Experiential Realism and Digital Place-Making

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Abstract
Despite originating as practical aides for the design of real-world architecture, Computer Aided Design and Draughting (CADD) software initially encountered a great deal of resistance, in part because of their initial expense and apparent technical complexity, but also because they were seen as blunt tools, crude instrumentation inadequate for the artistic expression of place. In March 2004 at an informal seminar hosted at the University of Melbourne in Australia, the eminent scholar Professor Marco Frascari argued computer reconstructions of architecture were far too exact and thus too limited in conveying the mood and atmosphere of architecture.With all due respect to Professor Frascari, this article will argue the converse: that recent developments in interactive technology offer new and exciting ways of conveying 'lived' and experientially deepened notions of architectural place-making.

Keywords
Games, game engines, place-making, architecture, Mayan archaeology, CADD

Introduction
CADD (Computer Aided Design and Draughting) tools were resisted by the architectural profession for decades (Andia, 2001) and were not seen as greatly helpful to the creative process (Lawson, 2002), and these reports have continued on into this decade (Ibrahim & Rahimian, 2010). Because of their views on the limitations of CADD tools, architects and spatial designers may be similarly skeptical of the artistic and evocative features of virtual places, virtual worlds, and immersive games while game designers might well read articles by architects on game-space and despair (Wigley, 2007).
In my own research I use game engines and low-cost VR software to attempt to communicate the cultural significance of heritage sites. I continually encounter the tension between not just those who preach realism and scientific accuracy and those who believe the focus should be on impressionistic and immersive 'adventures' into historical simulations. There is of course a third party, those who want the underlying mechanics of archaeological simulations to engage and provoke students, but even with these three major yet disparate interests (and there may be more) for designers of virtual worlds especially for heritage and heritage there is a central problem that their skill is showcased by the artistic flair of the simulated environment but this artistic flair can impede engagement, pedagogical aims, and scientific realism. And they are not helped by the increasing power and sophistication of game engines and increasingly affordable virtual reality.
Technology is not the impediment to creativity; it is becoming an impediment to accuracy. As Eiteljorg (1998) wrote of the dangers of this 'sanitized view of the past':

Mr. Tressel and I both wrote previously about how compelling the images can be, but we are now seeing images that seem to be photographs on a fairly regular basis… scholars too will find it harder and harder to maintain any scepticism about the accuracy of the images as those images get better and better … Our reconstructions are also too clean and neat. The real world includes people, animals, plants, trash, signs of age and decay on structures, etc. Here again, we can only include some of these items and make mistakes or omit them and present an antiseptic world that is equally misleading.

Historyisnotaprecisescience,and aiming atvisualfidelityrather than cultural significance is actually not in the best interests of virtual heritage (Boskovic, 1997) and at odds with UNESCO's policy on the importance of intangible heritage(UNESCO, 2010):

TheConventionfor theSafeguardingoftheIntangibleCulturalHeritagedefinestheintangiblethatcommunities,groupsand ,insomecases,individualsrecogniseaspartoftheirculturalheritage...intangibleculturalheritage istransmittedfromgenerationtogeneration,and isconstantlyrecreatedbycommunitiesandgroups, inresponsetotheirenvironment,theirinteractionwithnature, andtheirhistoricalconditionsofexistence.Itprovidespeoplewithasenseofidentity andcontinuity,anditssafeguardingpromotes,sustains, anddevelopsculturaldiversityandhumancreativity.

Thisarticlesuggestsfourpointsofdeparturefortestingwhetherfidelityisagivenoralimitationinthe experiencingofvirtualworlds.My premisesare: sensations are more than aesthetic experiences, history is fluid and not a concrete and inviolable objective fact, the most engaging virtual environments are *NOT*necessarily the most realistic ones, and that computer peripherals and related technologies are beginning to help us produce morepersonalized, atmospheric and contextually relevant virtual worlds.

Sensations are more thanaesthetic experiences

Martin Heidegger (1971) wrote several books on the distinction between aesthetics and artworks. ForHeideggerartcannotbe simply reduced to be merelyaresponsetosensations.For example, Heidegger argued thatwehearsoundsnotacousticsensations,andthus byimplicationall aestheticphenomenaareactuallydistillationsofpastexperiencescodified andrespondedtoas theoutcomesofdeliberate,intentionalactivity.
In his own words (1971):

Muchcloser tousthan allsensationsarethethings themselves.Wehearthedoorshut in thehouse andneverhearacousticalsensationsoreven meresounds.Inordertohearabaresoundwehavetolistenawayfromthings,divertourearfromthem,i.e.,l istenabstractly.

