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Exploring New Connections between the Physical and Digital for Future Heritage Interpretations

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Abstract
New forms of connections between information and the physical world create opportunities for novel activities around heritage. This paper analyses a technological progression from linking data and content to locations, towards data captured by and linked to everyday objects. The former is exemplified by a study which explored community-based inquiry activities at a historical cemetery site. To explore the latter, we are developing a series of scenarios and visualisations to analyse peoples' interpretations of contextual footprints – current and historical data gathered through the Internet of Things.

Author Keywords
Interpretation, Location, Internet of Things, Heritage

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

General Terms
Design, Human Factors.

Introduction

Much of our understanding of heritage involves interaction with things in the physical environment that bring with them a sense of the past. This could include heirlooms, monuments or buildings, from the mundane to the spectacular. A second inspiration to heritage practices is historical information and perspectives that aid our understanding. Objects and information are commonly juxtaposed to form heritage experiences, such as information plaques next to objects in museums or on historic buildings, or audio guides that complement specific parts on a tour of a site. Other practices such as genealogy and local history investigations are heavily dependent on gaining access to, and interpreting, information and artefacts that are particularly meaningful to us.

The potential relationships between the physical environment and information continue to evolve. GPS and GIS technologies allow us to effectively link and review information related to specific locations. New technologies and infrastructure are emerging such that rich memories of the context and environmental conditions of a wide range of objects could be gathered and stored [1, 2]. This paper explores how both these innovations open up the potential for new practices around heritage, particularly in a localised and 'unofficial' manner [3].

In describing this Internet of Things model, Srivastava [4] predicts that we are now moving forward from user-generated content to 'thing-generated content', where objects all around us effectively create and store data about themselves. The trend is increasingly for information linked to and drawn from places and objects with ever greater richness and accuracy.

This move from user to thing-generated content will place new value on interpretation: human ways of creating understanding from these diverse sets of data which hold relation to a particular person, place or time. Interpretation is a key, yet poorly understood, aspect of heritage practices: The underlying aim of official heritage interpretation is often to encourage certain social values – to value and care for a specific place or see the significance of an event. This often entails attempts to provoke the audience to think for themselves in new ways, with varying degrees of success [5]. The active creation and sharing of interpretations is central to unofficial heritage practices, and again social values are a key issue [3]. It is to be expected that more unofficial interpretative practices will develop around location-based and thing-generated content as this infrastructure becomes mainstream.

User-Generated Location-Based Content

The development of infrastructure for location-based, user-generated content creates opportunities for novel activities that increase individual and community engagement with the history of places that may otherwise be forgotten or ignored. The ability for anyone to create and review information about places means that a walk down a street, across a park or into a building can be augmented by a greater appreciation of the past, present and potential future of the place.

In the Mill Road Discovery project, a large cemetery site in Cambridge, UK provided an interesting space for exploring novel heritage practices. The aim was to support local community groups, amateur historians and schoolchildren to build and share understanding of the rich stories related to a place they passed through regularly. The gravestones were identified as individual

Figure 1: Capturing Location-Based Information and reflecting on it at Mill Road

locations to which information such as parish and war grave records, inscriptions, photos, stories and interpretations could be linked. This information could be added and reviewed whilst mobile through tablet computers and smartphones, and also in a nearby room equipped with a tabletop computer and laptops for further research, discussion and reflection.

The activity of relating information to physical grave locations, and using this to build interpretations and stories around the people buried there, was engaging in different ways: Some invested their time to build an accurate database linking parish records to individual graves. A professor from a local university happened upon the grave of an important figure in his discipline whilst reviewing collected information on the tabletop. He was inspired to write a biographical article about him, and spent time showing the gravestone to colleagues. Intriguing circumstances and gaps in information caught the attention of schoolchildren – why was a young man from New Zealand buried here? What had happened to him in his short life? These were interpreted and developed into narratives and characters for drama coursework [6].

The project highlighted the value to heritage of strengthening links between information and physical objects. It began with discussions around the technical problems of linking graves to existing records, but expanded towards the creation of interpretations and stories around the site. Whilst the activity provided enjoyable and engaging activities, it was not without difficulties: Although accurate GIS data on the location of grave plots was provided alongside current GPS location, users often found it hard to relate maps to their perspective on their surroundings. Graves could be almost on top of each other, and when a mistaken identification was made, it could be used as a point of reference, leading to further mistakes in linking data to records. Essentially, this represents a problem when attempting to link information to objects using location data of limited accuracy.

