_Report_FINAL.pdf

11. Oulasvirta, A., Rattenbury, T., Ma, L. & Raita, E. Habits make smartphone use more pervasive. Personal and Ubiquitous Computing, 2012, 16(1), 105-114.

12. Pew Research Centre. Half of adult cell phone owners have apps on their phones. 2011 Available from http://pewinternet.org/Reports/2011/Apps-update.aspx

13. Mackintosh, N. The Psychology of Animal Learning. London, UK: Academic Press Inc., 1974.

14. Horsley, R. R., Osborne, M., Norman, C. & Wells, T. J. High-frequency gamblers show increased resistance to extinction following partial reinforcement. Behavioral Brain Research, 229(2), 438-442.

15. Coventry, K. R. & Brown, R. I. F. Sensation seeking, gambling and gambling addictions. Addiction, 88, 541-554.

16. Lesieur, H. R. The Chase: The Career of the Compulsive Gambler. Cambridge, MA: Schenkman, 1984.

17. Langer, E. J. The illusion of control. Journal of Personality and Social Psychology, 32(3), 311-328.

18. Orgaz, C., Estevez, A. & Matute, H. Pathological gamblers are more vulnerable to the illusion of control in a standard associative learning task. Frontiers in Psychology, 2013, doi: 10.3389/fpsyg.2013.00306.

19. Maclin, O. H., Dixon, M. R., Daugherty, D. & Small, S. L. Using a computer simulation of three slot machines to investigate a gambler's preference among various densities of near-miss alternatives. Behavior Research Methods, 2002, 39(2), 237-241.

William Knight

Can Hacktivism be Understood as the Performance of a Collective Identity?

Advents in technology have given rise to new opportunity for global social movement, protest and activism. The term "hacktivism" describes the innovative use of internet technology to "circumvent limitations and hack clever solutions to complex problems using computer and internet technology" (metac0m, 2003). Since 2008 the most prominent and often infamous manifestation of the hacktivist ethic has been the group known as "Anonymous". Anonymous are a group defined by vastly different means between the media and those who self-identify as members – for the former they are often portrayed as hackers seeking

to sow chaos and spread hate (Fox News once dubbed Anonymous “The Internet Hate Machine”; a moniker which some members wear as a badge of honour) and news stories on the group are often centered around the capture and detainment of prominent members and leaders. For those within the community the notion of detaining a “leader” of anonymous is laughable, they see themselves as a leaderless, faceless embodiment of the will of the internet: Landers (2008), when speaking to members of anonymous, was told “We are the internet”.

The symbol of Anonymous’ facelessness is the infamous “V” or “Guy Fawkes” mask – the smiling visage hides the features of the face of the wearer, allowing them to shed their own identity and instead, perhaps, adopt a new one – that of the “Anon”: an identity, for all intents and purposes, indistinguishable from any other member of Anonymous.

Using observation and interviews with self-identifying hacktivists, this project seeks to examine the nature of identity in the context of this new and influential group. Can hacktivism be understood as the rejection of individual identities in favour of the adoption of a collective identity – that of the faceless and omnipotent “Anon”? Does being a member of Anonymous presuppose an adherence to certain norms and, if so, how are these expressed? How are they reconciled if the conventions are broken?

Ethics

One of the main bottlenecks for this particular study has been the gaining of ethical approval to begin the research. The hacktivist community, though almost all of the spaces of interaction are available and open to the public to view, are relatively suspicious of outside attention. So determining the appropriate method of participant recruitment was absolutely paramount to the success of the study.

At first a joint application was made for both the ethnographic observation and the interview phase of the study. There were, however, certain complications which came with the interviews which were not present as part of the observation study. So, in order to begin observation whilst the challenges in the interview application were addressed, a separate application was made.

Approval to begin the ethnographic observation was provided shortly after the application was made and the observation period began.

In the meanwhile the challenges associated with gaining approval to interview hacktivists persisted and, ultimately, boiled down to a choice between two approaches:

Either the researcher completely conceals their identity, providing a certain degree of protection from any unwanted attention. Or the researcher approaches the participants openly, and allows participants, now fully informed, to make their own decision about whether they would like to take part.

After speaking to numerous academics, colleagues and supervisors it was decided that the second and more open approach was more practical. An attempt to maintain an anonymous identity would become more and more impractical as more participants were recruited, and the researcher attended conferences and research events were the project would be presented. Conversely, the open approach ensures that the participants are fully aware of their rights when it comes to taking part – and any potential risks can be somewhat allayed by putting in place

certain technical protective barriers between the researcher and participant.

After this particular issue was resolved, the application for approval was made and, after a number of months, was eventually pushed through.

Observation

Ethnographic observation has been ongoing for a number of months now, and a great degree of extremely useful information has been obtained – not just academically, but also practically in terms of it informing the interview stage of the study.

The observation has occurred across a number of sites; from forums and websites associated with anonymous and linked groups (such as chanology on whyweprotest.com) and also on IRC channels which are recognised to be an important meeting point for "Anons" worldwide (Coleman, 2012). Additionally, an in-person observation took place at the "Million Mask March" in London on November 5th 2013.

Whilst the theoretical conclusions have not been coalesced to such an extent that they are publishable here, the data gathered as part of this study has provided the following important information for interacting with participants in the future:

Almost all sites have a 100% no personal information rule when interacting with other hacktivists. Every sites and IRC channel visited as part of the observation stated this particular rule in its guidance to new members. This information allowed the researcher to modify the approach instead of approaching the participants with personal information necessarily on show, the researcher would give individual participants the opportunity to ask questions about the researcher if they want, but the information would not be provided up-front.

The concerns of different "Anonymous" communities vary greatly – from combating the "Church of Scientology" to the monitoring of revolutions in Libya and Egypt. Consequently, the researcher must be ready to adapt the interview structure for each community if necessary.

Whilst there were other conclusions to be drawn, there were perhaps the most important for the practical running of the interview section of the project.

Interviews

The interviews have only just begun in earnest, and a preliminary study has been conducted at a particular site.

The participants at this site were at first critical of the approach, but after being given the opportunity to probe the researcher for more information a number of individuals came forward to answer questions, and a lively discussion was had in a public thread, alongside direct messages between a number of individuals and the researcher.

The data gained from this initial study has only just been transcribed and is currently undergoing coding before any analysis can take place. It has, however, already been useful in informing the research on the method by which he can approach the next site for study.

Future Plans

Both the interview and ethnographic observation are due to continue over the coming months. Data from both of these sources will be coded, thematically analysed

and written up.

Data from the observations have been written up into a conference paper which will be presented at the Friction conference in Nottingham in May.

References

1. Bennett, W. L. (2003). New Media Power: The Internet and Global Activism. In Couldry, N & Curran, J. (Eds.) Contesting Media Power: Alternative Media in a Networked World. New York, NY: Rowman & Littlefield Publishers.
2. Coleman, Gabriella (2012) Coding Freedom: The Ethics and Aesthetics of Hacking, Princeton University Press (December 2, 2012)
3. Landers, Chris (2008) SERIOUS BUSINESS: Anonymous Takes On Scientology (and Doesn't Afraid of Anything), CityPaper.com, http://www2.citypaper.com/arts/story.asp?id=15543
4. Metac0m, (2003) What is Hacktivism 2.0? http://www.edshare.soton.ac.uk/8762/2/whatishacktivism.pdf (accessed 10 March 2014)

Xia Li

Port Operation Assessment with Simulation Modelling and Fuzzy Based Multi-Stakeholder Multi-Criteria Decision Analysis

Port operation assessment involves many perspectives, which including transportation performance assessment, land use and planning, environment assessment, risk assessment. The decision analysis process normally involves one or more decision group or multiple stakeholders. The decision process therefore can be very complicated. So the research mainly focuses on understanding this decision process, and then tries to optimise the process.

To achieve this, I am following the rules of "small-to-big" and "simple-to-complex". In the second IDIC year, I have completed some small and simple things that may lead me to big and complex things:

- Developed a simple transportation system simulation. In this simulation, I could capture the dynamic changes of vehicle emission, traffic flow density and vehicle's selection of road path from time to time (simulation time). This helps me to understand how a transportation system can be modelled and what features can be extracted from the model.
- The model described above is modelled at macroscopic level. The traffic model is part of this model and this is essential to the transportation system. If the traffic model is not that accurate, this could lead to wrong result of any experiment performed on this simulation model. Therefore, I was doing research on traffic models, trying to select a suitable traffic model that can be used for the simulation model. I have completed a single-lane traffic model which takes weather and vehicle type into account, but still lacks testing. Also, this is very difficult to test with the simulation model I developed in the early stage.
- In order to test the selected of traffic model, I decided to design a separated simulation model which tries to compare microscopic and macroscopic level traffic models using the same mix-vehicle traffic flow analysis.

To prepare this test, I have done a 7-day field study and collected video data of traffic flow on a local bridge. This bridge has rich heavy truck flow, which perfectly presents the feature of mix-vehicle traffic flow. The data can be used to validate my traffic simulation design. So far, I have completed video analysis, counting the different vehicle types and mean velocity of passenger vehicle and container truck have been obtained. The next step would be designing the traffic models, a simulation model is also needed for a comparison experiment. Two traffic models should be developed, one is a microscopic level model, car-following behaviour, simple over-taking and lane-switching behaviour should be taken into account. A fuzzy method would be used which is similar to [1]; the other one is macroscopic/mesoscopic level model, this model may only treat all vehicles as two categories (passenger vehicle and truck), only truck-following behaviour would be modelled accordingly. But the design may have to be optimised due to the experiment result.

At the end of the year, a report should be done in order to compare the difference between microscopic and macroscopic simulation modelling method, and make a suggestion of simulation modelling selection of my research problem.

References

1. J. Wu, M. Brackstone, and M. McDonald. Fuzzy sets and systems for a motorway microscopic simulation model. Fuzzy Sets and Systems, 116(1):65 – 76, 2000.

Yao Li

Integrated System of Geodetic Monitoring with Numerical Modelling

Infrastructures like bridges and tunnels simplify our transportation, but also add complexity to our city system. The complexity sometimes means potential dangers like settlement and damage to buildings. A reliable way to predict the danger is crucial for preventing the potential disaster. The integrated system I proposed is based on the surveying data and numerical modelling techniques. Combining them can create a model which keeps updating measured data and provide prediction for the future.

Now I am doing several experiments that help to understand the behaviour of soil, these experimental results will help to build an advanced soil model that improves prediction accuracy in numerical modelling. Also, I am collecting data about tunnelling induced settlement; those data can be imputed into numerical modelling that uses advanced model to predict settlement and safety of ground. Ideally data collection will be done during my internship in a surveying company which has some tunnelling survey ongoing.

Horia Alexandru Maior

Measuring Mental Workload in Tasks that Vary in Complexity

Recent research has pointed towards further understanding the cognitive processes involved in the interaction between computer systems and users, with most papers using secondary measures of cognition to do so. My research is focused on using direct measures

of cognitive workload, using non-invasive techniques including brain sensing techniques with functional Near-Infrared Spectroscopy (fNIRS) . fNIRS is a brain imaging technique that offers the potential to provide continuous, detailed insight into human mental workload (MWL), enabling an objective means of detecting overload conditions during complex tasks. While other brain sensing techniques like functional Magnetic Resonance Imaging (fMRI) require minimal or no movement from users, fNIRS can be successfully used while seated naturally at a computer, as well as in car settings and other similar work environments (e.g. train driving, air traffic control). Further, because fNIRS is an optical based technology rather than electrical (such as Electroencephalography (EEG)), it permits more natural movements such as those associated with an individual's day to day living e.g. using a computer, talking, gesturing, etc., without introducing significant artefacts into the recorded data.

To understand the cognitive aspects of the interaction human-task/machine, it is essential to learn about user's capabilities and limitations in terms of their cognition: how people perceive, think, remember, and process information etc. Maior et al. (2013) [1] presents the background information and related work behind the theoretical models of human cognition. Throughout my PhD studies, these models are used to formulate hypothesis and interpret the results.

