38

APPREHENDING THE PAST

Augmented Reality, Archives, and Cultural Memory

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Background

"Digital heritage" is a term used to describe the confluence of digital technologies with cultural heritage initiatives. This emergent field includes a wide range of practices, such as virtual reality, 3-D modeling, interaction design, simulation, geographical information systems (GIS), statistical content analysis, and historical reconstruction. It refers to both digitized historical materials and the born-digital content designed to represent and interpret them and their referents. Central concerns for digital heritage include scholarly preservation and analysis, sustainability, and public access. The 2013 Digital Heritage International Congress in Marseille, France used the term "Built Heritage" to describe "sites to cities, towns, and cultural landscapes, i.e., World Heritage" as a key area in its call for proposals. Built heritage sites are increasingly a focus for mobile augmented reality applications (DHIC 2013).

Media studies brings to digital heritage an awareness of the critical implications of, and creative possibilities for, digital media authorship. Value-based choices inevitably inhere in any kind digital re-presentation of cultural objects, whether a digital version of a material object or a provision of framing materials. What is the basis of our decision-making about what to include in a reconstruction or exhibition? How can we ensure that the traces of our choices remain visible in a digital project? What role does access to archival resources play in understanding a specific location or object in situ? How can we engage users in meaning-making within the hybrid reality system we create?

The term "augmented reality" (AR) refers to the use of digitally delivered overlays or supplements to existing material environments. AR content is associated with a specific object or location. Users trigger access to AR resources through the use of downloadable smart-phone applications or headsets. AR is distinguished from virtual reality by the fact that it supplements, rather than replaces, a field of view. Mobile AR systems have the potential to help users create situated knowledge by bringing scholarly interpretation and archival resources in dialog with the lived experience of a space or object. This approach builds upon a number of historical traditions of annotation and representation, and of interpreting urban experience.

Since they are meant to be experienced in real space and real time, the resulting digital heritage projects can be understood as "hybrid reality systems." They combine material elements with virtual components to create a zone of interactive engagement. That zone can exist in museum contexts, in designated cultural heritage sites, and in the wider world.

Comprehension and Apprehension

A "comprehension" model for learning is one way to convey historical information about a built environment. The visitor *comprehends* the significance of a site or object as part of a historical phenomenon, or as an exemplar of aesthetic or technical achievement. Such an approach typically implies historical distance and appreciative observation. This stance is familiar as the educated user's approach to heritage sites and is reflected in many of the materials that help us interpret those sites. However, on-site applications also lend themselves to *apprehending* the past. The term "apprehension" conveys multiple relevant meanings. According to the *Oxford English Dictionary* (OED), apprehension's original meaning is to physically grasp, a concept that extends to mental prehension. Apprehension also suggests a state of anxious uncertainty, as well as seizure by an authority. (The police "apprehended" the criminals.) All of these meanings convey an aspect of AR design for digital heritage. By combining an intellectual approach to historic content with a visceral one, the hope is to create a more nuanced and immediate sense of the presence of the past in our lives today. The anxious uncertainty comes from recognition that we can never fully know the past, yet we reconstruct it to serve our own interests from a present-day perspective. In this sense, we potentially bind and contain the past as we make it our own.

As David Kolb (1984) and others have suggested, in experiential learning theory the difference between comprehension and apprehension is the difference between acquisition of abstract knowledge and experiential knowledge of a subject. Or, as Dieleman and Huisingh describe it:

> experience grasped through apprehension relies on the tangible and felt qualities of the immediate experiences. That refers to the kind of learning processes one goes through while exploring things, looking at them and touching, feeling, smelling, tasting and hearing them. It relies upon intuition, feeling, emotion and insight that are lateral processes of thought . . .
>
> (Dieleman & Huisingh 2006: 837)

Such tangible, lateral, intuitive elements are part of what we bring to bear through on-site engagement with digital resources. When coupled with intention ("an internal process that is achieved through reflection on an experience") and extension ("an external process that is achieved through active experimentation"), a transformation in learning combines comprehensive and apprehensive knowledge production (Sewchuk 2005: 1312). While all abstract knowledge is necessarily embodied or experienced in some way, the shift here is toward consciously crafted, combined effects. Transformation occurs when the learner integrates these elements into an alternate worldview and reflexive understanding of the self within it.