For Heidegger there is a'thinglycharacter' to works of art (including paintings and buildings),whichisnotencompassedor created by theperceptionof meresensations. Inherently, Heidegger'sargumenthasbeenrecentlybolsteredby experimentsinvirtualenvironments.Researchershavesuggestedthatthereisindeeda'toolness'quality tocertainobjectsinvirtualenvironments (Eurekalert, 2003). We may further extend the argument to suggest there is an aspect of 'thingness' to our perception of our world that should be considered when we design virtual environments.
Inthenineteenthcentury,empathy theoristsviewedarchitecture aslittlemorethansculpturalobjectsthatwecancreate associationsfor (Morgan, 1996). ThephilosopherAnthonySavileattacked architectRichardFoster'sworkforthesameconceit:treatingtheessenceofarchitectureassculpturalform(Savile, 1993).Forathing,beitahammerorabuilding,isnot merelyathree-dimensionalobjectfloatinginspace.Architecturealsoinvolvesinteriorspaces,thelinkingofspaces(e.g.,frominner to outer and the converse), and the placing or locating, using and imagining of symbolic objects(aswell as the selfandotherpeople) in space.
As well as the ordering of inanimate objects, architecture orders us.
Schellingsuggestedthatarchitecturecouldbeviewedasclothing, impliedthatratherthan merelyactingasaclumsy mass,architecture covers modifiesanddirectsour imaginedandreal movement.Weare in effectkineticsculpture. To quote Morrison (Morrison, 1988):

Viewersperceived the immobilityofpaintingsinone way by movingintoandoutofthefocalpointinfrontoftheworks.Theyperceivedthatofstatuesinasecondway,by

circlingstatuesintheroundorbypassivereliefs.Inbothcases,theviewers movedoutsideoftheworkofart.But, inarchitecturalsettingsandgalleries,viewers movedinside,andthroughtheworkofart, and- asgallerypaintings indicate- theybecamekineticcomponentsofthose aggregatedworks, participating inthewhole.

Architecture is not onlya shifting combination of human movement and imagined intention throughinter-relatedspaces.Architectureusesnon-realisticperceptualtricksto conveyasenseof atmosphere, or to stoke the curiosity as to what lies around the corner.Such architects includeUtzon,Asplund andAalto. I am naming Nordic architects as examples because in the far north architects had to ensure their buildings kept people entertained during the long cold dark winter.Architectural methods included indirectlightto lightenvisual massing,nofloor barriers,andchangesinslopeortextures thatindicate an importantsymbolicareaisnearby (E Champion, 1993).

The three architects I mentioned were also seen as 'heroes' of the modern movement, so any view of modernarchitectureastheembodimentofrationalityandthe machine aestheticisalsodebatable.Spatialillusionwasusedby many architectsofthenineteenthandtwentiethcentury,includingeventheearly modernists such as MiesvanderRohewho drew heavily on the tricks of artisticillusion,however muchhissupporters mighttalkofstructuralhonesty.Inalmosteveryfamousbuilding byMiesthestructurewasexpressed,butonlypartially.Hidden andunexpressedsupportswerenecessaryfor theexternalformtoappearperfectlyflatandfreelyfloating,such asin the FarnsworthhouseandtheBarcelonaPavilion.

ThecanonicalworkofMies,LeCorbusier,andFrankLloydWrightcanbeviewedasApollonianpavilion sbut theywerecontrastedwiththeDionysianwildnessofanationalpark(theBarcelonaPavilion),Frenchfi elds(VillaSavoye), andawaterfall(Fallingwater).This contrastwasdescribedbyNietzscheinhisdoctoraldissertationwritteninthepreviouscentury onthe importanceof aestheticillusion (Nietzsche, 1967).

Architecture mayalsocreate theappearanceofpopularity throughtheillusionoferosion.In thefamousWoodlandCrematorium in Stockholm,Asplundsawedintothe marblecolumnssothat theywouldprematurelyage, and detailed clocks and lights so that from a distance they appeared to wilt (Figure 1).InhisLister courthouseAsplundcreatedaburiedtypology;partofahallappearstobeadugoutclassicalcolonnade, implyingthe moderncourthousebuildinghadbeenbuiltoveranotherbuildingdatingfromantiquity and in his Stockholm Public Library he exaggerated the tapers of doors to distort their apparent and to allude to Egyptian architecture.

Figure 1: Asplund's Stockholm WoodlandCrematorim

Yes it is true thatcomputer models,asProfessorFrascariremarkedinhisseminar,donotnormallyincorporatetheseillusionsand aestheticcontrasts, but this is changing. Partly these techniques are not used because computer models themselves are typically flat and infinitely thin illusions, but we are increasingly seeing not so much digital models on a flat screen as immersive environments that occupy both virtual and physical space.