One important part of my PhD is measuring human MWL. MWL is a concept that is used to describe the amount of mental effort perceived by an individual when completing a task. It is dependent on many factors including the task load (the amount of work the task places upon the operator), operator's attitude, skills, etc. MWL plays a critical role when designing systems or tasks operated or undertaken by a human operator.

Humans are known for having a limited mental capacity, which means that they can only perform a finite set of tasks at any given period of time. Identifying these limitations is a key factor in the reduction and prevention of what is referred to as Mental Workload Overload. MWL Overload is therefore a state in which the demands placed on an individual are greater than their capacity to deal with such demands. When an individual enters a state of overload (the resources demanded by the task exceed the individual available resources), task performance is typically negatively affected.

Maior et al. (2014) [2] proposed a continuous detection of workload overload using the fNIRS brain monitoring technique. To detect MWL Overload therefore, we first must be able to measure MWL itself. A number of approaches exist and are considered in this research.

The analytical approach calculates MWL by varying the task difficulty and measuring the effect on primary or secondary task performance. One limitation of such approach is that simply having a high workload does not imply a poor performance. In fact, an individual requires a minimum amount of stimulation for an optimum performance of the task in hand. Not considering the minimum stimulation can potentially lead to the opposite of an overload situation - underload. The analytical approach therefore lacks some of the granularity that we would like when calculating the current MWL an individual is experiencing.

Another approach is the subjective assessment. This typically involves a subjective questionnaire that is taken retrospectively, after the task has been

completed. Examples of such a questionnaire include NASA-TLX and the Subjective Workload Assessment Technique (SWAT). These questionnaires are designed to assess an individual's perceived MWL whilst completing a given task. NASA-TLX is a widely used assessment tool, and has been utilised in 1000's of research studies. The tool does suffer from several weaknesses however, primarily the assessment happens after the task has been completed, and as such the user completing the assessment questionnaire may forgot certain elements involved in completing the task.

One final approach is through physiological reaction measurement. Using this approach, a user's physiological reaction (our automatic, instinctive, unlearned reaction to a stimulus) is quantified using the appropriate techniques and sensors. Examples of physiological measures include: cardiac activity, heart rate, brain activity, pupil dilatation, muscle activity and others. There is a great focus on using this approach to measure MWL as it has a number of benefits over the other techniques described above. Primarily, this is an objective measure, meaning that we are no longer at the mercy of the user's ability to recall their own actions, which is known to be different across individuals. Additionally, this measure is capturing reactions that occur naturally in real time, and as such provides a more naturalistic, approach towards conducting studies since we are no longer questioning users during/after a task (if we reflect again on the air traffic controller example, the operator would not be stopped and asked to fill a questionnaire during the task, but he would simply wear a sensor during the task). The measure occurs in real time, meaning that we now have the desired granularity to associate particular events that occur during the study and associating them with a recorded physiological response. As mentioned, we are using the fNIRS device which measures the relative change in the levels of blood oxygenation and we can associate this to MWL (this is of course an oversimplification and we encourage the interested reader to read further on this subject).

Another important part of my research is focused on investigating the impact that various tasks, tasks manipulation and everything related to the tasks properties (task modality, task complexity, task nature etc.) have on mental workload and human performance. I am interested in capturing performance data and MWL data. Pike et al. (2013) [3] investigated the impact of think aloud protocols on MWL and performance. Subjective responses and performance measures were collected during the study. The results provide novel view into the effect that different forms of verbalisation have on mental workload during tasks, and show that fNIRS, as an objective measure, is more sensitive to demonstrating these differences than subjective and reflective measures often used in studies. The findings are a step towards proactively involving fNIRS analysis in ecologically valid based user studies.

Further, I am interested in investigating what impact has the level of expertise on cognition, including the training element (for instance asking people to perform the same task twice). I am also very keen in finding out how we can stimulate (if possible) human cognition. My PhD is mostly based on empirical quantitative methods, running a series of lab experiments within a typical HCI setting. We collect the following quantitative data:

- Behavioral data (primary task performance, secondary task performance);

- Brain data (fNIRS data requires preprocessing step);
- Other physiological data (such as heart beat)-maybe;

We are also interested in using subjective measure techniques; including NASA-TLX.

References

1. Maior, H., Pike, M., Wilson, M., & Sharples, S. Directly Evaluating the Cognitive Impact of Search User Interfaces: a Two-Pronged Approach with fNIRS, EuroHCIR, 2013.
2. Maior, H., Pike, M., Wilson, M., & Sharples, S. Continuous Detection of Workload Overload: An fNIRS Approach, EHF2014, in press.
3. Pike, M., Maior, A. H., Porcheron, M., Sharples, S., Wilson, M. L., Measuring the Effect of Think Aloud Protocols on Workload using fNIRS, ACMCHI, in press.

Felix Osebor

Measuring Access: Evaluating Land-Use and Transport Interaction strategies using Agent-based Accessibility

Transportation plays an important role in the production of goods and services. It is also essential in the movement of people from different points of origin to their respective destinations. Apart from few instances such as personalised farming, both the production and consumption of goods and services rarely occur at the same place. The inputs for each production process are often gathered from different locations, and the outputs taken to other places where they can be accessed and consumed by businesses and individuals [8]. Accessibility (or access from a person perspective) to goods, services and destinations collectively called opportunities, is therefore the ultimate goal of most transport decisions. This excludes a small portion of travel such as jogging, horseback riding, and all leisure travels, wherein movement is an end in itself with no specific destination [1, 6, 9, 10, 12]. Nonetheless, leisure travels do also lead to specific destinations i.e. resort centres, or campsites.

Accessibility assessments, using measures like person-trips and generalised travel costs, generally aims to evaluate the impact of the land-use and transport system on the ease and ability of people and businesses to reach desired opportunities [2, 7, 9, 10]. However, defining an appropriate measure and approach for accessibility assessment is often a difficult task. It requires taking into account the distribution of potential activities across space, the transport means available, constrain of activities to specific time periods, and the characteristics of the individuals or groups under analysis. This introduces a tremendous level of complexity in the assessment process, notwithstanding the broad range of transport problems and solutions it considers [3, 5, 11]. Different perspectives are currently employed in assessing accessibility, with each reflecting parts or all of the components described above. Four main perspectives are recurring in the literatures; Infrastructure-based, location-based, person-based, and Utility-based perspectives [3].

My current work focuses on developing a methodological enhancement to accessibility evaluation, by using person-based accessibility

measures with agent based modelling. Person-based accessibility measures, founded in the space–time geography of [4], analyses accessibility from the viewpoint of individuals incorporating both spatial and temporal constraints. This involves using space–time prisms to describe/represent the potential areas of opportunities that can be reached by individuals or groups, given predefined time constraints. The research draws inspiration from and seeks to contribute to both computer science, and the built environment.

I am currently developing a prototype model and framework for the study, while also reviewing the literature.

References

1. Banister, D., 2008. The sustainable mobility paradigm, Transport Policy, 15: 73-80.
2. Dalvi, M.Q., Martin, K.M., 1976. The measurement of accessibility: some preliminary results. Transportation 5, 17–42.
3. Geurs, K.T., van Wee, B., 2004. Accessibility evaluation of land-use and transport strategies: review and research directions. Journal of Transport Geography 12, 127–140.
4. Hagerstrand, T., 1970. What about people in regional science? People of the Regional Science Association 24, 7–21.
5. Handy, S.L. and Niemeier, D.A., 1997. Measuring accessibility: an exploration of issues and alternatives. Environment and Planning, Vol. 29 A, pp. 1175-1194.
6. Heinze, G.W., 2000. Transport and leisure Paper prepared for presentation at the ECMT Round Table 111 on Transport and Leisure, Paris, pp. 1–51.
7. Hensen, W. G., 1959. How accessibility shapes land use. Journal of American Institute of Planners 25 (1),73–76.
8. Hutton, T., 2013. Planning sustainable transport.
9. Litman, T., 2003. 'Measuring transportation: traffic, mobility and accessibility' in ITE Journal, October Issue, 28-32.
10. Litman T., 2010. Evaluating Accessibility for Transportation Planning: Measuring People's Ability To Reach Desired Goods and Activities. Victoria Transport Policy Institute, available at: http://www.vtpi.org/access.pdf
11. Martin, C. J., and van Wee, B., 2011. Guest Editorial: What can we learn from Accessibility Modeling? EJTIR, 11(4), 346-349.
12. Mokhtarian, P., Salomon, I., 2001. How derived is the demand for travel? Some conceptual and measurement considerations, Transportation Research A 35, 695–719.

Yiming Quan

An Intelligent Multi-sensor Integration System using Fuzzy Logic and Neural Network Algorithm for Ubiquitous Positioning

Supervisors

Dr. Lawrence Lau (Ningbo)
lawrence.lau@nottingham.edu.cn
Prof. Gethin Roberts (Ningbo/Nottingham)
gethin.roberts@nottingham.edu.cn
Dr. Xiaolin Meng (Nottingham)
xiaolin.meng@nottingham.ac.uk

Introduction

Currently the satellite-based positioning is widely used as a standard solution for many localisation tasks. However, a good positioning quality by using GNSS alone cannot be guaranteed in all conditions or environments. Typical difficult environments, like urban canyon and mountainous terrain, can bring about sufficient satellite signal availability or bad satellite geometry when some of the satellite signals are blocked by building or shadowed by tree canopy at receivers. Apart from degraded signal availability, these difficult environments may also result in huge error caused by multipath propagation.

To solve the unreliability of using GNSS positioning in these cases, many solutions have been developed with integration of other sensors, like INS (Inertial Navigation System), WLAN (wireless local area networks), UWB (ultra-wide band). However, these sensors have their inherent limitations and cannot be applied to all the environments or all the time. To achieve ubiquitous positioning, especially the continuity of positioning in transition environments, a smart system is needed to make decisions about optimal selection of available sensors in different environments and how to aggregate the their output data. The aim of the research is to design an intelligent positioning and navigation system using multi-sensor data and based on fuzzy logic and Neural Network algorithms to realise ubiquitous positioning, that is, a smart continuous location determination system can identify environment change and make modification to the relevant technological configurations.

Current Progress

After taking an MSc module H24V29 Fundamentals of Satellites Positioning in UNNC campus during the autumn semester, fundamentals about GNSS have been learned including satellite signal structure, different satellite positioning techniques, and GNSS modernisation.

Tests on different kind of GNSS receivers and different satellite constellations have been conducted several times, with the standalone positioning method and relative positioning method. The testing site involves UNNC campus and Ningbo city centre area. Some preliminary data have been collected.

Current work focuses on the establishment and measurement of 20 new survey markers in UNNC campus. These permanent markers, after survey work, can be used as known points. They can provide a standard reference in the future positioning static testing and kinematic testing by comparing the standard reference with the measurements collected from regular field observations. Now all the new survey markers have been installed, and the traversing and levelling work will be finished in two weeks.

Liam Sloan

Adaptive Narratives: Using Social Signal Processing to influence engagement in games

Abstract

Computer games have become a part of 21st century culture with games development organisations constantly striving to produce new ways of engaging their audience. Particular attention has been given to

interactional modalities with examples such as the Microsoft Kinect, Sony Playstation Eye, Move and Eye Toy, Nintendo's Wii Remote and the most contemporary of which, the Microsoft Kinect 2. This group of devices have been used to allow the manipulation of software artefacts within a virtual technologically mediated space through player's interaction in real world settings (via the use of voice recognition and gestural recognition). The camera based technologies have been used to further develop an area of research known as Social Signal Processing [1], which contains a specific strand of research known as Facial Action Coding Systems or FACS [2]. FACS is a sign and judgement based system that enables the encoding of almost all anatomically possible permutations of human facial neuromuscular activity. This project aims to explore how using FACS in conjunction with consumer grade camera technologies may be used to alter the narrative of a game based on believable social interactions, between player's(through an in game player character) and in game non-player characters (NPCs).

