



Racing with Kangaroos and Chatting with Paintings: Augmented Reality in Museum Exhibitions

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Augmented reality, or AR, is the layering of interpretive content onto a “live” view of the brick and mortar world through the use of a smart phone or similar device connected to the internet. AR is used in a variety of industries from manufacturing and product design to print media and marketing. Use of augmented reality is on the rise in historic site interpretation and museum exhibition contexts in the United States, but its use is increasing particularly in Europe, which enjoys funding for AR applications and research from the European Commission’s Europe 2020 Initiative (European Commission). This essay will begin with a brief discussion of the technology, and then survey a couple key uses of augmented reality at historical sites—Cluny Abbey in France and the Reichstag in Germany. Then, I will discuss how this technology has recently been used to enhance interpretation in science and art museum exhibition contexts at the Science Center Dynamikum in Pirmasens, Germany and at the Sukiennice Museum in Krakow, Poland. Finally, the impact of the digital divide and some possible futures for the use of augmented reality in museum exhibitions will be explored.

Marker-based, Markerless, and Mixed? A Few Words About the Technology

Marker-based and markerless AR are technical terms that describe how a visitor accesses augmented reality content. Marker-based AR is accessed by scanning some sort of marker, usually a QR code, with a smart device. After scanning the marker, the AR content, in the form of image, sound, video, or 3D graphics, is then delivered to the visitors’ phone or tablet. Markerless AR does not use any such marker to deliver content to the

visitor, but relies on other means, such as GPS. Markerless AR is thus more difficult to program and requires more technical participation by visitors, as they must download and open a specific app, rather than simply scanning a QR code. Mixed reality, on the other hand, is a hybrid of augmented reality and brick and mortar reality, a sort of liminal merging of digital media and lived experience. Mixed reality allows visitors to interact in real-time with *both* the computer-generated images and sound *and* the physical exhibit space.

Augmented Reality in Historic Site Interpretation

Augmented reality has been used in the interpretation of a variety of historical sites—from Civil War battlefields to castles and cathedrals—in which all or part of the physical traces of the site are no longer in existence. In this use, augmented reality fills in the visual (and sometimes audio) gaps, layering a view of the site as it used to look, with its physical traces intact, onto the current ruined or altered site. An example of this strategy has been used at Cluny Abbey.

Cluny was a Benedictine abbey and a center of the monastic reform movement in Europe. Established in 910, Cluny was sacked during the French Revolution in 1790, and over the decades that followed, much of the third church, which had stood since the 1100s, was used as a stone quarry and systematically destroyed. Today, the south transept is the main surviving feature of the structure. Using an augmented reality application on a smart phone or tablet, however, visitors can see on their devices images of what the abbey would have looked like. Standing in the extant south transept,



Reichstag screen graphic. Courtesy of IGD Fraunhofer.

visitors simply see the abbey as it looks today reproduced on their screen. As they move through the space, however, what is now a garden renders on screen as the abbey's missing nave, giving visitors a good sense of the design and scale of the original structure in relation to the current site.

Augmented reality is also used in interpreting historical sites that are still standing, but have undergone changes over time. German visual computing institute IGD Fraunhofer has created an AR sight-seeing tour of Berlin, allowing visitors to key landmarks in the city, such as the Brandenburg Gate and the Reichstag, to see different historical views of the sites on the screen of their smart device while standing in front of the present structure. At the Reichstag, for

example, visitors can simply slide their finger across the screen of their phone to go back in time. Beginning with a current image of the building, one can drill down to see an image of the Reichstag damaged during World War II, and all the way back to the earliest, Neo-Baroque façade of the building.

