Situated Immersion: The Living Room of the Future

Adrian Gradinar
Imagination
Lancaster University
Lancaster, LA1 4YW, UK.
a.gradinar@lancaster.ac.uk

Joseph Lindley
Imagination
Lancaster University
Lancaster, LA1 4YW, UK.
j.lindley@lancaster.ac.uk

Paul Coulton
Imagination
Lancaster University
Lancaster, LA1 4YW, UK.
p.coulton@lancaster.ac.uk

Ian Forrester
BBC R&D
Media City, UK

Phil Stenton
BBC R&D
Media City, UK

Note the Living Room of the Future made possible through the Objects of Immersion research project funded by the Arts and Humanities Research Council (AH/R008728/1)

Abstract
This paper presents the Living Room of the Future which explores new forms of immersive experience which utilise Object Based Media to provision media that is personalised, adaptable, dynamic, and responsive. It builds upon previous research on Perceptive Media, Internet of Things Storytelling, and Experiential Futures which, in contrast to approaches that simply conflate immersion with increased visual fidelity, proposes subtle and nuanced ways to immerse audiences in a situated context. The room-sized prototype demonstrates this approach to immersion and includes connected devices that provide contextual data to personalise the media as well as physical elements that enhance the immersive experience.

Author Keywords
Object Based Media; Perceptive Media; Internet of Things; Experiential Design Fiction.

ACM Classification Keywords
Human-centered computing~Contextual design

Introduction
Much of the current rhetoric surrounding developing immersive experiences predominantly promotes technologies that support Augmented Reality (AR) and Virtual Reality (VR), such as Occulus Rift, HTC Vive,

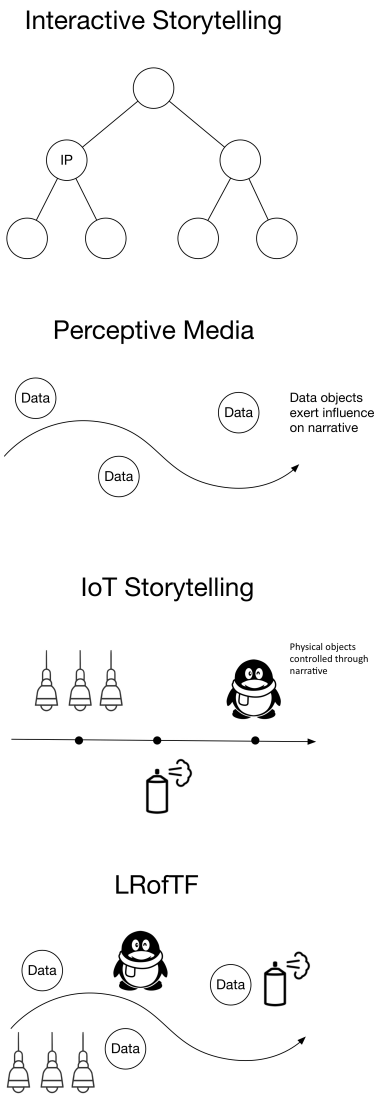

Figure 1: Different Storytelling Experiences

etc., and have become popularly described as "Immersive Technology" [6,7]. Whilst there is no doubt such technologies are interesting and important for the development of new forms of immersive experiences such rhetoric can also create a misconception that these technologies themselves are the basis of immersion rather than providing a platform on which potentially immersive content can be presented. The Oxford English Dictionary defines immersion as "deep mental involvement in something" which implies it is the activity that is at the core of the involvement as opposed to the tools used to achieve the involvement. Furthermore, it is the particularities of the activity which are immersive; when we say someone is immersed in a book or a game semantically we are referring to the person being immersed in a *specific* book or game. Therefore, when discussing the potential of technologies to enable new forms of immersive experience, it is important we do not limit ourselves to a particular set of technologies but the characteristics of the activity/experience they can enable. With this in mind this paper presents the Living Room of the Future (LRofTF), a functional prototype which explores how media broadcasters may utilise the potential of Object-Based Media (OBM) to deliver more immersive experiences to audiences in home environments. OBM allows the dynamic customisation of broadcast media, radio and television, content based on audiences' personal, contextual and derived data. OBM delivers personalised viewing experiences by producing media in smaller parts (objects), describing how they relate to each other, allowing them to be dynamically reassembled into many possible personalised programmes. In addition to reconfiguration of media objects, the LRofTF uses Internet of Things (IoT) devices to provide some of the contextual data used to personalise the media as well as providing physical elements that are incorporated into the overall immersive experience. The LRofTF draws upon prior research into Perceptive Media [5], IoT Storytelling [2], and Design Fiction [3]. While Interactive Storytelling relies on audiences influencing storylines through direction action, as exemplified recently through Netflix's Black Mirror episode Bandersnatch[1], Perceptive Media utilises contextual information relevant to audiences and data gathered using a range of sensors to subtly alter the media dynamically and without direct interaction with the audience. Although the overall story arc generally remains the same for each viewing, ambient aspects of the narrative are 'tweaked' in order to create more engaging, context-specific, situated [8] experience. Similarly, IoT Storytelling builds upon a fixed story arc, but augments how it is delivered by synchronising on-screen events with IoT devices that act physically within the viewer's context [2] as the story progresses (figure 1). Both Perceptive Media and IoT Storytelling are reminiscent of non-technical approaches to immersion. For example, a traditional storyteller may adapt aspects of the story's interior world to the particularities of the location and the group of listeners and may increase audience immersion by referring to real world events.