Introduction

Games have become a part of 21st century culture and can be found in both digital and physical forms [3]. Non-computational games are typically table top games where progression through its narrative is decided based on player action e.g. a series of moves across a games board is decided based on dice roles. A number of computerised games aim to deliver a narrative with the inclusion of components from traditional narratology e.g. the motivation behind a player's actions are often intended to thwart interventions posed by a protagonist. A computer game consists of [4]:

- A Player – a real physical person.
- A fictitious World – a virtual 3 dimensional space.
- A System – the machine to which provides the platform to support the World.
- An Avatar – the digital representation of a Player within the technologically mediated space.

One popular computer game genre is that of Computer Role Playing Games (CRPGs). The purpose of these games is to offer players the ability to step into the role of an imaginary character and play out that role within a technologically mediated environment. These games grew out of table top games, with early single player CRPGs such as Ultima and Eye of the Beholder. These pioneering games later progressed into multi-player games known as Multi User Dungeons (MUDs), setting the stage for modern games such as Skyrim and Dishonoured. The next step in developing CRPGs was to enable vast numbers of players to interact with one another in the same virtual space; this genre of RPGs is known as Massively Multiplayer Online Role Playing Games (MMORPG). Titles from this genre include World of Warcraft, Ultima online, Defiance and perhaps the most recent of which, Elder Scrolls online. In line with the evolution and development of this computer game genre a series of technological developments have been produced for interacting with a computer games system.

Perhaps the most typical methods of interfacing with computer game systems is mouse and keyboards, joysticks and more commonly control pads. This interactional paradigm is now starting to shift as technology is developed by organisations such as Microsoft, Nintendo and Sony that have released and continue to develop interfacing technologies.

Examples of these technologies include the Microsoft Kinect, Sony Playstation Eye, Move and Eye Toy, Nintendo's Wii Remote and the more relevant to this project the Microsoft Kinect 2. These devices use a range of sensors including cameras, microphones, accelerometers, gyroscopes and Infra-red as methods of input. Developers have begun incorporating these devices into new and existing computer games in various ways, for example: gestural recognition, speech recognition, manipulating virtual objects by manipulating the orientation of a real world object (manipulating a Wii remote to adjust the position of gyroscopes) and the more recent facial expression recognition.

Research Questions and Aims

The aims of this project are to explore from an experimental perspective:

"The dichotomy that exists between a player as a person and a digital representation of their character"

In exploring this space, a series of sub questions will also be addressed:

- Do players already exhibit facial expressions when playing games?
- Is using social signal processing a viable means of interacting with embedded agents in gaming environments?
- Do players want to use social signals as a means of interaction with embedded agents?
- Given the opportunity, will players choose to use social signals as an interactional modality?
- Can players utilise their emotional repertoire, as required, in order to use it as a means of interaction with socially intelligent NPCs?
- Do players currently identify with their characters? I.e. do they invest emotionally into the role of their character?

Methodology

The project will make use of experimentation to provide empirical evidence with regard to the effectiveness of using FACS in computer game settings. The experiments that will be conducted as part of this project are going to be designed to take place in a technologically mediated space within the Oblivion gaming environment. Oblivion has been chosen as it has an extensive scripting environment by which virtual spaces, quest lines and dialogue can be produced. In addition, Oblivion also has an interesting game mechanic were NPCs exhibit facial expressions based on a predisposition to your character in terms of Meta actions (An NPC will exhibit prototypic facial expressions to indicate how they feel about a character). This mechanic will be used to show real-time reactions of NPCs to a player based on facial expressions. The environment that is to be constructed to host the experiments of this project will contain a series of NPCs that constitute a social hierarchy. The experiments that are to be conducted as part of this project are:

1. Base line – placing a player into an unmodified version of Oblivion to see if they exhibit any facial expressions under normal playing conditions.
2. An introduction to a socially aware NPC – this experiment will expose a player to a socially aware NPC, using FACS to analyse real-time facial expressions of a player.

3. Into a social hierarchy – This experiment will utilise a series of socially aware NPC's. The player's role is to scale up or down the social hierarchy by interacting with NPCs using facial expressions and dialog choices. NPC's will pass the player (and subsequently their character) from NPC to NPC. This moving process will be based on how the NPC perceives the player. Moving from one NPC to another will result in the players character being moved up the social ladder or back down it ultimately resulting in the player either being at the top of the social order or at the bottom. The personalities of the NPC's will be determined by where on the social hierarchy they sit e.g. presentable, clean, donning high quality clothes and well-spoken at the top and wearing dreary rags, fowl smelling and common spoken at the bottom.

Contribution to the Field

The contributions that this project will produce will be to both the fields of Human Computer Interaction, Culture, Film and Media and will be in the form of:

- Technical understanding: A practical application of FACS which uses experimentation to provide empirical evidence about the effectiveness of FACS as an interface mechanic in this context, and to feed back by informing the development of the FACS system.
- Narratology and Ludology: Eliciting a deep understanding of the way in which players currently experience games with respect to their relationship with their avatar as a medium for experiencing a narrative, and how the application of FACS as a way of layering specific personal social signals onto an avatar might affect that relationship.
- Philosophical: Developing a deep understanding of the relationship between player and game - specifically examining blurring the boundaries of self and character, by the experimental application of FACS, whether this is desirable in practice, and to what extent such a boundary is necessary based on the narrative content of the game.

Progress to Date

At the time of writing experiment 1 is currently in development. This is due to the time consuming process of producing narrative content (dialog, characters and sourcing voice actors) and developing modifications for the Oblivion gaming environment. A complete literature review of Narratology and Ludology has been completed.

References

1. Paul Ekman, Ph.D, Wallace V. Friesen, Ph.D, Joseph C. Hager, Ph.D, "Facial Action Coding System The Manual", Published by A Human Face (2002).
2. Alessandro Vinciarelli, Maja Pantic and Herve Bourlard, "Social Signal Processing: Survey of an emerging domain", Image and Vision Computing 27 (2009) 1743-1759.
3. Daniel Eriksson, Johan Peitx and Staffan Bjork, "Socially Adaptable Games", Digital Games Research Association DiGRA. Proceedings of DiGRA (2005) Conference: Changing views - Worlds in Play.
4. Robert Buerkle, "Of Worlds and Avatars", (2008) University of Southern California.

Lachlan Urquhart

Bridging the Gap Between Law and HCI: designing Effective Regulation for Human Autonomy in Everyday Ubiquitous Monitoring Systems

Keywords

Law; HCI; privacy/ethics by design; value sensitive design; responsible innovation;

Abstract

The thesis considers specific everyday ubiquitous monitoring technologies situated in their real life context to understand what regulatory/legal challenges they pose. Legal rights are largely predicated on individual control over interests and exercise of human autonomy, but this creates a tension with ubicomp systems because they are increasingly autonomous, intelligent, less visible to the user, and have increased levels of agency [1, 2, 3, 4, 5]. This PhD seeks to understand what the regulatory and ethical challenges are and how they can be considered much earlier in the design and innovation process. This involves using grounded analysis of ubicomp technologies to surface the various problems that exist and bridge the communication gap between the law and design communities. This will require mapping the range of regulatory requirements that exist, translating these into more accessible forms and highlighting what design opportunities exist to address these challenges. Overall the process will incorporate legal perspectives into pre-existing frameworks on responsible innovation in ICTs [6, 8] and value sensitive design [7].

Current Work and Methodology

The research seeks to highlight how even the most ordinary, everyday technologies can give rise to a large range of legal, ethical and public policy problems [9]. Framing the first part of the PhD is analysis of the NEST learning thermostat system. This device replaces a conventional thermostat in the home, and monitors the behaviour of occupants to learn and manage energy use in their environment. The sources for analysis of this system include empirical work from a longitudinal study conducted in the US, user concerns detailed in online forums, situated narratives and analysis of the various NEST legal contracts.

These resources gave rise to a large range of legal questions relating to human autonomy, for example does tortious liability exist for the manufacturer due to harm caused by the system or who is contractually responsible for the costs of energy bills where the system has acted outside the bounds of agency expected by the user? The questions were mapped and clustered to relevant areas of law with doctrinal analysis focusing on unfair contract terms, tort law, consumer protection law, data protection and privacy law, agency and product liability.

The approach of using everyday ubicomp technologies to highlight the strengths and weakness in current legal governance will be replicated during the PhD. This will involve situating the relevant technology in its social context, primarily through use of scenarios/narratives; pre-existing studies/datasets and self conducted empirical work (interviews, focus groups and ethnographic work). Grounding analysis in a practical context will frame the discussions around specific system capabilities and

limitations, which provides much greater clarity for the legal issues, instead of engaging at a more abstract level. To narrow the scope of the legal resources used, the emphasis is restricted to examining effective regulation of autonomy specifically.

Underpinning this overall process will be extensive translation of concepts, terminology and ideologies between legal and human computer interaction (HCI) design communities. It is increasingly important for designers to understand the complex, fragmented state of law, and to interpret what it means for their work. This requires uncovering uncertainties inherent in the law, from the terminology used, the process of law (slow legislative progress), the ex poste nature of much legal regulation, and questions of ambiguity in interpretation of key legal concepts (e.g. the reasonable man test). Designers may not be equipped with the skills to navigate this landscape, and part of the PhD will focus on understanding how to present this information in an accessible manner that documents to what extent law provides clarity or uncertainty (i.e. does it create sufficiently clear guidelines/frameworks on what they can and cannot do?) Equally, legal bodies like regulators and policymakers need much greater awareness of the technology and challenges faced by designers in complying with the needs of the law.

The inadequacies or strengths in law can create new opportunities for designers to create solutions that actually work in practice. In the regulatory community, a lot of emphasis is placed on concepts like privacy/ethics by design and responsible innovation as a way of ensuring legal and societal values are considered during the design process, not just as an afterthought once the technology has been released on the market and into society. Implementing these concepts in practice requires recognition of the limitations, and moving from a theoretical to practical level, with input from both communities.

Creating a priori legal design principles, instead of relying on ex poste tools, like risk or long-term impact assessments, could be a significant step forward towards ensuring effective governance of autonomy in ubicomp systems. Initial proposals for increasing this cross community dialogue, and creating these a priori solutions include:

- Running focus groups to understand how designers think about legal issues, and at what point in the design process such concerns ordinarily arise.
- Consider the role of provenance and tracking of decisions made by ubicomp systems in order to increase accountability and facilitate auditing of decisions. This may be key in deciding when legal responsibility & liability for actions passes between machine and human actors in the system.
- Use existing ethics & privacy by design frameworks to understand how they envision incorporating legal and social norms into design.

Future Work

The next stage will be to conduct empirical field work with the Hub of All Things project (based in the Mixed Reality Lab and Horizon) to consider the range of regulatory issues raised by everyday management of a system that stores and allows trade with personal data collected in the home.

References

1. J Gilliom & T Monahan, “Everyday surveillance” in K Ball et al (2012) Routledge Handbook of Surveillance Studies (Routledge) p 405
2. M McCahill R Finn (2011) The Social Impact of New Surveillance technologies: An Ethnographic Study of the Surveilled (ESRC Project)
3. A Rouvray (2008) “Privacy, Data Protection and the Unprecedented Challenges of Ambient Intelligence” Studies in Ethics Law and Technology
4. J Cas (2009) “Ubiquitous Computing, Privacy and Data Protection” in S Gutwirth et al (2009) Computers, Privacy and Data Protection: An Element of Choice (Springer) p167
5. S Spiekermann and F Pallas (2005) “Wider Implications of Ubiquitous Computing” Poiesis & Praxis: International Journal of Ethics of Science and Technology Assessment
6. B Stahl, G Eden, M Jirotka, and M Coeckelbergh (2014) “From Computer Ethics to Responsible Research and Innovation in ICT: The transition of reference discourses informing ethicsrelated research in information systems” Information and Management http://www.cs.ox.ac.uk/publications/publication8475-abstract.html
7. B Friedman (2012) “Envisioning Cards: A toolkit for catalysing humanistic and technical imaginations” CHI 2012 http://www.vsdesign.org/publications/pdf/p1145-friedman.pdf
8. EPSRC Responsible Innovation Framework see http://www.epsrc.ac.uk/research/framework/Pages/framework.aspx
9. Wright et al (2010) Safeguards in a World of Ambient Intelligence (Springer)

Ning Xue

Intelligent Computation on Traffic and Transportation Systems

My aim is to contribute to the intelligent computation on traffic and transportation system. More specifically, currently I am looking at operations of container transshipments in Ningbo port. The Ningbo Port is the 5th largest port in the world. The problem we are looking at relates to the operations of container transshipments between nine different ports managed by a company. The company currently has a fleet of 45 trucks (the truck number will increase for emerging usage), each having the same configuration. There is a central depot for all trucks and the drivers are split into two shifts per day. Each shift lasts at most 12 hours. The day shift starts at 8am and the night shift starts at 8pm. Before the end of the shift, all trucks are required to return to the depot to prepare for the next shift. On average, there are about 200-300 containers to be relayed by the fleet every day. To meet the growing service demands and the introduction of other relay services, we are trying to increase the efficiency and maximise throughput. This will reduce the resources used in the future, saving a lot of cost while at the same time contributing less pollution.