Such a transformative approach to built heritage, one that relies upon both intellectual and affective experiences, cannot rely on a mirror world or isomorphic map of everything, as Borges famously described it in his satiric short tale, "On Exactitude in Science" (1999 [1960]). Rather, it is to create a memory palace that overlays the world. It is a conscious

construction of *selected elements* designed to enrich our experience and deepen our under-standing—on site, and on location. And by being in the presence of a place or material object, we introduce potential counter-narratives to abstraction and isomorphism.

Theories of Annotation

With AR, the designer creates digital content that is meant to be paired with an object or location. This content is accessible through a smartphone, headset, or other device and is triggered by either image recognition through the device camera or a GPS location match. The application that matches trigger with referent will display content that might include an image, a sound file, a 3-D object, a video, a web link, or a link to another AR track. AR can also trigger external applications, such as the device phone or Twitter.

In "A Look at the Museum of the Future," the *Wall Street Journal* identified AR as one of several types of *digital interventions* that are becoming more commonplace in art and cultural heritage museums. AR in this context occurs on a continuum with virtual reality; the sites themselves are curated experiences. With AR, institutions such as the Metropolitan Museum of Art are moving beyond existing marker-based technologies like QR codes to image recognition of paintings and objects as well as beacon-assisted geolocation. These sites can be seen as incubators for future interventions into apprehensions of the past (Gamerman 2015). Yet, this kind of immediate intervention has made substantive inroads outside the museum or designated heritage site context as well, as seen in apps like *London Street Museum*, with its AR overlays of historic images upon contemporary street scenes (Museum of London 2015). Such interventions often build upon previously existing content.

There are two main types of AR annotation relevant to built heritage interventions. First, a *documentary annotation* is directly related to, and representative of, the history or attributes of the object of inquiry—for example, an historic photo of a current site or a 3-D model documenting vanished architectural detail. Such annotations could be thought of as virtual palimpsests, or traces, of earlier "writing" on the fabric of the annotated object. Annotations can be triggered by a specific image or object, or in reference to a specific location. For instance, consider the *Digital Durham* AR app, which reframes Preservation Durham's walk-ing tours of Durham, North Carolina as augmented Tobacco Heritage and Civil Rights AR experiences with both historic imagery and audio tracks (Digital Durham 2015). For these kinds of projects, geolocation serves as the trigger linking the physical location to the virtual trace. Users access these annotations by activating a mobile application layer that pulls up different images, 3-D models, or sound files based on GPS coordinates. The world becomes the "Museum Without Walls," a concept that CultureNOW describes as "celebrating our vast cultural environment as a gallery that exists beyond museum walls through cultural tourism and arts education" (Museum Without Walls 2015). A primarily visual experience might be complemented by audio, for example, or related materials about authors, audiences, and effects. Contextual data, informational graphics, network diagrams, and other framing devices might offer just-in-time information with greater impact. The digital difference is that these annotations can appear on location, and they can themselves be triggered and sometimes manipulated by users. These interactive elements may prompt the apprehensive qualities of the experience by introducing a degree of openness and user interpretation.

A second type of AR intervention, the *interpretive annotation*, is less about a one-to-one correspondence between material objects and their virtual analogues, and more about adding a complementary, interpretative layer to the experience. These annotations might be archival, historical, or contextual framing. They might be fanciful or personal. They might also include

games and other add-on activities to enrich the experience. Such experiences might draw upon sensory modes that complement, rather than compete with, the primary sense organs in play. Synecdochic and synesthesia effects might facilitate informational overlay at an associative or even subconscious level of experience design. For instance, the New York Public Library has created several AR experiences that move beyond direct, documentary annotation, most ambitiously with the "Unveiling Visions: The Alchemy of the Black Imagination" exhibition in 2015, which combined AR elements with existing artwork in a critically engaged intervention about Afrofuturism (Frederick 2015).