The trials brought together diverse people from the local area. They led to the creation of multiple interpretations built through the interweaving of information, physical objects and discussion. There was evidence that these kinds of activities developed a greater sense of the value of the place, particularly for the schoolchildren [6]. Although it is sometimes suggested that modern technology has eroded our sense of community and place, the project instead suggests that technologies can instead increase our appreciation and engagement in the local area.

Interpretations of Thing-Generated Content

In some contrast to the technologies used at Mill Road, Internet of Things (IoT) technologies are emerging that provide a direct link between information and physical objects. These technologies can support the automatic capture and sharing of data through sensors and networking, such as the location of an object, its environmental conditions and its proximity to other objects. Information about 'entities of interest' could be gathered either directly from the object, or via devices that monitor the environment and track entities within it [2]. 'Object memory' models and infrastructure are proposed such that historical records and metadata about all kinds of things from clothes to groceries to appliances could be queried [1].

The information held in these object memory models models is likely to combine automatically collected data and human interpretations. Churchill et al identify three major elements that can link objects and communities: *Annotation* permitting asynchronous conversations around an object, the *History* of an object such as logs of use or other sensor data, and the *Connection* of the object to communication systems [7]. The linking of human-generated stories to objects is being explored through research such as the 'Tales of Things' project [8]. Our interest in the Intergenerational Interpretations of the Internet of Things (IIIoT) project is how people might interpret and use the data that is automatically collected about these objects, as a basis for understanding the past and the present.

Business logistics has been a key driver of these technologies to date, aiming to automate stocktaking or ensure quality [9]. However new products aim to integrate the IoT more closely into intimate situations: For example a current project at Horizon is developing 'Trackable Tableware' to explore how everyday objects such as plates and mugs can generate data about their use that forms a 'contextual footprint' over time [10]. GreenGoose now market tags to attach to household objects, allowing families to automatically monitor and gamify activities such as brushing teeth, walking the dog or playing Frisbee [11]. Although it is hard to envisage the amount of information that people will be willing to share, or will be able to keep private, it is likely that IoT technologies will provide us with greater access to historical data about family and friends, rather than the powerful or famous. Also, rather than focusing on objects of official cultural value, this data is as likely to be broadly collected from mundane, everyday objects as from precious ones – commodities such as clothes and groceries.

This project explores the ways in which members of different generations in a household might interpret IoT information about each other. As a starting point we are exploring how people respond to a set of scenarios, grounded in upcoming technologies and used to explore how people interpret IoT data about others around them. Current and historical data from individual objects could be combined to produce rich visualisations of events, and changes to places and people over time. This could provide a valuable new resource to augment future heritage activities. Whilst it is currently feasible to link our interpretations to objects, in the future these interpretations could be augmented by automatically generated re-enactments of how a person or place looked, or the historical passage of an object between people and places.

As an example, one of our scenarios concerns how data might be used to share in past and present experiences of others. Previous work in this space has included Brown et al's development and evaluation of a 'Whereabouts Clock' that provided information about the current location of other family members [12]. Inspired by this concept and the richer data that could be taken from the IoT, we have developed the idea of a 'Proximity Portrait'. This is conceived as a display in the home that would visualise objects in close proximity to each member of a household or family at any given time. For instance it could depict the clothes they were wearing, and show if they were driving a car, reading a book or playing a computer game. As with standard portraits, the Proximity Portrait would support a view into the past with particular relevance for family or

household members. Visualisations could show change over an extended time period – how did the clothes we wear evolve? What we were doing on this day last year? What were the most common objects around us?

Visualisations of this kind will still leave gaps and will provoke, rather than provide interpretations, it will not - for example – directly expose a persons' intentions. Our research will explore how a viewer of the portrait makes judgements or build a narrative that interprets the actions and intentions of people being viewed, particularly in relation to their generation and role in the family. What different impressions are provoked through this kind of visualisation? Our understanding will be framed by a range of social and psychological literature: For example, cognitive models of event segmentation explore how people might distinguish and define meaningful events in relation to each other (e.g. [13]). Stereotyping can be particularly pronounced in relation to people of different generations and ages (e.g. [14]), and a small set of beliefs and biases may be important in the judgements we make when interpreting information, particularly with emotional and family ties (e.g. [5], [15]).

It is through systems such as this that we envisage information generated by embedded computation becoming available for interpretation in heritage practices and other social interactions. As with other kinds of heritage practices around information, links between places, people, events and objects are key to understanding. This scenario looks at the links between people and objects, and from this we would expect people to infer events and places. Another visualisation and scenario could focus on links between place and objects – for example tracking how the appearance of a room changes over time as items and people move in and out of the space. Developing this approach, we could see IoT data playing a role in the evolution of our understanding of history, as important as sources to historical inquiry as writing, photography or video.