Another problem is the trucks are equipped with GPS tracking devices. However, the

GPS information is not fully integrated with the current routing software developed by the company. Thus, besides monitoring functionality, the GPS information is not fully used. Being able to dynamically report the exact location of a truck, the valuable GPS information should be integrated with the system to dynamically adjust generated routes in order to increase the efficiency.

Chao Zhang

Automatic Semantic Tagging of Surveillance Video Streams for Important Event Prediction and Detection

My research is about how to make the current surveillance system more intelligent and efficient with video annotation technology. Since the video annotation based on the frames, this work started with image annotation and its relative implementations.

In the past few months, I've reviewed the algorithms and theories about image processing and machine learning, along with several implementations. On the other hand, for human factor research, I've checked some ergonomic requirements for control rooms; and also learnt about research ethics of surveillance systems.

The review of video processing and machine learning was started with feature selection methods, which could significantly influence the accuracy of classification. Those algorithms covered gradient feature, colour feature, and texture feature; such as SIFT, GIST, HoG, hue, etc. (Yang et al., 2011). In addition, I implemented the Semantic Nearest Neighbour (SNN) on MATLAB as well as its random forest classifier (Fu et al., 2012). And for next step, I'll consider how to achieve such algorithm into video processing. For the video processing part, one very first task in my work is achieving automatic object detection, due to our proposed processing model. I'm now trying different measures of achieving automatic detection of objects or events in arbitrary video clip. Another task is to find adequate video datasets, which can provide convincing training sources as well as keep a relatively small scale. With the help of my supervisor, we found a similar project of Columbia University with a different annotation process. Moreover, the Shenzhen University in China also holds some traffic surveillance data, and hopefully they could provide us the access permission.

References

1. H. Yang, L. Shao, F. Zheng, et al. Recent advances and trends in visual tracking: A review[J]. Neurocomputing, 2011, 74(18): 3823-3831.2. H. Fu, Q. Zhang, G. Qiu, Random forest for image annotation[M]//Computer Vision–ECCV 2012. Springer Berlin Heidelberg, 2012: 86-99.

Cohort 2013

The Horizon CDT cohort 2013 commenced their studies in September 2013 and will complete their PhD in September 2017.

There are 26 students in cohort 2013 which includes 13 IDIC students. The cohort disciplines include Architecture, Business, Computer Science, Geography, Human Resource Management, International Relations, Journalism, Linguistics, Marketing, Philosophy, Physical Education, Politics and Psychology.

Joyce Addae (IDIC)
psxjha@nottingham.ac.uk

Kyle Arch
psxkga@nottingham.ac.uk

Georgiana Avram
psxga@nottingham.ac.uk

Anna Clarke
psxjc7@nottingham.ac.uk

William Darler
psxwtd@nottingham.ac.uk

Joy Egede (IDIC)
psxje@nottingham.ac.uk

Christopher Ellis
psxce@nottingham.ac.uk

George Filip
psxgcf@nottingham.ac.uk

Xinyu Fu (IDIC)
psxxf@nottingham.ac.uk

Panagiotis Koutsouras
psxpk3@nottingham.ac.uk

Zhuo Lei (IDIC)
psxzl1@nottingham.ac.uk

Boying Li (IDIC)
psxbl1@nottingham.ac.uk

Mengdi Li (IDIC)
psxml1@nottingham.ac.uk

Jingxin Liu (IDIC)
psxjl2@nottingham.ac.uk

Shuli Liu (IDIC)
psxsl5@nottingham.ac.uk

Cong Mu (IDIC)
psxmc3@nottingham.ac.uk

Roma Patel
psxrp3@nottingham.ac.uk

Martin Porcheron
psxmp9@nottingham.ac.uk

Anne Quandt
psxaq@nottingham.ac.uk

Andreas Reiter
psxajr@nottingham.ac.uk

Louise Schofield
psxlms@nottingham.ac.uk

Elizaveta Temir (IDIC)
psxet2@nottingham.ac.uk

Hanne Wagner
psxhw@nottingham.ac.uk

Bolei Xu (IDIC)
psxbx@nottingham.ac.uk

Liming Xu (IDIC)
psxlx@nottingham.ac.uk

Lanyun Zhang (IDIC)
psxlz3@nottingham.ac.uk

Joyce Hoese Addae

Exploring Big Data to Improve the Usability of Security-Decision Interfaces for Web Based Applications

It is vital that web based security functions are highly usable as these features are generally exposed to a broader cross-sections of the society (amateurs and experts alike). Security breaches can lead to numerous problems such as destruction of operating systems, or disruption of information access [1]. Although in the past users were often blamed for security failures, recent trends in computer security research highlights how human behaviour can impact on the usefulness of technical security solutions. Nurse et al [2] acknowledged that design of cyber-security systems and interfaces must take into account psychological and social factors.

My aim is to investigate how users from different parts of society behave when using particular security interfaces and to use insights from psychology to develop or improve existing frameworks for understanding users in the context of cyber-security. Lee and Turban [3] argued that security of systems is one of the major reasons why customers do not trust Internet technology. Consequently internet security challenges can limit the extent to which users patronise services provided with web interfaces.

To date, there have been a handful of research on human authentication protocols [4, 5]. Although Asghar [5] focused on mathematical analysis in his research on human authentication protocols, he admitted that, human behaviour needs to be considered to make such protocols more practicable.

For my PhD research, I want to look at how Big Data can be explored to make security mechanisms deployed for web based applications more usable. The acceleration in the creation of data and information has led to new technologies being developed to analyse massive data sets. However, analysis of these massive data sets from a human factors perspective has received less attention as compared to technical mechanisms facilitating their efficient storage and processing [6, 7]. I hope to adopt a multi-disciplinary approach in investigating how advances in Big Data technologies can be adopted for security analytics to provide an integrated view of security-related information that can be used in profiling users for customised security-decision interfaces within a developing IT ecosystem.

References

1. H. Min and W. Galle, “Electronic commerce usage in business-to-business purchasing”, International Journal of Operations & Production Management, vol. 19, no. 9, pp. 909-21, 1999.
2. J. R. Nurse, S. Creese, M. Goldsmith and K. Lamberts, “Guidelines for Usable Cybersecurity: Past and Present”, In Cyberspace Safety and Security (CSS), 2011 Third International Workshop on, pp. 21-26, 2011.
3. M. Lee and E. Turban, “A trust model for consumer internet shopping”, International Journal of Electronic Commerce, vol. 6, no. 1, p. 75–91, 2001.
4. H. Jameel, R. Shaikh, H. Lee and S. Lee, “Human Identification Through Image Evaluation Using Secret Predicates”, In Proceedings of CT-RSA, pp. 67-84, 2007.

5. H. J. Asghar, “Design and Analysis of Human Identification Protocols”, Doctoral dissertation, Macquarie University, 2012.

6. D. Bollier and C. M. Firestone, “The promise and peril of big data”, in Communications and Society Program, Washington, DC, USA, 2010.

7. D. Fisher, R. DeLine, M. Czerwinski and S. Drucker, “Interactions with big data analytics”, Interactions, vol. 19, no. 3, pp. 50-59, 2012.

Kyle Arch

Studying the Effects of Game Design on Team Formation, Organisation, and Strategy in Online Games

Online games present a unique teamwork situation, where players are teamed up with people with whom they have no previous experience. A lot of the time, these players are at different ability levels as well, and these teams are often expected to work together towards some common goal. Teams are formed on the spur of the moment, and for a comparatively short time.

Players within a team can act in one of two general ways – they can either work and co-ordinate with the rest of the team, or they can act individually but still with the team’s goal in mind. This presents a few problematic situations — a strategic team versus a team of individuals will most likely have an inherent advantage regardless of ability, and a single team composed of a group of co-ordinated players and a group of individual players will cause annoyance to the co-ordinated players and possibly alienate the individual players. Neither of these situations is conducive to enjoyable gameplay for any parties involved.

I wish to study how we can affect the way that teams form, organise themselves, and strategise through the design of the underlying online games. There are various aspects of game design that could have affects, from aesthetic (Level, UI, art design), to mechanical (weapons, rules, items, objectives, roles) to social (communication channels available – voice, text, radio messages, role of clans, lobbying systems).

The aim is to identify areas of game design that can be leveraged to promote teamwork and organisation in online games. It is also possible that this will contribute to the underlying studies of teamwork in general.

The main method will be prototyping games or environments that expose different design elements and study the teamwork and organisation of players with these prototypes. Qualitative methods will most likely also be used as enjoyment is a large part of gaming, and measuring players’ enjoyment would be easiest done in this fashion.

Georgiana Avram

Understanding and Deconstructing Barriers to Sustainable Behaviour Mediated Through Smart Grid Technology

Currently, sustainable consumption is a topic of general interest, while the transformations societies must undergo in order to enable it have become a focal discussion point for policy makers and researchers alike. At the same time, high performance ICT technologies have paved the way to such concepts as smart cities that aim to provide urban dwellers with

services via ICT- centred infrastructures. The rapprochement here resides in the potential of smart city technologies to address such issues as 'energy shortages, traffic congestion, inadequate and poor urban infrastructure, health and education' (Lee et al., 2013: 284). Horizon, through its involvement in carbon awareness and smart consumption initiatives, such as C-Aware and Smart Grid prototyping, is highly involved in this conversation. Research and work so far has focused on the design and evaluation of a range of prototypes, with an emphasis on raising awareness of energy consumption and carbon footprint as a way of making these issues accountable to consumers and motivating sustainable behaviour.

In this context, my research interest resides in the application and deployment of smart grid technologies, as enablers of more efficient power systems and sustainable consumption. The objective of upcoming research, therefore, is understanding and deconstructing the barriers to environmental behaviour, especially as mediated through the use of ICT in smart grid technology.

When viewing consumers interacting with ICT technologies in industrialised economies, the literature reveals significant gaps. Firstly, proposed solutions in this context have predominantly been informed by technology and rational choice economic theory. Therefore, the opportunity for this research resides in exploring the potential of behavioural sciences to enable sustainable consumption. Social marketing in particular represents a significant theoretical stem that could inform the objective of this upcoming research, due to its 'application of commercial marketing principles and techniques to influence' socially desirable goals (Peattie, 2010: 216). A further limitation stems from the methodological choices that have dominated research, focused mainly on quantifying attitudes and behaviours around sustainable consumption. Therefore a suggested methodological approach views bringing together both scalable quantitative insight, as well as qualitative observations of actual behaviour of interacting with smart grids. Thirdly, with a view to understanding the consumer in the round, the upcoming research aims to consider consumers as part of families, communities or households and developing an understanding of sustainable consumption in the context of collective behaviour.

References

1. LEE, Jung, Hoon, PHAAL, Robert, LEE, Sang- Ho. "An Integrated Service- Device-Technology Roadmap for Smart City Development". Technological Forecasting and Social Change. 2013, 80, 283- 306.
2. PEATTIE, Ken. "Green Consumption: Behaviour and Norms". Annual Review of Environment and Resources. 2010, 35, 195–228.