Returning for a moment to the Museum Without Walls, these two types of annotation are so powerful because they happen outside of the museum or other controlled settings. The unique object or location becomes the gateway into the wider, hybrid reality world. With AR image recognition and location-based content provision, material intervention may not even be necessary to create a hybrid reality environment, either. In fact, the social and cultural implications of a GPS, satellite-reliant culture may become the subject of apprehension itself. Consider recent work by the Manifest.AR collective at the Museum of Modern Art and the Venice Art Biennale, for example (Sterling 2010). ManifestAR artist, Tamiko Thiel, interjects gold AR silhouettes of censored artists, suggesting that each "erased silhouette stands for countless unknown or lesser known artists who face censorship or persecution with no public support" (2011). AR itself can be controversial as a medium. In 2012, the Collaborations: Humanities, Arts and Technology Festival at Duke University included AR triggers scattered around campus to highlight artwork and programs featured in the museum and temporary exhibitions (CHAT Festival 2012; Ferreri 2012). The application creator faced more trouble getting permission to inject AR into the museum space than in allowing projection mapping onto the façade of the museum itself.

Historical Precedents

Designs for digital heritage applications for on-site experience derive in part from traditional, analog forms of spatial and contextual communication. One could trace a trajectory of location-based annotation back to centuries of travel guides, for example. We might also take inspiration from older, "detached" representations of place—comprehensive approaches to seeing an environment with some critical distance from the object of inquiry—such as eighteenth-century zogatropes (Blake 2003) or nineteenth-century stereoscopes (Schiavo 2003). Contemporary analog models for AR might include guidebooks, annotated maps, tours (human-led and audio-guided), documentaries, and books with acetate layers showing before-and-after renderings.

With these media in mind, three key approaches to AR are *layering* (as in the case of overlays and maps), *scaling*, and *one-to-many approaches* to knowledge sharing. Scaling occurs on both spatial and temporal levels. Annotations might draw upon the tradition of museum maquettes or architectural building models that show how a building might have looked in another time. This use of scale gives people a sense of the whole construction via miniaturization. Similarly, image-based juxtapositions participate in a long history of recapture photography, employing a temporal dimension mapped onto an implicit z-axis, where images from the past are juxtaposed or overlaid directly upon contemporary scenes. They might also draw upon existing one-to-many experiences, as in the case of amateur photographers recapturing iconic sites photographed by famed photographer, Ansel Adams (Ansel Adams Gallery 2015). A single photograph may produce many derivatives or versions, as people mimic historical works and styles.

For historical precedents to apprehensive annotation, we might turn to creating sketches, writing postcards, or journaling about a place. More recently, we might create metalayers of participatory conversations through microblogging, group mapping, and digital graffiti with AR tags. These activities may facilitate a sense of collectivity or membership within a city or similar environment. In all of these, we mediate and remediate experience with the aid of digital media forms, such as games, which naturally lend themselves to participation. In 2011, the New York Public Library made headlines when Jane McGonigal created a game there; it was called *Find the Future* and relied upon students to find QR codes associated with historic objects and then write their own associated content (Terdiman 2011). More recently, the Google startup, Niantic Labs, created a game called *Ingress*, which, in 2015, engaged over a million users per day in searching for real-world landmarks as part of a contest between two "opposing forces" (Tatera 2015).

For more object-specific annotations, we might look to museums and their use of exhibition signage, dioramas, panoramas, and handheld guides, not to mention the layouts of museums themselves as interpretive contexts. Christopher Jones traces a trajectory of museum supplements, from audio tours and mobile websites to QR codes, apps, and games, to suggest how an object's meaning and significance are understood. He highlights AR interventions in the Tate, the Louvre, and the Uffizi as key new developments and approaches (2015: 190). Elsewhere, QR codes are already found in many heritage sites, once again reinforcing the idea of the world as a museum or exhibition. QR codes are popular because they provide accessible web links to online resources and can be created quickly and easily.

With AR, we can also move beyond transmitting historical tidbits about objects and environments into curating experiences of specific sites that both support and challenge traditional narratives. A simple way to do this is to create the potential for multiple viewpoints to exist simultaneously in a given location or situation. For example, the Soundwalk tours originating in New York during the 2000s describe their work as "an exclusive and poetic discovery of a city, on the bridge between Baudelairian stroll and cinematic experience" (Soundwalk 2015). Here, history is not a given. It is not merely transmitted to a listener. Instead, it is a collection of different sounds and various voices that contextualize a landscape. People do not look at it; they stroll through it.