Discussion

The Mill Road Discovery project and IIIoT represent contrasting points in a wide space through which new technologies are beginning to intersect with our views of the past. Figure 2 begins to map this space by representing links between locations, objects and information in the activities seen at Mill Road, and the activities expected around the Proximity Portrait.

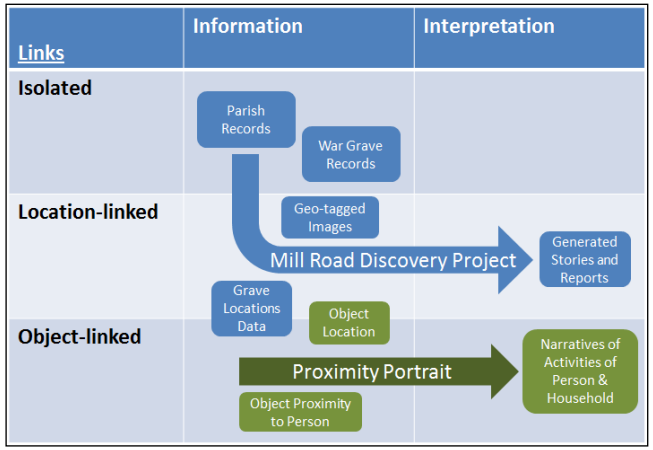

Figure 2: Characterising the discussed activities by use of location or object-linked information and interpretations

A plurality of linked media, events, places, people and objects have always informed heritage practices. New technologies can widen participation and opportunities for creative interpretation if they are designed with an

appreciation for individual and social behaviours. In the case of Mill Road, existing communities around a place were engaged in a novel way. In IIIoT, we are only beginning to understand how people will interpret and react to new data sources and links between information and the physical world. In both cases, more localised community and family heritage practices become possible, based around active interpretation, re-enactment, and the creation of new narratives, using personally meaningful data sources.

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References

[1] W3C. Object Memory Modelling - Final Report. Available from: http://www.w3.org/2005/Incubator/omm/XGR-omm-20111026/.

[2] Haller, S., The Things in the Internet of Things, in Internet of Things Conference. 2010: Tokyo, Japan.

[3] Giaccardi, E., Things we value. interactions, 2011. 18(1): p. 17-21.

[4] Srivastava, L. The Internet of Things - Back to the Future. 2011; Available from: http://www.youtube.com/watch?v=CJdNq7uSddM&feature=related.

[5] Ham, S.H., Can Interpretation Really Make a Difference? Answers to Four Questions from Cognitive and Behavioral Psychology, in Interpreting World Heritage Conference 2007. p. 42-52.

[6] Coughlan, T., van der Linden J., & Adams A. Local connections: designing technologies for discovery and creativity within the community. interactions, 2012. 19(1): p. 18-22.

[7] Churchill, E.F., Nelson, L., and Sokoler, T., Tools that tell tales: Bridging context seams by digitally annotating physical artifacts. , in Workshop on Smart Object Systems, UbiComp 2005: Tokyo, Japan.

[8] Speed, C., An Internet of Things That Do Not Exist, in Interactions. 2011, ACM Press. p. 18-21.

[9] Haller, S., Karnouskos , S., & Schroth, C.,, The Internet of Things in an Enterprise Context, in Future Internet: FIS 2008: First Future Internet Symposium. 2008, Springer-Verlag.

[10] Trackable Tableware. Available from: http://www.horizon.ac.uk/current-projects/Trackable-Tableware.

[11] Greengoose. Available from: http://www.greengoose.com/.

[12] Brown, B., Taylor, A. S., Izadi, S., Sellen, A., Kaye, J., and Eardley, R., Locating Family Values: A Field Trial of the Whereabouts Clock, in UbiComp 2007, Springer-Verlag. p. 354–371.

[13] Zacks , J.M. & Swallow, K. M., Event segmentation. Current Directions in Psychological Science, 2007. 16: p. 80-84.

[14] Schmidt, D.F., & Boland, S. M., Structure of perceptions of older adults: Evidence for multiple stereotypes. Psychology and Aging, 1986. 1(3): p. 255-260.

[15] Nickerson, R.S., Confirmation Bias: A Ubiquitous Phenomenon in Many Guises. Review of General Psychology, 1998. 2(2): p. 175-220.