Anna Clarke

Customisable Tools that Support Creative Cognition in Music Composition

I'm interested in computer-based tools to support musicians during their composition process.

When starting to compose, musicians do not know exactly what they want to make or exactly how to make it. They combine two different strategies to answer these questions.

The first strategy is to explore many different possibilities, and combine or abandon them (“divergent” and “convergent” thinking). The second strategy is to cycle between stating a musical problem and solving it, using experience gained in each iteration to guide the definition of the problem in the next iteration (“problem setting” and “problem solving”).

To help with these processes, musicians create paper notes as “cognitive artefacts” that help them think. They create and abandon these notes as they move through each iteration, and maintain representations of multiple possibilities. In these notes, they use symbols that are specific to each composition (or even to each problem setting iteration) and which may have multiple, ambiguous, or changeable meanings. They may also include plans for actions they are as yet unable to do, or cannot verbally explain how to do (“implicit knowledge”).

Computer tools for musicians support only one part of the music making process - they allow the musician to specify the low-level details of a finished work, such as notes, tempo or synth settings. The musician is required to do this in a notation specified by the designers of the tool, like “piano roll”, western score notation, or code. If there are any customisation features, they are intended to reduce repetitive work (e.g. “presets”), rather than for defining meaningful concepts like “verse” or “mood”.

I propose that a computer-based tool for supporting composition should also support the strategies described above, in similar way to paper notes. Such a tool would allow the musician to:

- define their own notation to work in
- alter, extend and redefine that notation as they work
- use that notation to express multiple possibilities

Existing work has looked at these abilities in other contexts - customising visual representations in statistical visualisation, customising an editing interface in tailoring and end-user development, and exploring possibilities in “subjunctive” interfaces.

This PhD asks whether extending those approaches to the musical domain would result in observable changes in the behaviour of composers.

In order to answer this question, I will need to establish what forms of representation musicians use, establish how to provide the novel features in a usable way, and finally determine whether the novel features result in a change in the musicians composition process. This will require observing musicians during short sessions of composition, diary studies to gather longitudinal data on their composition process, and usability testing.

While all composition does tend to have a social aspect, that is not the focus of this PhD, so I intend to attempt to recruit participants who are working mostly on their own. Some possibilities for recruitment are:

- local bands and musicians
- higher education students who compose for films and games
- professional composers in art, theatre and film

William Thomas Darler

Shop 'til You Drop — A Life Course Approach to Predicting Future Shopper Behaviour

Abstract

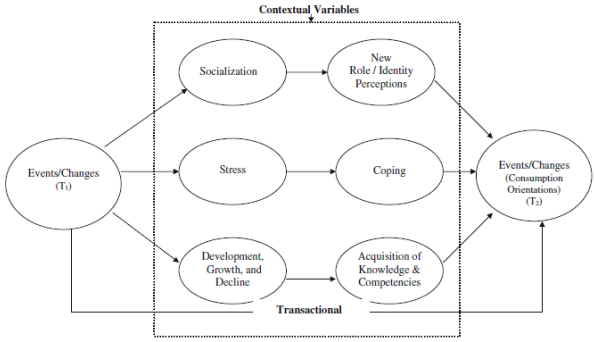
Although consumer behaviour in retail stores has been studied at particular life stages (such as adolescence, old age, or during pregnancy), there is a lack of empirical, longitudinal research about how this behaviour changes over the consumer life course. This means there is inadequate theoretical and practical understanding of how consumer spending patterns change over time, how companies can anticipate these changes, and how their products, services and promotions can be tailored to better meet consumer needs. This PhD utilises a mixed methods approach to study patterns of consumer behaviour at two retailers throughout a ten year period of the life course. Managers will be interviewed about the planned journey the consumer is expected to take through their shopping experience with the retailer. These interviews will be compared against actual shopping behaviour from loyalty card data to track the similarities and differences between planned and actual consumer behaviour.

Background

Marketing scholars have known that prior life experiences can influence future shopping behaviour but there has been little longitudinal research to investigate how these patterns change over the consumer life course [5]. Psychological and sociological research has several different perspectives that contribute to the study of consumer behaviour over time, pulled together in a multidimensional model called the life course approach. Psychologists refer to an orientation called life-span development, the continual process of development starting at conception and ending at death [1, 4]. Sociologists refer to the life course perspective as a social phenomenon, distinct from life span because it focuses on transitions (discrete changes in life status) and trajectories (longer patterns of stability before change) that vary across time, location and over different populations [3]. Other bodies of work have referred to a convergence between psychological and sociological perspectives, describing how people adapt to "biological, psychological, and social changes, events or circumstances" experienced in their lifetime [5, 2]. Figure 1 shows a conceptual model combining the views from academic literature to show how events over the consumer life course can lead to changes in consumer orientation [5]. However, the model has not been empirically tested and the aim of my PhD will be to use interview data and documents from retailers, along with observed customer behaviour from loyalty card data, to create a refined life course model that is useful for managers and academics.

Expected Contribution

This research will contribute to academic literature by creating an empirically tested life course model of shopping behaviour and will be beneficial to managers by creating dynamic shopper typologies to predict behaviour over time.



References

1. Baltes, P.B., Reese, H.W. & Lipsitt, L.P. (1980). Life-span developmental psychology. Annual Review of Psychology, 31, 65-110.
2. Clausen, J.A. (1986). The life course: A sociological perspective. Englewood Cliffs, NJ: Prentice Hall.
3. George, L.K. (1993). Sociological perspectives on life transitions. Annual Review of Sociology, 19, 353-373.
4. Honzik, M.P. (1984). Life-span development. Annual Review of Psychology, 35, 309-331.
5. Moschis, G.P. (2007). Life course perspectives on consumer behavior. Journal of the Academy of Marketing Science, 35, 295-307.

Joy Onyekachukwu Egede

Automatic Assessment of Pain in Newborn Infants

Pain in newly born babies including premature neonates directly impacts on the eventual health and wellbeing of the child [1]. Currently, medical experts conduct pain assessment by physical examination or observation of the baby's facial expression, crying and movement of the limbs [2]. A pain score is assigned using scales, some of which include the Faceless Acute neonatal pain scale (FAN) scale [2], Douleur aigu du Nouveau-n (DAN) scale [3] and the Neonatal facial coding system [4]

The aim of this project is to automate the assessment of pain in newly born infants using machine learning and computer vision techniques. The study will involve the collection of video footages of babies in intensive care units for the purpose of analysing their body movements, facial expressions and body posture in response to painful medical procedures such as heel prick. The data will be used to train models that can be used to identify and assess pain in newly born babies. As this research focuses on children that do not yet have the ability to speak, validation of the model results will be done with the help of medical professionals who have a good understanding of interpreting and assessing pain intensity in babies.

Furthermore, children at this stage tend to change quickly in terms of their physical features hence; another aspect of this research could potentially include a study on how the expression of pain evolves as these infants grow from one stage to another e.g. from preterm to full term and then to older infants. The results of this study, which will include a model to detect and assess pain intensity in babies, will potentially find application in Neonatology a field of medicine that deals with medical care of newly born babies particularly the premature and ill infants.

References

1. R. Carbajal, S. Veerapen, S. Couderc and et.al, "Analgesic effect of breast feeding in term neonates: randomised controlled trial," BMJ, vol. 326, p. 13, 2003.

2. R. Grunau, C. C. Johnston and K. Craig, “Neonatal facial and cry responses to invasive and non-invasive procedures”, Pain, vol. 42, pp. 295-305, 1990.

3. C. Milesi et.al, “Validation of a neonatal pain scale adapted to the new practices in caring for preterm newborns”, Archives of Disease in Childhood-Fetal and Neonatal Edition 95.4, pp. 263-266, 2010.

4. L. Thewissen and A. Karel, “Analgosedation in neonates: do we still need additional tools after 30 years of clinical research?”, Archives of disease in childhood-Education & practice edition 96.3, pp. 112-118, 2011.

Christopher Ellis

An Investigation Into the Analysis and Visualisation of Subjective Musical Qualities

Within the physical sciences, research into musical qualities has tended to focus on properties, such as pitch and volume, which can be easily mapped to formal wave properties like frequency and amplitude. This PhD intends to further this area of research by investigating the more subjective qualities of music like genre, tone and timbre which cannot easily be reduced to formal wave properties. In a strict sense the domain of this PhD is captured by the following research questions:

- Can a computational model be developed to classify music in accordance with subjective musical qualities?
- Can knowledge of these qualities be used to develop useful and engaging tools and visualisations?

An interdisciplinary approach will be taken when investigating these questions with qualitative and quantitative methodologies being borrowed from both the physical and the human sciences. The overarching research strategy will be structured around an initial literature review and informed by a preliminary investigation into the concepts and features people commonly associate with subjective musical qualities.

In addition to furthering the fields of knowledge surrounding musical qualities and visualisation it is hoped that this PhD will lead to the creation of assistive technologies for performers and DJ’s, helping them to connect with their target audience.

Another potential area of impact concerns the generation of meaningful visualisations to provide an impression of a piece of music to individuals who are losing their hearing. Whilst you cannot teach a blind person to see describing the world to them is better than nothing. A similar idea would be applied here when attempting to create meaningful visualisations to better reflect how a piece of music makes us feel. In much the same way a theatrical production attempts to give a physical expression to a piece of literature, these visualisations would be attempting to give a visual expression to a piece of music.

This PhD may also contribute to the rich existing body of research concerning the positive effects of music on those undergoing recovery from various physical and psychological ailments.

George Costinel Filip

Trust in Autonomous Vehicles. Trustworthiness and Driverless Cars

Summary

Since 2012, when new laws have been introduced in some American states to allow the usage of autonomous cars, as well as the new patent that Google has received for a Robo-Taxi, Heathrow airport using autonomous transport pods, the issue of Trust in the usage of autonomous vehicles has become one of great importance.

Autonomy in cars comes in many different levels (function-specific automation, combined-function automation, limited self-driving automation, full self-driving automation). For this particular reason, research on autonomous cars should focus on these levels independently and investigate how they can potentially affect the trust of the users of such vehicles.

I will initially focus on the different ways of interaction with the system (namely visual, audio and tactile), taking into account how particular voices and faces have a varied impact on the user's level of Trust than others. One example for this is the incorporation of Siri in the system of a car, which raises the question of whether people who know how to use Siri (or related technologies) might show enhanced levels of Trust in a "Siri-ready" vehicle.

Another important aspect of my future research will be dedicated to the study of different levels of trust that users have in self-parking cars, which represent a different stage of autonomous cars leading towards full autonomy.

The final stage of my PhD is going to be the research of complete autonomous cars, focusing on issues such as the trust of others traffic participants in driverless cars especially in contexts where pedestrians are involved.

Research Questions

- How is trust affected by different methods of interacting with Autonomous Systems, either via User Interface or by direct interaction: verbal, visual or tactile?
- How should a driverless car react when a pedestrian is on the sidewalk? And should the pedestrian trust the car to stop?
- Are there different levels of trust for different levels of autonomy? Should users trust the information received from the sensors of an autonomous car?

Aims and Objectives

The aim of this research is to offer a better understanding of how driverless cars can be more trustworthy and how the interaction between user and car can lead to Trust.

Methodologies

The methodologies that I will take use of during this research, beginning with a literature review, are going to involve usability studies, interviews and comparative studies as well as the use of a car simulator in order to analyse driver/passenger behaviour in unexpected situations.

Xinyu Fu

Real-Time Processing of Big Data in Social Networks for Identification of Imminent Global Events

This research develops a Big Data architecture that collects, collates, restructure and present large spatial-temporal datasets in real-time from the WWW and social media in order to understand collective, crowd-sourced information for detecting events. The methods developed here are novel and will lead to knowledge that will fill gaps in related disciplines, for massive data may reveal new patterns that are unknown in pre-Big Data era.