Place, Space, and the Architecture of Apprehension

Apprehending the past through AR goes beyond an emphasis on learning styles and annotation to also suggest an *apprehensive stance* toward the very project of digital heritage or historical-place-making. For insight into critical engagement with the construction of place, space, and everyday life, many theorists build upon the work of Henri Lefebvre. In *The Production of Space* (1992 [1974]), he famously describes three registers of space-making. Perceived space is the space of everyday experience, while conceived space is the space of urban planners and map-makers. Lived space bridges these two modalities. It is into the context of enriching lived space that AR projects intercede. They rely upon both the sensory affordances of the physical location in question and the abstract information rendered accessible through the mobile platform (Lefebvre 1992: 38–39). Human experience completes the process of placemaking.

As human geographer Yi-Fu Tuan points out, "place is whatever stable object captures our attention" (2001: 162). On the topic of heritage objects and sites, Tuan suggests that, "[i]f a piece of sculpture is an image of feeling, then a successful building is an entire functional realm made visible and tangible" (164). The life-world implied in a monument or built

structure creates the observer and the observed. There is a danger here, however. Tuan also notes that the production of cultural heritage sites is itself a sign of willed comprehension and critical distance. It "annul[s] the past by making it all present knowledge" (198). While AR might arguably afford opportunities for richer, transformative engagement with historic sites, is it done so at the expense of the history and lifeworlds of actual inhabitants, past and present? Could a solipsistic interest in creating "user experiences"—in drawing upon apprehensive responses as well as comprehensive strategies—turn the world into a personal theme park? Is there a way to prevent our overlaid experience design from negating what came before? Does AR privilege a presentist response to the past? We must be apprehensive about our interventions and aware of the extent to which, as designers of digital heritage applications, we are imposing a convenient fiction upon a place, even as we co-create a new one.

How, then, do we begin to understand our sites of annotation and architect the museum without walls? As noted earlier, layers, models, and one-to-many relations become critical features for organizing annotations. But, to take full advantage of the medium's possibilities, we also need to understand how users experience space. In *The Image of the City* (1960), urban planner, Kevin Lynch, famously studied the ways in which individuals engaged in urban wayfinding through surveys and studies of their behaviors. Lynch introduced the idea of place legibility, or *imageability*. He identified features of the city familiar to mapmakers (the paths, edges, districts, nodes, and landmarks of Lefebvre's conceived space), described how those features become relevant to users in perceived space, and explained how they also contribute to the collective conception of the city—to the transformative space of lived experience. His insights can help designers understand both how urban spaces are constructed and experienced and how they might choose their own objects of augmentation. For instance, his identification of geographic primitives, or the vector-friendly attributes of the map that translate into how people navigate the world, can serve as a first step for creating points, paths, and regions of activity for users. The "image of the city" is constructed of these elements. The *Visualizing Venice* AR app built upon this idea when it used the Venetian network of over 4000 cisterns as a starting point for understanding Venetian architectural history. As geolocated points on a map, the individual cisterns became landmarks within the individual plazas constructed around them (Lanzoni, Szabo & Olson 2015).

For most location-based AR, reliance on the map substrate for information management and presentation is part of the operating system (wireless beacons are sometimes used in more enclosed spaces like museums and exhibitions). The underlying grid of X and Y coordinates necessarily undergirds the construction of location-based markers, regions, and zones in a GPS-dependent system. Planned spaces are often built from maps and blueprints. Maps in this sense have generative power. They are also used for interpretation and representation. And we rely upon their conventions, especially when using GIS to create a location-based AR project. GIS software is designed to help users create points, lines, paths, and regions. We can then explore these features in digital environments and use them as a basis for AR authorship. The map becomes a necessary precondition for this engagement, and the layered map becomes a conceptual framework for situating annotations. Assumptions about the importance of geographic features, which can be located on a map as vector data, are em-bedded in the conventions of GIS software itself. The familiar points of interest found in guidebooks and tourist maps translate into Points of Interest (POIs) in the system. POIs are a geometric fiction brought to life in an ambient zone of temporal and spatial experience; we realize and inhabit that fiction in our AR scenarios. However, as in GIS software, which has to accommodate the reality of image-based historic maps by allowing for georectification

(or association between points on an historic map and the contemporary grid), AR designers can complicate this picture. By making maps more interactive through AR, and by encouraging a sustained engagement with the complexities of their referents through lived experience on site and on location, designers can draw upon the vector-driven sense of their importance alongside a "raster," or uniquely qualitative sense, of their specificity.

