
Augmented Reality Broadcasting: Challenges and Opportunities

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ABSTRACT

The constant evolution of technologies involved in the production, distribution, and consumption of broadcast material has impacted our perception of our societies and the way we interact with each other. Future changes in this landscape will be carried forward by advances in high speed mobile connectivity, and the sensing and awareness properties of virtual and augmented reality devices. In this paper we present a vision for a use-case of these emerging technologies in the context of a scenario, and discuss the social and technological challenges they present.

KEYWORDS

Augmented Reality, Broadcasting, HMD, Information Retrieval

INTRODUCTION

The traditional content viewing model tied the audience to the time of broadcast and the location of the receiving device. More recently, these two restrictions were removed by on-demand TV and the advent of mobile devices and connectivity, respectively.

The next major change in this landscape will likely come from further advancements in: (1) mobile and wearable devices such as smart glasses and head-mounted displays (HMDs), (2) sensing and context awareness properties of these devices, and (3) recommender systems that go beyond the collaborative [4] and content-based [3] filtering techniques.

The British Broadcasting Corporation (BBC) is a UK-based public service broadcaster founded in the 1920s [1]. With regular radio and TV production since the 1920s and the 1930s respectively, and on online presence since the launch of their first website in 1997 [2], the BBC has an enormous amount of high quality archived content. New challenges and opportunities emerge when considering the utilisation of the above-mentioned technologies to leverage this archive effectively. The following scenario illustrates these points.

SCENARIO

*Alice works in a design office in the centre of Manchester. One of her hobbies is birdwatching. She spends the weekends learning about different species of birds that live in the United Kingdom. She often goes on trips with a local community of birdwatchers exploring nature and seeing the birds in their natural habitat. Recently a friend recommended a new app that runs on smart glasses and helps to identify and document different birds. The app uses the BBC's archives amongst other resources to enrich the experience of its users. Alice treated herself to a pair of smart glasses recently and had the app installed on them almost immediately. On the day of the trip she wears the glasses as she approaches the assembly point to meet with others in the group. The computer vision algorithm on the app detects a bird in the treeline in front of her. She is notified visually with the bird being outlined on her display and also using a sound notification which she hears through the bone conduction speakers of the device. On one side of her display Alice can see a zoomed in image of the bird and its immediate surrounding space captured by the cameras on the glasses. Next to it, textual information about the bird is displayed informing Alice about useful and interesting facts. On the other side of her display she can see selected content from the BBC archive (audio bites, video snippets, thumbnails of image collections, and text articles) presented to her. She can interact with the content on her display using hand gestures, or she can perform a subset of these interactions using **eye gestures**. The latter is useful in this case since it eliminates the chance of scaring off the bird with her sudden hand movements. On the top of her display a small green circle starts to blink with the caption "live". She gazes at this icon and **double blinks** to select it. This opens a small rectangular live feed in her display which is a real time camera feed of another birdwatcher's smart glasses in another part of the country who is currently looking at the same specie.*

CHALLENGES

It can be seen from the scenario above that in addition to the well-known technical challenges of the field such as tracking, field of view, battery life, ergonomics, etc., there are other technical and non-technical challenges that need to be addressed to create a successful user experience. These challenges include but not limited to: (1) the identification, retrieval, presentation of relevant content from large reserves of available material, (2) the ability to create shared and social experiences, including fostering an instantaneous "watercooler" experience with others wearing head-mounted

displays (HMDs). (3) new ways of interacting with content, other HMD wearers, bystanders and the wider environment.

Identifying Relevant Content

The BBC (and other similar media entities) have significant pools of media from which they may draw, spanning a wide variety of mediums and modalities (radio, TV, teletext, web content, subtitles etc.). Indexing and searching this content remains an open challenge even for relatively straightforward queries. However, in the context of HMD use for out-of-the-home media presentation, content selection becomes extremely complex, with criteria **encompassing environmental, task-based and social contextual factors**.

In the previously presented scenario, content selection accounts not only for Alice's age, preferred media channels, and her longstanding interest in birds, but also her present location, the season and weather (to identify birds likely to be seen nearby), and her visual and audio field (to capture relevant images and birdsong). Knowing that Alice is currently not heavily time-constrained may also help select content based on duration. If Alice makes a birdwatching trip with others, the selection may not only need to detect and merge these contextual factors from multiple users, but may additionally add some shared context (e.g. media items that co-present users have in common).

At present, the means for expressing such queries does not exist, nor is the data appropriately indexed. Further, generating and responding to such queries in a timely manner is likely to pose significant technical challenge.

Creating Social Experiences

Traditional TV experiences (and to a lesser extent radio, web etc.) have always centred on the home, with consumption taking place mostly within close family relationships or even solitary settings. However, this limitation of location has not impacted the ability for media consumption to become a shared and social experience. Indeed, TV (and in particular light entertainment such as soaps and reality TV) is widely considered to be a canonical example of so-called "water-cooler" conversation (in which employees gather in shared office spaces to discuss the previous evening's viewing). Media consumption through HMD displays in shared spaces provides new opportunities for crafting these social experiences, but also raise challenges not previously encountered.

Traditional broadcast models of TV have ensured that the same media content is consumed by multiple members of a social group simultaneously. Innovations in viewing technology (e.g. video recording, on-demand) have broken this model. For co-located HMD wearers, two options for content selection inspired by these previous viewing patterns exist: (1) show all co-located users the same content (near) simultaneously, or (2) show co-located users different content items whilst still maintaining some form of shared experience. Whilst the first of these has clear potential for rekindling

media consumption as the social experience it once was, the second has greater potential for ensuring more relevant and adaptive media. Trading-off these competing factors poses an interesting and yet difficult challenge.

Natural Interactions

Traditional interaction metaphors provide input and output to and from a digital system in abstract ways. In virtual and augmented reality the opportunity exists to use the affordances of the virtual objects for direct manipulation. For instance, instead of pointing and clicking on an object with mouse to move it, the virtual object can be picked up and moved as one would do to a real object. These new ways of interaction provide new opportunities in a social context. For instance in games and social collaborations this new paradigm lends itself to more social and direct interactions between the players and the collaborating parties. On the other side of the spectrum, the HMDs allow for a more subtle set of interaction metaphors to be implemented. In the previous scenario Alice used eye movements to interact with the content. In situations where subtlety is required this may be desirable (e.g. not to scare off a bird). However this type of interaction in a social context could promote social exclusion.

CONCLUSION

In this paper we described some technological and non technological challenges and opportunities provided by out-of-home use of HMDs for media consumption. In particular we note that this new technology provides an exciting means of contextualising content, and of rekindling shared media experiences that have recently been degraded by catch-up and on-demand TV.

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