The data acquired with the Big Data architecture will be studied together with Complexity Systems Theory in order to connect disparate datasets into meaningful visualisation. The aims of this project are:

1. To explore current Big Data methodology in the context of User Generated Content, Social Media and Networks, adopt best practices and develop novel approaches to facilitate our research goals (encompassing the 7 Vs of Big Data - Volume, Variety, Velocity, Veracity, Variability, Visualisation and Value)
2. To design and develop Big Data hardware and software architecture that is efficient, expandable and scalable for collecting raw data from uncertain environments such as the WWW (volume, velocity and variety)
3. To design novel algorithms that maps and visualises disparate datasets into a cohesive network of relationships that informs and predicts the effects of data on specific topics (veracity, variability, visualisation and value).

Sentiment analysis tools [1] will be developed for extracting 'emotional' information from social networks, followed by statistical analysis and data mining algorithms to further refine data into useful information. Global event forecasting might be one product of analysing social media content [2]. The final result might be presented through visualisation.

References

1. Liu, Bing, and Lei Zhang. "A survey of opinion mining and sentiment analysis". Mining Text Data. Springer US, 2012. 415-463.
2. Pang, Bo, and Lillian Lee. "Opinion mining and sentiment analysis". Foundations and trends in information retrieval 2.1-2 (2008): 1-135.

Panagiotis Koutsouras

Beyond the Borders of the Game: How User-Generated Content Affects the Gaming Experience

Abstract

This project has a dual goal; initially, I am interested in investigating how the gaming experience in games that are based on creating and sharing content is shaped. Simultaneously, I want to explore how the elements that constitute this experience feed into and inform the design process of tools and games for creating content.

Through user-generated content, player participation in the development of the game becomes a crucial role in the whole process, as it cultivates community and identity building inside the context of the game. Players influence (and are influenced by) the reciprocal activities of creating and sharing content, in an effort to co-develop and contribute to the community they deem themselves part of.

This extends to the digital society of today, as there are numerous instances of how the experience of a particular game extends even outside of its scope. Some examples are earning money by selling digitally created items for games, providing secondary entertainment through live streaming online tournaments or even bringing the game into physical reality by wearing costumes to represent gaming personas.

The aim of this proposed PhD project is to investigate how applications and services could be designed and developed in a better way, to facilitate the creation and sharing procedures inside both the games and the real-life context they can be found in.

The research question can be further disambiguated into the following topics:

- Who creates this content and who consumes it? What are the identities and practices gamers enact in such a process?
- Why is this happening? What are the motivations of the gamers in order to participate in a community like this?
- What are the elements that constitute this experience? What are the dynamics between them; how do they interact and influence each other?

Deliverables

1. A detailed framework of the elements that define the gaming experience inside user-generated content based games.
2. A set of guidelines for utilising the elements which constitute this gaming experience in the design process of tools and games for creating content.

Methodology

For the initial steps of the project a set of research methods commonly used in linguistics and the social sciences will be used. This includes content analysis and discourse analysis, followed up by online ethnography and concludes in a grounded theory to further enhance and enrich the results that will come from the research proposed.

Zhuo Lei

An Intelligent Video Monitoring System for Smart Transportation

Research questions

1. How to improve the performance of intelligent video monitoring recognition in complex urban street scene.
2. How to improve the performance of intelligent video monitoring recognition within interference, such as weather.
3. How to improve the performance of intelligent video monitoring inside vehicles to assist human driving.

Aims and objectives

To improve the performance of intelligent video monitoring to assist smart transportation.

Background

Nowadays, intelligent video monitoring is becoming important and gradually replacing the human resource. For ordinary video monitoring, people have to be beside screens and stare at them. Thus, when exceptional cases happen, people will have to take several seconds to notice them, even to set off the alarm. In some situations, time is significant and crucial, hence it cannot be wasted. However, people will feel fatigue in eyes after focusing attention for long period of time.

Intelligent video monitoring can solve the problem, as it is able to keep running all the time. In other words, machines is tireless rather than human. Furthermore, machines have higher capability of computing, hence they can response to different cases even in milliseconds. Therefore, video monitoring technology has been applied in many areas, such as transportation.

With development of smart city in China, intelligent video monitoring is playing an important role. It will help to find stolen, robbed or violated vehicles automatically; it can capture highway traffic statistics or entry-leave vehicles accurately; it can facilitate a timely response to traffic emergency and contribute to reasonable and effective scheduling. Thus, intelligent video monitoring can achieve many applications which can help the management of transportation. However, it still cannot reach a high accuracy due to technical restriction, and can only be applied to recognise some certain objects.

One of the key technology depending the accuracy of intelligent video monitoring is object recognition, which is significant to make machines to understand what a scene means. Urban Street is an important evaluation scene to object recognition technology, because there are many different objects in the street, such as pedestrian, vehicle, road signs, zebra crossing and traffic lights. People see these things frequently every day, thus, if machines can understand these scenes and recognise these objects in the street, intelligent video monitoring will be able to response to different situations more accurately and effectively. Moreover, it can also be used inside the vehicles to assist human driving. Specifically, some research has been done to apply the technology to recognise variety of objects on computer aided vehicles, hence drivers can be given early warnings once exceptional cases happen. If the accuracy can achieve a high level, unmanned vehicles can even be developed and put into formal use in urban street.

Methodologies

Interviews and Questionnaires, Machine Learning and Computer Vision algorithms

Discipline

Computer Science, Human Factors, Transportation

Relevance

Interviews and Questionnaires to collect user requirement and evaluate the system. Machine Learning and Computer Vision algorithms to improve the performance of video monitoring recognition. Transportation regulation and knowledge to satisfy user requirement.

References

1. J. Tarel & F. Guichard. Combined dynamic tracking and recognition of curves with application to road detection. ICIP 2000: 216-219
2. M.B. Wilson & S. Dickson. Poppet: A Robust Road Boundary Detection and Tracking Algorithm. BMVC 1999.

Boying Li

Building a Comprehensive Model to Predict Diffusion Pattern of Online Word-of-Mouth

Research Question

Can social network factors and content of message predict the diffusion pattern of online word-of-mouth?

Research Aim

The online word-of-mouth (also known as electronic word-of-mouth, i.e. eWOM) is a commonly used term in marketing, meaning the Internet-based communication among potential, actual, or former customers regarding an organisation and its offerings [1]. Traditionally, researches in marketing have tried to explore some factors that influence the spreading of eWOM; however, the studies are usually done by self-reported questionnaires, and limited by the data, only individual behaviour can be analysed, thus can hardly predict the large-scale long-term diffusion of customer opinion and communication [2].

My proposed PhD project aims to use big data (in this case, the large amount of eWOM generated from social networking sites) to predict the diffusion pattern of customer opinion/words. Based on current literature review, the provisional research structure will include the analysis of social network factors and the content of eWOM. This model could be used to predict the transmission situation of certain eWOM, and thus be used by businesses to better manage customer relationships and allocate resources.

This research does not have to focus on eWOM, it can also be broadened to cover (or shifted to focus on) other business related ideas such as advertising ideas, business management ideologies; or more general public opinion/idea formation and transmission. If broadening the scope, the research question could be changed into: how does information transmit on social networking sites?

Provisional Research Methods

- Social network analysis will be used to analyse the social network effects.
- Sentiment analysis and text mining will be used to analyse eWOM content.
- Linear regression and neural network will be used to predict the diffusion pattern of eWOM based on the proposed factors (inputs).

Based on existing literatures, the provisional dimensions of network factors include the tie-strength, homophily, trust, normative, and informational interpersonal influence [2]. In addition, there can be other factors that affect the spreading of eWOM in social networking sites as well, for example, the content of eWOM. Content of eWOM could involve visual information (e.g. photos), emotion, attributes

of product mentioned, and motivations expressed, etc. Textual-visual information formats have been proved to have greater influence on motivation to travel than text-only information [3]; it may also affect eWOM spreading. Attributes here mean the attributes of product mentioned in eWOM [4]. Consumer opinion and communication can also be emotional, meaning having strong emotion in the message. Because emotional eWOM can trigger/induce receivers' emotional responses, it is likely to stimulate their attention, influencing the diffusion [5]. Emotion may also affect the transmission through its effect on credibility of information. Moreover, the perceived motivation of information spreading (e.g. sense of belonging, enjoyment of helping others, compensation) may also influence how receivers of information react [6]. For example, a piece of tweets with personal opinion on a product (i.e. eWOM) that is seen as aiming at helping others may be retweeted by more people than those that are perceived as serving self-oriented purposes.

References

1. Jansen, B.J., Zhang, M., Sobel, K. and Chowdury, A. (2009) Twitter power: tweets as electronic word of mouth. Journal of the American Society for Information Science and Technology, 60 (11), 2169-2188.
2. Chu, S and Kim, Y. (2011) Determinants of consumer engagement in electronic word-of-mouth (eWOM) in social networking sites. International Journal of Advertising, 30 (1), pp. 47-75.
3. Lee, G. and Tussyadiah, lis P. (2010) Textual and visual information in eWOM: a gap between preferences in information search and diffusion. Information Technology & Tourism, 12 (4), pp. 351-361.
4. Gopinath, S., Thomas, J.S. and Krishnamurthi, L. (2014) Investigating the relationship between the content of online word of mouth, advertising, and brand performance. Marketing Science, Articles in Advance, pp.1-18.
5. Boyd, D. (2010) Streams of content, limited attention: the flow of information through social media. Educause Review, Sep/Oct-2010.
6. Cheung, C.M.K. and Lee, M.K.O. (2012) What drives consumers to spread electronic word of mouth in online consumer-opinion platforms. Decision Support Systems, 53 (1), pp. 218-225.

Mengdi Li

Embrace Big Data in Wind Energy: Performance Monitoring of Wind Turbines Using Novel Data Mining Approaches

Background

At present, incomprehensibly sheer volume of information, often described as "Big Data", is generated every day due to the increasing use of the Internet and other technologies like ubiquitous sensors [1]. The flood of data has been exploited in different disciplines such as Science and Business. When it comes to newer sectors like renewable energy, Big Data also has great potential for exploitation.

Wind energy has become the world's fastest growing renewable energy type due to wind's wide availability and environmental considerations [2]. An increasing number of wind turbines are being constructed every

year across the globe. As the failures such as spalled bearings, drive train failures and fractured gears in wind turbine system lead to significant repair and maintenance costs, proper monitoring of wind turbine and early fault prediction seem essential [3]. A number of approaches like vibration analysis and optical strain measurements have been applied to monitor the conditions of wind turbine [3]. However, those traditional approaches are limited to lab settings and costly as additional sensors are required.

Research Question

How can performance monitoring and fault diagnosis of wind turbines be conducted in a cost-effective but more efficient and accurate way?

Research Aim

This research aims to explore the potential of Big Data in wind energy, utilising the huge sources of wind turbine data recorded by advanced supervisory control and data acquisition (SCADA) systems of wind turbines to predict performance in real time.

Methodology

Novel data mining techniques will be investigated to predict faults associated with different wind turbine components ahead of their occurrence, and to continuously monitor the states of wind turbine system based on the operational data. The goal of this research is to help minimise the chance of system failure, facilitate scheduled maintenance, and harvest more wind energy from the wind farm.

References

1. D. Bollier, and C.M. Firestone. The promise and peril of big data. Washington, DC, USA: Aspen Institute, Communications and Society Program, 2010.
2. A. Kusiak and A. Verma. Prediction of status patterns of wind turbines: A data-mining approach. Journal of Solar Energy Engineering, 2001, 133(1), 011008.
3. A. Kusiak et al. Prediction, operations, and condition monitoring in wind energy. Energy, 60, 2013, pp.1-12.

Jingxin Liu

Pathological Computerised Image Analysis

Along with the quick development of computer science, computer vision technology has been applied in every kind of field.