Mixed Reality at the Science Center Dynamikum

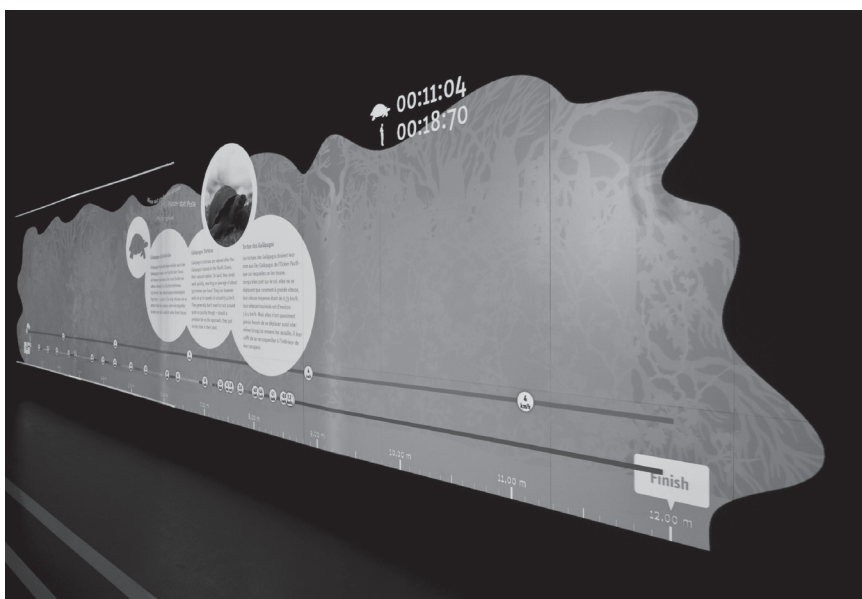
In science centers, mixed reality can be used to give visitors context to understand phenomena in the physical world in relation to their own experiences. The Science Center Dynamikum in Pirmasens, Germany offers visitors a chance to “race” various animals using mixed reality, learning about the animals—in relation to their own performance—in the process.

In the *Footrace Tunnel* exhibit, visitors select an animal..., then race the length of the exhibit against a computer generated image of the animal... that is traveling at the speed at which the animal runs in real life.

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Footrace Tunnel—Race in progress. Courtesy of Dynamikum, Axl Klein, dogtreatpix.com.



Footrace Tunnel—Text and images displayed after the race. Courtesy of Dynamikum, Axl Klein, dogtreatpix.com.

In the *Footrace Tunnel* exhibit, visitors select an animal from a range of options, then race the length of the exhibit against a computer generated image of the animal projected on the wall that is traveling at the speed at which the animal runs in real life. Kangaroos and elephants zoom past visitor-participants, while visitors can easily beat the tortoise, the millipede, and even the human sperm to the finish line. When the race is over, the interaction with the animal continues as the animal exalts in triumph if it has won the race, shouting “Yahoo!” or something similar, or bemoans its loss if the visitor has won. The race duration and average speed are projected on the wall as well, along with facts about the chosen animal.

Bringing Paintings Alive at the Sukiennice Museum

For the Sukiennice Museum in Krakow, Poland, augmented reality was a means by which to engage and expand audience. The Sukiennice’s collection of 18th and 19th century Polish paintings had sharply declined in popularity, especially among young people. To revitalize their permanent collection and attract younger visitors after a major facility renovation, the Sukiennice scripted and produced short films in which actors depict what is happening in 12 key paintings in the permanent exhibition. Using their smart phones, visitors can access these productions in the gallery. On screen, the visitor sees these *tableaux vivants* acted out seemingly in front of the paintings themselves, as if the actors are standing between the visitor and the painting.

More than a traditional audio tour, this televisual approach to in-gallery interpretation presents contextual



Screenshot from *Sukiennice—Secrets Behind Paintings*. Courtesy of Leo Burnett Warsaw.

information about the objects in a highly engaging, at times soap operatic style, with the stories about the objects focusing on very human topics such as war, crime, madness, and lust. In the image on this page, for example, we see a visitor watching the film interpreting a painting that depicts a Polish noblewoman known for her lascivious behavior. In the film, the actress portraying the woman in the painting boldly and rather breathily states, “I don’t mind people calling me a whore, wanton, or a harlot. In every capital I have a lover. Sometimes more” (Leo Burnett Worldwide). Predictably, these films were highly popular, especially among younger visitors whose daily lives are highly saturated by media, and who may find a traditional museum display far too static. It was so popular, in fact, that as of April 2011, the augmented reality exhibition had attracted 20% of Krakow’s population (Leo Burnett Worldwide).