Critical cartographers engage with this facticity of map-making, their rhetorics, and their cultural power; from leaders in the field, such as John Pickles (2003), Denis Wood and colleagues (2010), and J. B. Harley and P. Laxton (2002), AR designers learn how map-makers operate. Mark Monmonier (1996) discusses *How to Lie with Maps* by helpfully decoding mapping conventions, while Pickles draws our attention to counter-mapping practices, or mapping focused not on geometric bases alone, but on time, ideas, activist goals, intellectual associations, and community values. Tensions between what was designed and what is experienced could be important moments for an AR intervention. Map artists, such as those found in *The Map as Art: Contemporary Artists Explore Cartography*, suggest other creative models as well (Harman & Clemens 2010).

Experience Design

Just as annotation systems draw upon earlier inspirations, so, too, does the experience design of AR systems. Such design can include the more obvious documentary elements noted earlier, but also encourage apprehensive elements: the affective and sensory engagement with the real and virtual worlds combined through AR. From Edgar Allan Poe's "Man of the Crowd" (1840), which suggests focused (if monomaniacal) attention to the one in the many, to Baudelaire's sauntering flâneur reveling in the crowd, we can take inspiration from literary wanders and wanderers to shape user positionality. In *The Arcades Project* (2002), Walter Benjamin discusses Baudelaire and nineteenth-century Paris while identifying a key tension between the shock and enjoyment of urban experience. How might we foreground that tension?

In experience design for AR, heightening existing phenomena or reading against the grain of what the city "wants" can create productive contrasts. The field of psychogeography describes "specific effects of the geographical environment (whether consciously organized or not) on the emotions and behavior of individuals," as Guy Debord suggested in 1955 (1). The Letterists, the Situationists, and the Surrealists before them, all focused on the individual and collective experiences of the city. Debord introduces the dérive as the "playful-constructive" movement through the city—a drift—by a small group of people alert to "the attractions of the terrain and the encounters they find there" (1958: 62). This alertness on the part of the designer could result in enriched experience for users. In "Walking in the City," Michel de Certeau (1980) distinguishes the city produced by "strategies" from the individual who uses "tactics" to move within the city. Suggesting we learn from these precursors, Merlin Coverley's *Psychogeography* (2010) explores "new ways of apprehending our surroundings, transforming the familiar streets of our everyday experience into something new and unexpected" (cover). The designer of an AR system may become part producer and part consumer advocate, helping to introduce a third space in which design suggests possibilities and creates suggestions, as users enact them in their own ways. This combination of comprehension and apprehension is reflected in the idea of "algorithmic walking": a preset series of steps and turns to take, without reference to a map, to see what they reveal. Such "generative psychogeography" is updated for the contemporary age by groups such as Psy-Geo-conflux (Hart 2004).

While Lynch helps us comprehend how people experience urban space in terms of geo-metric forms, and the psychogeographers help us develop tactics for recognizing our own agency in apprehending our environments, Grant Hildebrand (1992) explores dimensions of how we experience natural and architectural spaces in light of human survival instincts and the pleasures of peril, hazards, and heroic quests. In *The Origins of Architectural Pleasure*, he bases his work on the English geographer Jay Appleton, and cites Stephen Kaplan, who "has empirically validated" preferences for landscape scenes that "either contained a trail that disappeared around a bend or . . . depicted a brightly lit clearing partially obscured from view by intervening foliage" (Kaplan qtd. in Hildebrand 1992: 52). Mystery and entice-ment, Hildebrand suggests, are products of a controlled and controllable environment. With novelty, there are limits; for "there is a sense of control, a sense that the rate of exposure to novelty is at the discretion of the viewer" (53). Information architects, Stan Ruecker, Milena Radzikowska, and Stéfan Sinclair (2011), also draw upon Appleton's ideas in "I See What I Can Do: Affordances of Rich Prospect Browsing." An urban landscape to explore might be mirrored conceptually with an annotated, augmented world. Similarly, as Wendy Chun remarks in *Programmed Visions*, part of the appeal of computer mediated experience lies in its ambiguity, in not knowing what lies beneath the surface of the interface (2011: 2).