In the traditional pathology area, pathologists routinely explore tissue slides through a microscope and produce diagnostic and prognostic results based on the observations. The increasing number of tissue slides and the importance of this type of examination in both clinical medicine and biological research make this visual work tedious and of low efficiency. Computerised image analysis methods have largely been developed in the area of digitised medical image analysis. Digitised tissue slide analysis allows the Pathologists to use computer assisted image analysis technology to reduce time cost and increase the accuracy of diagnosis [1]. In addition, it allows for easy access, convenient storage. The project would explore other medical fields which would use the same image analysis methods.

Aims and Objectives

Developing a robust pathological image analysis method to aid pathologists in the

examination of tissues sides.

Methodologies

According to the above mentioned idea, the following knowledge would be used: image processing, computer vision, pattern recognition, machine learning, pathology

References

1. M. Cregger, A. J. Berger, and D. L. Rimm. Immunohistochemistry and Quantitative Analysis of Protein Expression. Arch. Pathol. Lab. Med., 7: 1026–1030, 2006.

Shuli Liu

Novel Perspectives to Study Practical Problems in Ports Operations

Research Questions

1. How can we use 'multi-perspective modelling' to bring the different parts involved in ports operations into line with each other?
2. How can system simulation and visualisation help us design more effective ports operations platform?
3. To what extent could emerging technologies improve the operation efficiency.

Aims

To improve the efficiency of ports operations with novel methods; ambitiously, to implement part of intelligent decision support system for decision-makers.

Methodologies

Simulation tools, Heuristic/metaheuristics, Mathematical Modelling and Optimisation, Data mining, Multi-criteria decision support analysis Related discipline Computer Science, Logistics and Supply Chain, Mathematics, Traffic Science, Management Science

Relevance

Using multi-disciplinary techniques to solve practical problems and to provide decision support for decision makers in Ningbo Port that plays an important role in the prosperity of the local economy. Studying the application of emerging technologies like RFID and IoT (Internet of Things) into ports operations in order to promote the development of smart port.

References

1. Matthew E.H. Petering, Katta G. Murtyb, 2009. Effect of block length and yard crane deployment systems on overall performance at a seaport container trans-shipment terminal. Computers & Operations Research 36 (2009) 1711 – 1725
2. Francesco Parola, Anna Sciomachen, 2005. Inter-modal container flows in a port system network: Analysis of possible growths via simulation models. International Journal of Production Economics ,Volume 97, Issue 1, 18 July 2005, Pages 75–88
3. Pablo Cortes *, Jesus Munuzuri, J. Nicolas Ibanez, Jose Guadix, 2007. Simulation of freight trac in the Seville inland port. Simulation Modelling Practice and Theory 15 (2007) 256–271.

Cong Mu

Connecting Quantified Self with Rhythmanalysis

The quantified self (QS) movement emerged in 2007 and has gained traction in recent years as an increasing number of people in urban areas start to adopt mobile and wearable technologies, such as fitbit, for life-logging and life optimisation purposes. [1] According to Deborah Lupton, the QS refers to "the practice of gathering data about oneself on a regular basis and then recording and analysing the data to produce statistics and other data (such as images) relating to one's bodily functions and everyday habits." [2]

In my group research project last year, my team found that most data models built in commercial self-tracking devices focus on physiological data, such as step counts and sleep patterns. Companies also use social networks to help users manage and circulate their data, thus building virtual QS communities to promote such kind of self-tracking and engendering a cultural phenomenon.

I want to research a new, alternative QS model in my PhD project. Since this movement is closely related to using ubiquitous computing in everyday life, I want to connect it, though not exclusively, to the theory of rhythmanalysis proposed in 1980s by Henri Lefebvre, a pioneer on everyday life studies. I will also draw on Michel Foucault's idea on the care of the self, an approach suggested by Lupton [3], to study the QS as a "technology of the self." [4] Moreover, given that self-tracking gadgets as well as their related social apps form a physical and virtual companionship to the users, it is inevitable to study the human-machine relation herein. My approach to this question will be phenomenological, replying on such theorists as Don Ihde, Donna Haraway and Andrew Pickering. [5][6]

The reasons for applying rhythmanalysis is that i) it provides a general framework to capture and analyse the rhythms in daily life; ii) it treats the rhythms both inside and outside a human body, but also indicates that some rhythms are difficult to detect, hence the need for training, or, in my case, awareness-enhancing technologies; iii) it is human-centred so that the QSer, as a rhythmanalyst, sees him/herself as a metronome that displays eurhythmia or arrhythmia, resulting from the dynamic interplays between the internal and external rhythms. [7] Therefore, one of my goals is to build a model based on this metronome notion.

Developing Lefebvre's theory, Tim Edensor has proposed four rhythmic categories, which can serve as a paradigm for the modelling:

1. The rhythms of people
2. Bodily rhythms
3. Rhythms of mobility
4. Non-human rhythms [8]

The alternative QS differentiates itself from lifehacking, or popular techniques to cope with worklife stress, because it does not use dressage, or habit training, to force the people to conform to the linear rhythm of Taylorism. The reason is that cyclical rhythms cannot thus be suppressed, and lifehacking may actually lead to digital disengagement. [9] Instead, the smarter self-tracking devices should accommodate both the cyclical and the linear for achieving eurhythmia, or, in case of arrhythmia, they can provide records and assistance for rhythm debugging.

References

1. D. Lupton. Understanding the human machine. IEEE Technology and Society Magazine, 2013, Winter, 25–26.
2. Ibid, 25.
3. D. Lupton. The quantified self movement: some sociological perspectives. Blog, 4 Nov 2012, http://simplysociology.wordpress.com/category/quantified-self/.
4. M. Foucault. Technologies of the self. Technologies of the self: a seminar with Michel Foucault, 1988, 16–49.
5. D. Ihde. Bodies in technology, 2002. 67–100
6. D. Ihde. Introduction. Chasing technoscience, 2003, 1-7.
7. H. Lefebvre. Rhythmanalysis : space, time and everyday life, 2004, 19–20.
8. T. Edensor. Introduction : thinking about rhythm and space. Geographies of rhythm : nature, place, mobilities and bodies, 2010, 4-7.
9. T. Potts. Life hacking and everyday rhythm, ibid, 34.

Roma Patel

Crafting Touch: the integration of wearables and smart material in theatre for young audiences.

Wearables and smart materials could potentially play a role in reconceptualising the way costumes and scenography shape the audience's experience allowing for new modes of expression, communication in theatre for young audiences (TYA). Wearables, unlike many of the technologies we currently experience, are designed to be so closely related to the human body, have the potential of becoming a 'second skin' and the ability to act as 'perfomative' technologies by gathering information, processing it to further the narrative and create a responsive theatre experience.

Questions

- In what ways can tangible, tactile and direct sensing; natural interfaces be integrated into a scenography and costume design?
- How can wearables and smart material be used creatively to enhance the dynamic of the narrative in TYA?
- How can wearables technologies become 'performative' interactive elements?
- How do the actors and the audience relate to responsive costume and scenography?

Aims and Objectives

The project aims to investigate how wearables and smart materials can be designed and integrated into costumes and scenography to enhance narrative and create a new compelling interactive; storytelling platform that can encourage active audience participation and deeper engagement with the performance.

- To design and make a series of iterative prototypes to test and explore the interrelationship and dramaturgy of touch, materiality, craft and technology.
- To measure how wearables and smart materials can encourage new audience participation through involvement; in real-time interaction, the sense of discovery and encouragement to play.

- To define the extent to which wearables and smart materials can influence traditional storytelling in theatre.

Methodologies

The research project will adopt a multiple method interdisciplinary approach to bring together creative action and critical reflection in studio practice setting. It will draw from design practice theories such as practice led research, critical design, constructive design and performance theories. Action-reflection will be achieved through a reflective journal together with storyboards, visualisations and prototypes will provide a picture of the research development and progress.

For evaluation and testing with users qualitative and ethnographic methods will be employed. In collaboration with the Lakeside Arts Centre, I will consult a cross-section of users including children, parents, actors and theatre companies. Focus groups, observation and interviews will be used to collect qualitative data to gather evidence of the design, interactive content, accessibility, engagement and usability. Interviews will be a key method to find out about the users experience in-depth.

Martin Porcheron

Embracing the Divide Between Physical and Digital Social Contexts

People now live connected lives, wherever they go they can be reached through their array of devices, and often choose to engage with others who are not present in an individuals current physical social context. An observation made is that people may often consciously, or unconsciously, choose to ignore those around them and engage in activities that may be detrimental to interaction with others,

The aim of my PhD is to identify and attempt to create a framework of understanding to address why people choose to disregard, or engage with digital social connections in favour of present physical contexts. There are a number of factors to consider, such as the type of environment (pub, museum, park and so on), the reasons for disengagement (such as retrieving/researching a topic, boredom, obsession), and people's perceptions of how these activities affect their engagement with the environment, and the people around them.

The objectives of my PhD will be to first identify the reasons for this disengagement, following which I want to examine and gain and understanding of the ways user behaviour can be modified to enhance the situation not necessarily halt the user behaviour though. For example, through timely interruptions, or breaking privacy boundaries, it may be possible to actually trigger heightened engagement with others in the local vicinity. Finally, I intend to examine the affects, including individual perceptions, of interventionism in this manner.

A number of methodologies will be covered in throughout the PhD including a mixed-methods approach to gaining a comprehensive understanding of existing behaviour (including ethnographical approaches, and quantitative data collection), participatory design methods to understand potential designs such as focus groups will be used, in co-ordination with prototyping of ideas to gain an understand of user perceptions and reactions.

Anne Maike Quandt

Health Communication in the Digital Age

The research question I want to investigate is "What is the role of technology in adolescents' health communication?".

I am a PhD researcher in my first year. My background is in linguistics in which I hold a Master of Research equivalent degree. Prior to starting the PhD programme in the Horizon CDT I worked as a research associate on various research projects. One of these projects inspired my strong interest in the interdisciplinary field of health communication. I am particularly interested in a research topic investigating the ways adolescents communicate their health experiences.

Corpus linguistic studies have been undertaken in this area by researchers at The University of Nottingham, who analysed and identified main topics of concern, most frequent questions and the distribution of demographics in online adolescent communication with health professionals [1]. However, no comprehensive linguistic analysis of the language teenagers use to communicate health experiences has been undertaken. This analysis constitutes a worthwhile contribution to the field as it has substantial implications for understanding the challenges adolescents face in health contexts.

Furthermore, no longer limited to face-to-face communication, the way adolescents communicate and how they communicate now incorporates substantial amounts of computer-mediated communication. These methods of communication not only provide properties such as (more or less complete) anonymity, but also provide different modes of communication. It is well documented that teenagers do not communicate well with GPs [2,3]. Despite this, there has been limited research into how adolescents communicate about their health experiences, and even less is known about the effect of using multi-modal technology to facilitate the expression of health experiences. Such knowledge is not only invaluable in enabling better communication between health practitioners and adolescents but also important in additionally finding ways to encourage discussion amongst adolescents about health. Additionally, I am interested in investigating how adolescents communicate health experiences amongst peers and the effect of using novel multi-modal technology to facilitate the expression of health experiences. Such technology would not only elicit data for the analysis of language that adolescents use, but additionally examine the suitability of such technology to support communication of potentially sensitive health topics.

References

1. Adolphs, S & Mullany, L (2011) "Am I normal?" A new communications tool for healthcare practitioners. 'From Innovation to Impact': University of Nottingham Innovation Expo, Jan 27-28 2011.

2. Jacobson L, Richardson G, Parry-Langdon N, Donovan, C (2001) "How do teenagers and primary care healthcare providers view each other? An overview of key themes". British Journal of General Practice 51: 811-816.

3. McPherson, A. (2005) "ABC of Adolescence: Adolescents in primary care". BMJ 330: 465-467.

Andreas Josef Reiter

Understanding and supporting innovation in creative spaces

Background

So-called hacker-, crafts- or maker spaces are physical places where people collaboratively work on the creative and/or technical interests of its members, utilising and managing both the space and its infrastructure and equipment. These creative environments provide a rich and fertile seeding ground for innovative enterprises of various intents, and in the case of the Austrian open technology labs OTELO has led to successful start-ups utilising the provided infrastructure. This entrepreneurial aspect is accompanied by an educational one – hack spaces often offer the space, opportunity and expertise of their members in workshops and support activities that are necessary to learn in a playful manner without the definitive need for "success" (in fact failure is more seen as a challenge and opportunity to learn), and usually operate with an inclusive approach – all age groups are welcome, and all trades can be found.