Historical interpretation is fluid

Archaeologistsareasinterestedincontroversyandthedegreeofagreeduponaccuracyastheyareinth ehistoricalreconstructionitself (Kensek, Swartz Dodd, & Cipolla, 2002).Currentdigitalreconstructionsdonotingeneralshowtheprocessbywhicharchaeologistspier cetogetherlikelyscenariosastowhathastakenplace.For archaeologists are site detectives. They deduce patterns ofbehaviourfromartefacts,knowledgeofother comparative cultures, and by testing changes to thelandscape anthropologists and archaeologists maydeveloptheirown'detectiveknowledge'ofapast culturewhichisnotaccessibletothegeneral public via either trips to the actual site or throughtouristliterature.

What may surprise the general public is that archaeologists are also very sensitive to the

embodied and physical nature of their work, I am constantly asked how to employ virtual reality and haptics to 'feel the earth' of a site. We have not fully tackled this in virtual environments, perhaps because virtual heritage showcases are staggeringly hermetic and inflexible, but this is also changing (E. M. Champion, 2002) and there are interesting explorations of other media to help convey the sense of site (Eve, 2012).
Fidelitycanbeseenasfaithfulnesstoobligations,duties,orobservances.It may meanan exactcorrespondencewithfactorwithagivenquality,condition,orevent; or accuracy.It mayalsorefertothedegreetowhichanelectronicsystemaccuratelyreproducesthesoundorimageofi tsinputsignal (Anon, 2015a).
Yetinvirtualheritageprojects,thefidelityisnotconceptuallyorevenphysicallyfaithfultothe past.Fidelityofreproductionisoftenahighresolutioncaptureofthestaticremainsresidinginthepresen t;usingscientificextrapolationofpastcircumstancesthroughanalysisofremainingdata,oramonum entbasedonasingular(historicallysituated)archaeologicalinsight.
Virtualenvironmentsdonottendtoshowhowthelocalpastinhabitantsmodifiedinteractedwithandi nhabitedtheirenvironmentthroughtheirownviewofreality,nordotheyaccommodatethewildlyvar ying'alien'perspectivesofviewers.Wecouldarguethatthesemissingfactorsarehermeneuticinnatur e.Hermeneuticsarguesthatwemustgraspthe worldoftheinterpreteraswell astheworldoftheinterpretedinordertogainthemeaningofthetextorobjectofart(Gadamer, 1976).
Forexample,thephilosopherHans-GeorgGadamerwrotethatonecouldn'tnegatethetemporal(andspatial)differenceofreaderandreadi ng,forthatimpliesthatmodernhumans(asintheEnlightenmentviewofhumanity)canseparateanym odernhumanbeingfromtheirhistoricalbackground.Reflectioncannotholdatadistanceandobjectify thepast,forthepresentisalwaysa'given'.'Tobehistorical,'Gadamerasserted,'meansthatoneisnotabs orbedintoself-knowledge'(Gadamer, 1976, p. xiv). Given the constants swirls debates and controversies in history permeate our understanding of place and cultural identity (Andrews, Barrett, & Lewis, 2000; Graves-Brown, Jones, & Gamble, 2013), virtual environments with historical content should also somehow communicate these varying levels of certainty and agreement (Kensek et al., 2002) while being aware of different audiences (Wineburg, 1991).
For a more direct discussion of how historical interpretations do not so much fix as fight over notions of place, please consider reading the geographer Doreen Massey (Massey, 1995) or the philosopher Ed Casey (Casey, 2013) .