Given that the visitors’ experience of the artwork is quite literally mediated

by the film, with the actors placed in virtual space between the visitor and the painting, one could argue that such a use of augmented reality actually detracts from the museum experience by placing the focus on the interpretive media, rather than the museum object. Indeed, in “Media and Museums: A Museum Perspective” in *The Virtual and the Real: Media in the Museum* (1998), Ann Mintz argued that people do not come to the museum to see media; they come to see objects. Further, she wrote that, “a virtual visit to a museum is fundamentally a media experience, not a museum experience” (Mintz, 1998). As Galani and Chalmers found, however, audience engagement and meaningful interaction are ultimately more important than this “prioritising the unmediated experience of the museum object—‘the real thing’—over the mediated experience via technology” (2010).

Augmented reality expanded the *Sukiennice*’s audience and gave visitors

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additional context for understanding the works on exhibit. Perhaps many of those visitors only experienced the exhibition through the mediation of the augmented reality. Perhaps many will not be repeat visitors to other exhibits in the future. If, however, even a minority of new visitors who were attracted by the technology, rather than the works of art, became interested in the objects and wanted to learn more, or wanted to visit other museums in the future, then this project can be judged a success.

What About the Digital Divide?

With the increasing prevalence of mobile media in museums, augmented reality is bound to become much more commonplace. According to research done by the Pew Internet and American Life Project, as of 2013, 56% of American adults have a smartphone and 34% own a tablet (Brenner). The numbers will soon be even greater in Western Europe. By 2017, Europe is expected to dominate global smartphone penetration, including the only three countries to have more than 90% smartphone penetration and with seven of the top ten countries in smart phone ownership (the United States is predicted to rank 11th) (Rooney, 2013). Smart phones and tablets are clearly becoming ubiquitous, and unlike devices provided by the museum, visitors have a high level of familiarity and comfort with their own smart device. This familiarity ultimately makes for a better media experience for the user, but also means that museums should spend the extra time and money to develop augmented reality content for both Apple and Android markets. Many museums, however, continue to develop only for iPhone and iPad.

Of course, for those who do not own a smart device, augmented reality can widen the gap between have and have-not, further isolating the rural and urban poor, audiences that museums already tend to under-serve. The Royal Ontario Museum, for example, designed their AR experience for *Ultimate Dinosaurs* to be downloaded by users onto their own smart device from the Apple App Store, but at least partially circumvented the problem of the technology gap by providing iPads for visitors who did not own their own iPhone or iPad. While this can be a satisfactory solution, in some settings, such as outdoor sites, it might not always be possible for museums to furnish the hardware.

Connected on the Go and at Home: Some Futures for Augmented Reality in Museums

What is the future of augmented reality in museums? Look for augmented reality to become increasingly connected to social media, with opportunities for visitors to share their experiences on Facebook and Twitter. The AR component of the Royal Ontario Museum's 2012 *Ultimate Dinosaurs* exhibition, for example, allowed visitors to tweet images of their AR dinosaur encounters. Also look for ways in which in-gallery augmented reality can bleed into the world outside the museum's walls, such as billboard advertisements that the Sukiennice Museum placed around Krakow inviting people to call or text message characters from the paintings. Finally, look for museum AR experiences that visitors can enjoy in the comfort of their own homes. The United Kingdom's Natural History Museum allows users with a printer and a webcam to see a 3D augmented reality Neanderthal at home by simply

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downloading and printing the AR marker and placing it in front of their webcam.

Marker-based augmented reality is relatively easy to produce, with entry-level AR programs retailing for as little as \$35 for the introductory version and requiring about as much computer expertise as CAD (computer-aided design) software

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(Wong, 2011). AR generally allows visitors to use their own smart devices, and it is highly versatile, working well in the interpretation of history, science, and art exhibits. With increased opportunities to engage, educate, and delight visitors in the gallery, on the go, and at home, the future of augmented reality in museums looks bright. ✨

<http://www.youtube.com/watch?v=JNY-ogBkt4Q>

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