

Case Studies in Application of Augmented Reality in Future Media Production

Adrian Woolard¹, Vali Lalioti², Nicholas Hedley³, Neil Carrigan¹, Matt Hammond², Joey Julien¹

¹BBC Creative R&D, UK
adrian.woolard@bbc.co.uk

²BBC Research & Development, UK
vali.lalioti@rd.bbc.co.uk

³ARToolworks Inc, USA
nix@u.washington.edu

Abstract

In this application-based poster, we describe three case studies about potential applications of augmented reality (AR) in the broadcasting and entertainment industry. The poster covers the potential impact on BBC's principal objectives to 'entertain, educate and inform' in a variety of environments such as broadcast studios, classrooms and in the home.

1. Background and Motivation

Augmented reality (AR) has recently become more widely applied with advances in display and tracking technology [1]. However, the majority of the entertainment industry has yet to take full advantage of AR due to the practical requirements of production.

Technologies that merge real and virtual elements in broadcasting include virtual studios [2] and outdoor broadcast systems that allow 2D graphic images to be merged with video image to, say, display statistics in sports events [3]. Currently, interaction between real and virtual elements is limited to pre-scripted animations manually triggered by the director. Also, interaction between separate virtual objects is difficult to achieve as broadcasting systems use separate devices to track each element.

Examples of work addressing user's interaction with virtual content include the Magic Book [4], which enables interaction with non-immersive AR interfaces, and Mark's research [5] that allows simple gestures to control screen-based games. Both demonstrate new methods for entertainment merging the sophistication of computer games with physical objects and actions.

The BBC's role as a public service UK broadcaster is based on the principles to 'educate, entertain and inform'. The importance of editorial context on user experience is critical in assessing AR in many different production areas. The emphasis is not so much about technology itself, but about the needs, reactions and adoption by a wide variety of users. Different AR applications may be appropriate to different combinations of user type and setting. The BBC has focused on a conventional broadcast studio, the home environment and a classroom.

2. Case Study: Entertain (Children's Drama)

Initial empirical work, undertaken by BBC, with 8 to 12 year olds suggested that AR applications that lack interactivity were not popular and discouraged repeated use. As a result, we undertook a study through observation and interviews, to assess the impact of narrative content on the motivation and fun of the user. The content originated from a children's animation drama and was designed for use in the home. The challenges were based on a team of virtual characters trying to save a rare creature in a futuristic setting. The work produced five mini-games that utilize the ARToolkit [6] with a variety of goal-based tasks to be solved including; character selection (Figure 1), exploration of a virtual world and a 'race-against-the-clock' construction of a 3D structure.



Figure 1 Example of content from a mini-game

The study suggested that the introduction of narrative content through virtual characters, worlds and scenario-based goals improved user experience. Users were able to recognize and manipulate the different characters and objects. Humour and animation were seen as stimulating when used upon completion of a task. There was general consensus among the users about need for greater complexity and elements of skill in the demos. This is currently limited by authoring tools available.

3. Case Study: Educate (Science Learning)

This study considered the application of AR as a tool for teachers within a classroom and assessed the potential impact on the learning outcomes of students. The material selected for the study was Earth-Sun-Moon (ESM) for

students aged 10-11 years old. Current teaching techniques for demonstration of ESM relationships include using objects such as a torch and tennis ball [7] but research by Shelton and Hedley has shown potential of AR in education [8]. The system was configured using web camera, projector display and tracking patterns, shown in Figure 2.



Figure 2 Teacher using AR content with a class

The findings of the empirical study (ABBA design) with real schoolchildren suggested that AR could provide a robust and compelling alternative to current teaching methods of ESM, including 2D representations on the web. Teachers learnt to adapt to the limits and tolerances of the AR interface with minimal practice allowing easy manipulation and inspection of the 3D content. Preliminary results, which are not statistically significant, suggest that AR had the potential to produce greater improvements in test scores compared to those who experience web-based instruction. This type of interaction and perceptual feedback might provide users with a better understanding of the subject matter in question.

4. Case study: Inform (News Broadcast)

This practical study explored the application of AR in a TV studio to enable a presenter to analyse news of a country in conflict. A 3D landscape was linked to an AR tracked pattern placed on a table surface. The presenter then positioned 3D tanks or missiles, using other AR trained patterns, onto key areas of the landscape allowing discussion of ‘what if’ scenarios, shown in Figure 3.

Several extensions were needed to allow this type of tracking with a production camera. These included; dealing with interlaced images, zooming of camera lens, ability to merge virtual objects both in front and behind real elements and chroma-keying patterns that could also be recognized by the tracking algorithms of ARToolkit. The application ran on a standard PC, with DVS video board and Nvidia GeForce4 Graphics card.

BBC production staff felt that the interactions were powerful and meaningful in relation to the editorial context and enhanced both the presenter and viewer

experiences. It was also felt that it showed potential to integrate easily into existing production technology. The prototype merged the real and virtual in a way that could lead to the ‘suspension of disbelief’ for the viewer, which is often unattainable when using television graphics.

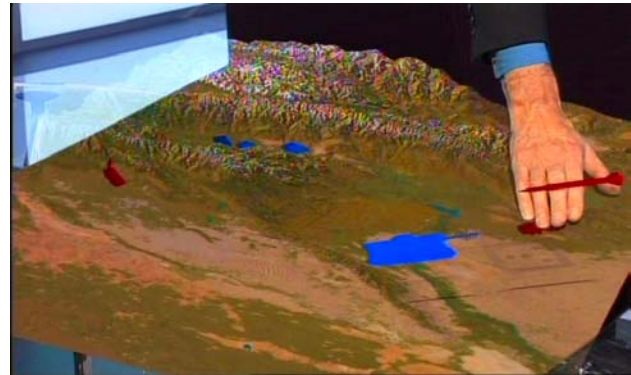


Figure 3 Missile flying towards tank

5. Discussion

In this poster, we have described three case studies in application of AR in media production under the generalized content categories of entertain, educate and inform. The studies were based in the home, classroom and broadcast studio respectively.

Using ARToolkit allowed great flexibility through development of rapid prototypes of sample content and interactivity to engage with creative staff to stimulate new ideas. The studies indicated that the potential to add narrative to stimulate an entertaining user experience was feasible but required greater levels of sophistication in the interactivity. The creation of an AR interface as a teaching aid could be simple and intuitive for teachers. The development of a bespoke system to allow broadcast staff direct use of AR in a studio produced encouraging results. Further research will tell if there are AR applications that will have a sufficient impact on user practice (learning, understanding, exploration) to drive the need to integrate AR into everyday use.

6. References

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