Engagement versus realism

Part of the problem of discussing virtual environments has been the many shifting meanings of virtual and virtuality. Sometimes the virtual has been conflated with the digital when in fact it is a Middle English term derived from Latin *virtus*, and actually predates it (yes *digitus* is also Latin, but Latin for toe).
Virtualitycanbedefinedasexistingorresultinginessenceoreffectthoughnotinactualfact, form,orname:*thevirtualextinctionofthebuffalo.*Itmayrefertothatwhichexistsinthemind,especiallya saproductoftheimagination(usedinliterarycriticismofatext).InComputerscienceitmaymeanthatw hichiscreated,simulated,orcarriedonbymeansofacomputerorcomputernetwork:*virtualconversati onsinachatroom* (Anon, 2015b).
Inpopularusagethereseemstobeaconflationbetweentheword'virtual'meaningtohavetheeffectoft he'real'withoutactuallyhavingmaterialorformandasasynonymfortheword'digital'.Further,'appea rstobereal'couldmean,'anobjectlookslikesomethingthatreallyexists',or'Icanbelievethatitexists'.
As discussed above (Eiteljorg, 1998), sometimes realismis conflated with visual fidelity but it could also meanconceptualfidelity. Consider the experiential realism of immersive computer games,I might believe something exists and is 'real' evenifitdoesnotlook'realistically'likeanythingIknow; aslongasIbelieveit mayaffect me (Thompson, 2000). So whenwetalkoflimitsappliedtovirtualenvironmentswe may meanthatfidelitytotherealworldisconceptuallyratherthanvisuallyrealistic.Realismhasitsuses,but sodoesthe expandingofperceptionandculturalunderstanding. The virtual environment designer can modify the information affordances to behighlyselective (moreappropriate tothelearningcurveoftheaudience),interaction patternscan be shaped tobe metaphoricalanddramaticratherthangod-like(omniscientand omnipotent),ordesigners maydeliberatelyreducethe cognitive loadingrequiredtocompletetasks.
At ACADIA 2001, Kalay and Marx defined eight types of virtual places but their paper may lead to some designers believing the classifications were both descriptive and prescriptive (Kalay &

Marx, 2001). In response, at ACADIA 2002, the author and Bharat Dave proposed a new categorization of virtual environments(E. Champion & Dave, 2002). We proposed that virtual environments could instead classified by the overall design goal.
In this framework the first and typically easiest virtual environment to design is visualization-based, the second virtual environment focuses on providing for activities, and the third (and most difficult to design) allows participants to decode, interpret and possibly even create 'inscriptive' (hermeneutic) environments. Our hypothesis was that virtual environments (and digital archaeological reconstructions in particular) would more engaging if they are capable of engaging the user in a world of interactive but culturally constrained social communication.
An important distinction to make here is that simply flooding a virtual world with other players does not create a sense of cultural presence, but of social presence. Museum research has indicated that realistic but non-interactive installations of virtual heritage projects may bore the audience (Mosaker, 2001) but allowing participants to talk to each other in a virtual heritage world may improve the sense of engagementat a cost to cultural presence.
To put it another way, if we allowed participants to appear in avatar form as typical tourists, and to chat about whatever they liked in an online world, this social presence of like-minded others may destroy the cultural immersion necessary to understand the virtual environment from a historical and locally constrained perspective. If we instead give them contextually appropriate goals rather than let them wander around at will (i.e. as travellers or inhabitants rather than as tourists), and provide contextual constraints and affordances (just as some games do); this may actually increase their enjoyment and also their understanding.
However, much presence research has been focussed on general virtual environments, and contextual information on what works best for specific types of virtual environments seems to have been less of a priority.
This is a chicken and egg situation, designers wish for more generally useful guidelines, but universal findings derived from experimental conditions are less likely to find out what specifically appropriate interaction works best (Turner, 2007). More research is needed to determine which forms of interaction and type of depiction are more compelling, task-effective, useful for cultural presence, and optimal for learning purposes.

More atmospheric virtual environments

Computers may appear to be too exact and yet game engines can produce fog, human physiology-based game shaders, texture-based erosion, people-based erosion, and artistic visualization. Even Autodesk is producing a game engine; architects are now using game-engines for real-time interactive virtual simulations. Computer peripherals are beginning to offer up more personalized, atmospheric contextualization thanks to biofeedback (Figure 2), hybrid display equipment, physical computing and projection mapping, camera tracking and Head Mounted Displays. These new technologies along with the Internet of Things, promise more engaging incorporation of disperse sources of information databases and sensor-based data.

Figure 2: Biofeedback that changes the atmosphere, shaders, gameplay, AI, and music

Apart from hardware, some of the techniques used in computer games may help.Directorindirect lights mightgloworproximity-sound istriggeredwhenparticipantsapproach importantpathsortools.Aswithaction-based computergames therecanbedamage areas,territory-basedfactors,andsacredspacesthat areofflimitsorchangethenavigationorexplorationcapabilitiesoftheparticipants.Avatarscouldcha ngetheirappearanceorabilitytoperformtasksatcertaintimesorinproximitytokeyobjectsandevent sorwhenmore culturallyembeddedperspectivesarerequired.One couldalsouse memory-based mapping(twodimensional mapsofthelocalareafadeinandoutdependingonhow long ago theactorwasthere)sothattheactorisnot cognitivelyoverloaded.Overlayscanalsobeusedtohighlightobjectsoraddtask-relatedorcharacter-basedinformation.