Extending Object Based Media

The LRofTF was realised by combining elements of the aforementioned approaches with OBM. This was

[1] *Blackmirror:Bandersnatch* is as an interactive film in which the viewer can make decisions for the main character.

Figure 2: LRofTF Physical Objects.

achieved by utilising a range of commercial and bespoke IoT devices which were also integrated into the Databox platform [1] to protect privacy. The LRofTF aimed to *unite* real and virtual contexts so they become co-situated and can be experienced together.

Experience Design

Until relatively recently living rooms were the primary media-consumption hub of most homes, but today, with the ubiquity of screens and mobile devices the reality is that media are consumed wherever the audience requires and there may be multiple different types of media being simultaneously consumed within a living room. Notwithstanding the changing nature of the living room, for this project we constructed the prototype around a living room as it is still a common spatial configuration within homes, and most importantly, is a well understood concept of space, providing a familiar context. Whilst the initial version of the LRofTF was designed for a specific installation at the FACT gallery in Liverpool[2] (UK) as part of a public exhibition [4] it has been redesigned with new perceptive media content and new interactions and device for events at the Victoria and Albert Museum and Tate Modern in London before it went on permanent display in a 'Future Home' at the Building Research Establishment in Watford. It is this version we describe in the following subsections.

Physical Objects: As the LRofTF represent a potential near future we identified a selection of off-the-shelf IoT products including programmable lights, a heating/cooling fan, window blinds, and smart plugs, to incorporate. In addition to these commercially-available products, we included a clock-radio whose speaker provides ambient sounds as part of the media; a series of sensors to detect audience interactions with objects in the room (including a drink coaster and a remote-control device); a coffee table with in-built hand sensor, display, and thermal printer; and a voice activated LED 'eye' which provides a personality for the living room and masquerades as the camera for its face-scanning technology. Whilst the commercial products and the printer may be considered as 'outputs' of the LRofTF, the sensors should be seen 'inputs' generating data.

Media Objects: This expanded version of the LRofTF uses a short drama called the Break Up[3] which was specially commissioned by BBC R&D to highlight the potential of visual perceptive media having previously demonstrated it for radio [5]. The objects of the film can be reconfigured through derived data (i.e. weather, location, time, number of viewers, music preferences, genre preferences, etc.) to provide personalised versions in a number of ways: the film can have different colour grading applied; different soundtracks to represent either musical preference or mood; alternate endings. In an extreme example of using OBM to alter the story an alternative version of the story, but presented in sci-fi style and with some roles swapped among the actors, can be intercut with the primary version based on input from the sensors.

Technical Challenges: Designing and building the LRofTF was a significant challenge and required a number of bespoke technical layers to function properly. In order to take advantage of the privacy-

[2] https://youtu.be/yneprnGCRm0

[3] Created by Julius Amedume

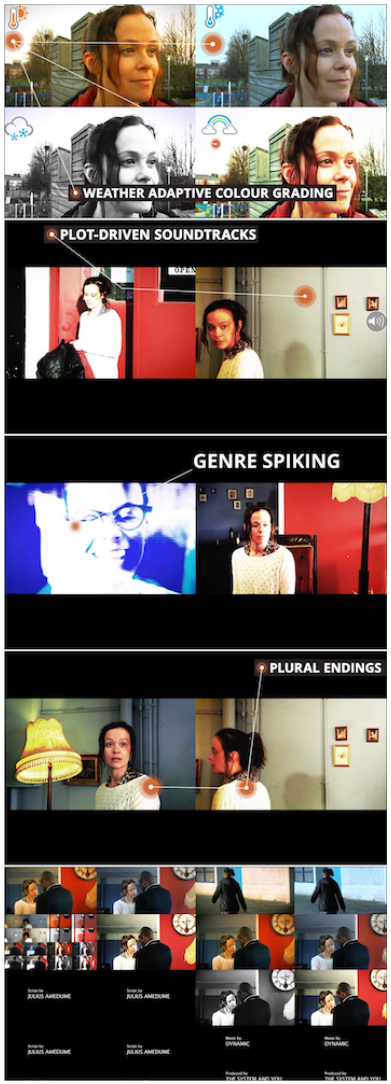

Figure 3: Data Driven Drama variants.