These inherent educational aspects, in Schrock's [1] paper title fittingly described as "education in disguise", and the insight gained through observation of the actual accountable work action could potentially inform the design of new educational concepts, fit for the educational needs of the 21st century society.

Aim and Objective

The objective of the proposed PhD project is an ethnomethodologically informed ethnographic exploration of multiple hack/crafts spaces and collaborative work environments in their various instantiations across the UK (such as the Nottingham Hackspace community) and internationally.

In order to get a first-hand account of the work that makes these creative spaces work and the issues these places of innovation face, a two-track approach will be employed, consisting of a sensitising ethnographic study into the everyday practices and activities at hack/maker spaces, and the development of a technology probe as an intervention potentially employing a participatory design approach. This will then provide valuable insights into the everyday account of what work it actually is that makes these spaces work.

Another track is to compare the lessons learned from the first intervention to those observable in other hack spaces in order to identify similarities and differences in innovation and what it is that drives and fosters successful innovative practice in hacker/crafts/maker spaces. A possible outcome of the ethnographic study could then be technology to support innovation in hacker/crafts spaces – depending on the lessons learned from within these spaces.

Relevance, multidisciplinarity and impact

Innovation, creativity and craftsmanship are the key challenges of most 21st century businesses and as such have a critical impact on the nurturing and development of new models of entrepreneurship and collaboration, as well as new models of education and indeed arguably the foundations of society. By investigating and understanding what the everyday work is that make hack/craft spaces work, we can inform and improve not only

existing spaces, but also derive lessons and implications for the design of the future workplace in general. The proposed research will be based on the technical (computer science) knowledge of the researcher and will be informed by education and social sciences research, as well as business and entrepreneurship studies.

References

1. Schrock, Andrew Richard. "Education in Disguise": Culture of a Hacker and Maker Space, InterActions: UCLA Journal of Education and Information Studies, 10(1), 2014

Louise Mary Schofield

Individualised Education: Understanding Learner Interaction to Tailor Content

Background

Currently, in the UK education system, teachers deliver content to students in a group setting, applying methods that try to cater to the majority of learner needs [1]. However, the individual differences in learning styles and pace of content absorption have been found to be entirely subjective on the individual [2]. How far can technology play a part in helping to cater to the educational needs of individuals? Could it be possible to tailor content specific to a person's learning capabilities, and if so, what affect will this have on meeting the educational objectives outlined in Bloom's taxonomy [3]? Research has shown that students can be reluctant to verbalise concerns about a lack of understanding in front of their peers [4]. Would it be possible to take non-verbal cues from students in order to impact the rate and depth at which the material for a particular topic is delivered? Using Wizard of Oz experimentation, eye tracking, and facial and gesture recognition a non-invasive system will be developed that adjusts its method and pace of content delivery based on the measurement of student attention and confusion. It is believed that this system will then be able to provide teachers with insightful analytics about their students' progress. The research will be built upon existing learning theories and will contribute to the literature surrounding individual learning, learning analytics and the use of facial and gesture recognition in education.

Research Questions

Can a non-invasive machine measure attention and confusion to level where it can be used to tailor educational material being delivered to the individual?

What influence does having individual student learning analytics, formed from the proposed machine, have for the teacher?

Aim

To research how facial and gesture recognition can be used in education to enhance individual learning.

Objectives

- Propose a framework for content creation and machine decision making
- Measuring individual attention
- Measuring individual confusion
- Understanding learner interaction with machines

- Create software that delivers information based on non-audio cues from the individual
- Compare tailored teaching with traditional teaching, using Bloom's taxonomy
- Understand the impact of learner analytics for the teacher

Methodologies

It is envisioned that a mixed methods approach will be used, combining both quantitative and qualitative approaches. Example methods will include; questionnaires, focus groups, semi-structured interviews, Wizard of Oz experimentation, overt observation, eye-tracking and screen recording.

References

1. NSW Department of Education and Communities. When One Size Doesn't Fit All!, 2011. [Online] Available from: http://www.curriculumsupport.education.nsw.gov.au/secondary/pdhpe/prolearn/ reading/pr_007.htm [Accessed 4 March 2014].
2. Honey, P. & Mumford, A. Manual of Learning Styles. London: P Honey, 1982.
3. Bloom, B. S. Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain. New York: David McKay Co Inc, 1956.
4. Burns, J. School maths lessons: Pupils 'scared to ask for help', The BBC, 2012. [Online] Available from: http://www.bbc.co.uk/news/education-17258668 [Accessed 4 March 2014].

Elizaveta Temir

Mobile design framework for sustainable behaviour change: roles of UX design and motivation in physical activity

My PhD research question can be split into two sub-questions:

- what is the relationship between UX design of physical activity apps and their users' motivation; and
- how can this knowledge be used in design for sustainable behaviour change.

I am planning to take a naturalistic approach and use ethnography as my main research method. The PhD will start with a wider focus directed towards general organisation of people's physical activities, including both technology-assisted and technology-non-assisted. Once I gather enough knowledge on the motivational differences between those who use technology in their physical and those who do not, I will focus on studying UX of the wide variety of consumer physical activity apps and what relationship it has with users' motivation.

The end objective is to produce a design framework for sustainable behaviour change in the physical activity domain.

Hanne Gesine Wagner

Transparency and Open Data in Government - the way forward for citizen engagement?

PhD Research question

In the most general terms, my research interest is in how technology can be used to engage and interest individuals in politics. The focus for my work is going to be on what role transparency and Open Data can play in this.

The Coalition government included the commitment to opening up governmental data and increase transparency in its coalition agreement. It is meant to increase accountability, make public spending more effective and promote economic growth through innovative usage of the provided data [1].

My PhD will inquire whether and how transparency and Open Data could also be used to increase citizens' political and civic engagement.

Aims and Objectives

My research aims to analyse the current usage of Open Data in citizen engagement as well as understand how it could be used to empower citizens further. This could for example be done through formulating design paradigms for mobile apps and websites.

Participation does however also require a minimum level of understanding of the political process in general. Therefore, it is also of interest for me to see whether increased transparency can have an educational effect as well as how it may lead to a better understanding of institutional politics for the citizens. Additionally, I am planning to put Open Data in the context of other alternative political participation mechanisms such as e-petitions and see how the availability of supplement data can change a person's participation behaviour. Doing so, I also aim to open up some of the politics behind Open Data in government agencies and what this means for the data citizens ultimately are presented with.

Further objectives are to consider the existence and use of open government data in the UK in context of the European Union and compare the national situation with other European countries, for example Germany where the Open Data culture is still in its infancy. Here it is of interest for me what is needed to make open government data work as a promoter of political participation across borders, how it can open up the 'black box' that European Union activities are for many and what shared standards in data release need to be adhered to, to make all this work.

Methodologies

Methodologies used may include interviews and focus groups used to understand the needs of the various stakeholder in the domain of open government data. This will include citizens' and activists' needs as well as the governmental position when deciding if and what to publish. I am also planning to quantitative and qualitative analyse existing data sets and applications, in order to see what is already out there, what works, or not, and what information and apps are still missing and might be needed. There will also be consideration of current legislation in regards to Open Data and how citizen can demand the release of certain data sets.

References

1. Cabinet Office. Coalition Agreement, 2010.

Bolei Xu

Explore User Behaviour for Click Prediction in Sponsored Search

The research is to design an intent based model for prediction of advertisement clicks in sponsored search. The research will not only focus on what users are looking for, but also concern about why users click on these ads [1]. In particular, the relevant information including the content and persuasion of ads is the determination that would affect user click behaviour, and the attention of users should also be considered as a main influence factor.

The first step of research is to identify psychological desire of users in order to find out what kind of textual content would have influence on the user click behaviour. Next step is to retrieve and analyse representative feature of textual contents from the description of ads by means of data mining method in order to find the suitable representations for the intents model [2]. The final step is to test the intent based model on a large-scale advertisement search and click logs from Yahoo Webscope lab.

References

1. T. Wang, J. Bian, T. Liu, S. Zhang and T. Liu. “Psychological Advertising: Exploring User Psychology for Click Prediction in Sponsored Search,” (presented at the KDD ’13: Proceedings of the 19th ACM SIGKDD international conference on Knowledge discovery and data mining, New York, New York, USA: ACM Request Permissions, 2013), 563–571, doi:10.1145/2487575.2487699.
2. S. Kim, T. Qin, T. Liu and H. Yu. “Advertiser-Centric Approach to Understand User Click Behavior in Sponsored Search,” (presented at the CIKM ’11: Proceedings of the 20th ACM international conference on Information and knowledge management, New York, New York, USA: ACM Request Permissions, 2011), 2121–2124, doi:10.1145/2063576.2063905.

Liming Xu

Developing Reliable Computer Vision Techniques to Interact with Aestheticodes

Aestheticodes focuses on making decorative patterns more interactive, capturing and exploiting their digital footprints. Decorative patterns are an ever-present feature of our everyday world. From motifs and borders, to swathes of colour and texture, almost every object that we value is embellished with a pattern that has been carefully designed to enhance its aesthetic, meaning and value. Such patterns are an essential feature of ceramics, textiles, wallpaper and all manner of home furnishings and fittings. Those patterns has become a ubiquitous feature of our everyday world.

The aim of our research is to develop reliable computer vision technologies to support the process of interaction with those patterns, changing the patterns into codes robustly. There are techniques needed to develop in order to recognise the patterns accurately,

such as separating the figure from background, reliably recognise patterns when intervening by reflections, shadows and food. Also, Recognition technologies and the debugging tools need to develop for enabling designers to create drawings freely with minimum rules as possible as we can.

After those works, we will extend our recognition technology to work with a much wider variety of images, such as various reality systems, pixel-based recognition technology. we also exploit the possibility of assigning ordinary pictures in everyday world with unique codes, which can greatly enlarge the range of interaction.

Based on above ideas, we will dive into the areas of computer vision, machine learning, pattern recognition and psychology, find solutions to support the interaction with patterns.

References

1. Rupert Meese, Shakir Ali, Emily-Clare Thorne, Steve Benford, Anthony Quinn, Richard Mortier, Boriana Koleva, Tony Pridmore, Sharon Baurley. From Codes to Patterns: Designing Interactive Decoration for Tableware. CHI 2013, Paris, France.

Lanyun Zhang

Image and Text based Trip Route Recommendation App to study human behaviour towards choosing vacation destinations

My PhD is to design and develop a mobile application to give customised trip recommendations and to further study the factors that affect people's decisions in terms of choosing vacation destinations.

- Technically, I am interested in introducing image labelling or image-based and text-based information searching algorithms to search the desired holiday destinations. On the other hand, the ideal outcome of using the app is to generate an optimal travel route, in which different factors will be considered. For example, users can select and save their personalised interests, including favourite movies, books, TV programmes, musicians, bands, genre of music, sports, festivals and events. The app will give recommendations based on all the customised information.
- From the perspective of HCI, I am interested in how people think about this design of interaction, involving image-based and text-based searching. Since there are various factors in the input options, I also want to study how different factors are affecting people's decision making and possibly, if there will be any difference between different culture background.

Therefore, my research question by now is to develop an application to study human behaviour in terms of choosing vacation destinations.

My methodology will involve survey, design, development and user study. First, a survey is going to collect the data in terms of how people are planning their vacation currently. Therefore, it is reasonable to start design the structure of the mobile application and design how people should interact with it. At the same time, it is very interesting to involve and combine more advanced searching approach or advanced algorithm to improve the search result and speed. After developing the app, the last step is to run a user study to obtain peoples opinions towards the app, collect data

to study what factors are affecting people's decision making towards choosing vacation destinations, or compare people from different cultural backgrounds.