Hybrid Reality and Games

Such rich prospects might extend to alternate and hybrid realities. For instance, the *Reacting to the Past* (2015) paper-based games encourage students to role-play historical events. Of course, many attempts have been made to create historically based videogames, too, from *The Oregon Trail*, which was first available in 1971 and taught an entire generation of school-children about U.S. settlement of the west, to the *Assassin's Creed* games, which have relied on elaborate reconstructions of historic Florence, Jerusalem, and London, among others. Though not always accurate as models, as Nicholas Trépanier points out, "video games [are] a very efficient way to let undergraduates engage with historiography and leave them with a sophisticated, critical perspective that is likely to remain alive long after they graduate" (2014). The *Hidden Florence* AR app uses this rationale, employing a fictional character, the 1490s woolworker "Giovanni," to draw users through the Renaissance city (Hidden Florence 2015). Engagement with the character leads to greater compression of the urban context.

Alternate reality games, or ARGs, also provide models for how historical, participatory, and social elements could be combined to create engaged experiences of heritage locations. Frans Mäyrä and Petri Lankoski describe hybrid reality in relation to gamespace. Complicating the well-known "magic circle" (a term first defined by Johan Huizinga) as a separate, con-sensual space for games, they consider how location-based games unfold within the context of everyday life (Mäyrä & Lankoski 2009: 131; Huizinga 2014 [1944]). Their idea of the "gaming frame" provides a useful way of understanding the ambiguous nature of interaction between the virtual world implied by the existence of AR and the material world of lived experience. Mäyrä and Lankoski also describe a "playability zone" in which users interact between a spirit world and a physical world when logged into the system. This middle zone, the "mixed world," becomes the site of interaction. This concept inspired the "InnerSpace Adventure" AR experience (see Figure 38.1), a temporary AR art installation at a conference at the New York Hilton in 2013. Participants were posited as academic conference-goers engaging with an imaginary site as well as context-specific conundrums as they moved through the hotel's public spaces (Rudinsky & Szabo 2013).

Figure 38.1 InnerSpace Adventure augmented reality game presented at the College Art
 Association Conference in New York City, February 2013, as part of the
 AR2View show. Created by Joyce Rudinsky and Victoria Szabo.

In Jorge Luis Borges's, "The Garden of Forking Paths" (1991 [1941]), with its alternate
histories simultaneously unfolding, we can find inspiration in literature for how to situate
users and create new experiences as well. The idea of what was not built, or what did not
happen, could be the starting point for a game-based approach to digital heritage AR.
Explorations of the unbuilt world might highlight architecture, but also alternate outcomes
for conflicts, migrations, and crises. The options are not completely open-ended, but rather
curated, and can include considerations of operations before, during, and after a site visit.
Then again, true interactivity might necessitate shutting down the system entirely.

The Digital Heritage Ecosystem

AR projects for digital heritage can grow out of and complement digital mapping, archival, and virtual world projects in how they take advantage of the affordances of digitality. They can be quantitative and qualitative and also incorporate both near and far perspectives (zoom in/zoom out) in how they engage users. They can address dissatisfaction with computer simulations as well as the abstractions of mapping by oscillating between these two modalities of hybrid reality systems; they can also inhabit a heterogeneous third space that combines the two. They can make access to archival materials meaningful in context while integrating game elements to encourage active engagement. As Ole Kjaer Mansfeldt, Ellen Marie Vestager, and Marie Baek Iversen point out in their 2007 study, *Experience Design in City Tourism* for Scandinavia, only 16 percent of tourists are actually motivated to travel by learning history (2008: viii). Yet, they want to be more than tourists—to go off the beaten path and meet the locals—and are attracted by "atmosphere"—by the desire to know the architecture, art, and history of the places they visit (38). These results are suggestive for future AR design. The goals of a city-wide AR project might be to reconnect lived experience of the city to the enriched information we share about its history, culture, and people; to highlight palimpsestic architecture and the practices of diverse communities; and to instantiate frames of reference that operate within the city itself. They might surface contradictory uses, flows, and networks within the city that transcend or cut across point-based annotations and peel away the fabric of the present to help users apprehend change over time—to enrich experiences of the unfolding now.

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