enhancing features in the LRofTF all data moving through the system is managed through a Databox architecture. This required that various bespoke software drivers be created that interface between LRofTF and the IoT devices around the room. OBM is a pivotal part of the LRofTF's operation, and usually works with the given media's constituent parts (e.g. sound, film clip, subtitle). Whilst these objects still exist within LRofTF, we extended the system such that the IoT devices around the room are OBM objects too. These serve two purposes: first, they capture and generate data providing contextual information about the audience and the physical world to the OBM system (as in Perceptive Media); second, they provide a means for the OBM system to act in the world, extending the scope of the media beyond the screen (as in IoT Storytelling). OBM encodes and manages how all of the objects relate to each other semantically, and in conjunction with the film, the space, the IoT devices, and Databox it choreographs the whole experience

The Experience: The requirement for the experience was to be designed such that it: would highlight the potential of Perceptive Media; foreground the increasing use of data collection as part of media consumption; and stand-alone without the requirement to be overseen by human operators. The experience is essentially split into three parts where the first simply introduces the experience and highlights how data collected in the living room can be used to create a customized version of the drama augmented by including IoT objects. In the second part the voice of the living room highlights the sensors and actuators within the room and requests permissions for data collection. To highlight that data collection is a tangible part of the experience and that viewers are essentially engaged in a transaction for which they provide data in exchange for viewing, the living room prints out a permission slip which the audience must sign to proceed. The drama is then played based on a profile generated by the system. At the start of the film the blinds come down and the room's lighting adapts to each scene (this is dependent upon which of the four colour gradients is chosen). When the lead characters is outside, the fan switches on matching the wind blowing her hair. The music within the film is chosen dependent on the profile generated by the system as is the ending which culminates with the character either leaving or staying with her abusive partner. At a predefined point within the narrative, an IoT smart plug is triggered by OBM to turn on an Ultra Violet (UV) light during which a short section of the science fiction film is shown before returning to the main drama. As with Perceptive Media the impact of particular data interactions which affect the drama are not shown immediately which means that while each experience was uniquely tailored to the audience, they would not necessarily be able to see why or how. Therefore, at the end of the experience an explainer video shows the points at which variations to the narrative occurred, and why (figure3).

Conclusions

The near future world in which LRofTF is situated in intentionally blurs the boundary between the audience's context (i.e. 'reality') and diegetic context (i.e. the virtual future mundane). The LRofTF invites audiences to become *part of* the artificial world to achieve an embodied suspension of disbelief. Throughout the LRofTF project it has been clear that there is a symbiotic relationship between the immersive media that this research addresses and the Experiential Design Fictional strategy employed to explore it.

References

1. J.A. Colley and A. Crabtree. 2018. Object Based Media, the IoT and Databox. In Living in the Internet of Things: Cybersecurity of the IoT - 2018, 34–40. https://doi.org/10.1049/cp.2018.0034
2. Paul Coulton. 2017. Sensing Atoms and Bits. In *Sensory Arts and Design*, Ian Heywood (ed.). Bloomsbury, 189–203.
3. Paul Coulton, Joseph Lindley, Miriam Sturdee, and Michael Stead. 2017. Design Fiction as World Building. In *Proceedings of the 3rd Biennial Research Through Design Conference*, 163–179. https://doi.org/10.6084/m9.figshare.4746964.Image
4. Paul Coulton, Joseph Lindley, Adrian Gradinar, James Colley, Neelima Sailaja, Andrew Crabtree, Ian Forrester, and Lianne Kerlin. 2019. Experiencing the Future Mundane. In *Proceedings Research Through Design Conference*.
5. Adrian Gradinar, Daniel Burnett, Paul Coulton, Ian Forrester, Matt Watkins, Tom Scutt, and Emma Murphy. 2015. Perceptive Media – Adaptive Storytelling for Digital Broadcast. In Advances in the Astronautical Sciences. 586–589. https://doi.org/10.1007/978-3-319-22723-8_67.
6. Amanda Kamin, 2018, Why Immersive Technology Will Transform Communications Across Sectors, PR Week, Retrieved 28/03/2019, https://bit.ly/2qNHZZH.
7. Steve Montgomery, 2018. An emerging hunger for immersive technologies. AV Magazine, Retrieved 28/03/2019, https://bit.ly/2YxY7hI
8. Lucy Suchman. 2007. *Human-Machine Reconfigurations: Plans and Situated Actions*. Cambridge University Press, Cambridge..