Place-making

What do the above technologies and techniques promise for the public's experience of virtual

environments?
I would agree that even though technology is now promising unlimited virtual universes (Parkin, 2014) it does not by itself explain and demonstrate how places inside these virtual universes *are* places. This lack of detail is also obvious even in games and other virtual environments which offer some degree of personalization and user-modification (Quiring, 2015) but I suggest an even more fundamental issue concerns our understanding of place-making rather than the power and accessibility of the technology at our disposal to create or evoke it digitally.
For example, the academic literature on virtual worlds (Thomas & Brown, 2009) commonly references place-making, but without detail or prescriptive design guidelines or even clearly explain how digitally replicated space (on different computers) can possibly be equivalent to physically and experientially shared space *between* people. Information Sciences can provide extensive surveys on place-making and 'sense of place' definitions based around a notion of 'a space that has acquired meaning as a result of human activities'(Arora & Khazanchi, 2010) but once they actually design virtual places how the researchers can ascertain the activities that take place are genuinely experienced *inside* the virtual place and are genuinely meaningful to the participants is not demonstrated.
Even in the architectural publications that focus on virtual place-making (Gu & Maher, 2014; Tan & Yee, 2009) design guidelines are vague or high-level. Anthropologists who write about virtual world design seem to focus more on the designers and their politics rather than on the actual experienced inhabitation of place (Malaby, 2011). So I suggest part of the vagueness around virtual place-making is due to the vagueness of the subject rather than technological limitations.
The more traditional academic literature on real-world places may appear archaic or contrarian (Erik Champion, 2005), but in general focuses on place affording a sense of *insideness* (Heidegger, 1971).
Although Casey (Casey, 2013)disagrees(and with good reason) that this is always required, I think we can say that in general place surrounds us. Following Relph(Relph, 1976), we can also argue that placeallows people to engage in activities which in turn leave marks on a space so that it is identifiable to others. So place has a spatial identity and presence, affords room and clues for activitiesand can be interpreted to identify its typical use or the behaviour or identity of its users.
I have said that real-world places typically surround and provide boundaries, but they are also spatially complex even if they are thematically unified (and this is one of the great challenges of architecture; to thematically link yet artistically separate functional spaces from symbolic places is not trivial). Place as a spatially enclosing experience would be a challenge to fully recreate on conventional computer displays.
Real-world places are also multimodal, contestable, and re-interrelated (Massey, 1991, 1995) and our personal preferences and abilities to receive and appreciate these different place sensations also vary over time. So places are not static objects and they require interaction with the observer for the latter to understand and experience placesas filtered and filteringprocesses rather than simply as designed products.
Real-world places are inhabited and experienced by us as bodily sensations and even as extensions of the body. They change dynamically according to climate, weather and extreme or gradual events of nature. Not only do they change, our memory of them changes. Our experience of them may also be affected by our changing experiences of other places.
Given the above, how could we create a more immersive yet beguiling sense of place, rather than merely a space in which objects are ordered purely because of their size, shape and position? There are design techniques that could be better employed to help virtual environments be experienced more like places and less like spaces.The first and most obvious technique would be to better employ peripheral space.Conventional video games were displayed on flat walls, but we can use new software to project them across multiple surfaces and on curved displays to engage peripheral vision and increase a sense of territoriality and general embodiment (Figure 3).

Figure 3: The Cylindrical Stereo Display At Curtin University, HIVE

Secondly, real-world places are full of thresholds and interstitial space (Bridges & Charitos, 1997; Graham, 1998). Consider a medieval church, before you enter the main room of the

church you typically have to enter a very small space, the relatively cramped foyer or vestibule increases the apparent sense of space of the main hall. Interstitial space is more the space between floors, and many computer games have collision problems when spaces intersect, but coding can ensure that when there are collision issues the player is teleported to another less troublesome location.

Thirdly, immersion is more powerful when vision is supported by another sense (touch, taste, hearing or smell).Research into presence in virtual environments suggest the importance of augmenting vision with other senses, such as touch (Biocca, Kim, & Choi, 2001), sound and smell (Maeda, Ishibashi, Fukushima, & Sugawara, 2013; Ramic-Brkic & Chalmers, 2014) or other environmental triggers such as floor vibration (Feng, Lindeman, Abdel-Moati, & Lindeman, 2015).

Fourthly, embodiment and inhabitation (to create a sense of scale and outlook) is important to reduce an impression of a flat and empty world and will be affected both by the content and the display technology (Creem-Regehr, Stefanucci, & Thompson, 2015; Glenberg, Witt, & Metcalfe, 2013).

Fifthly, virtual environments could follow the lead of roleplaying games that feature changing climate and topography which affect the avatar. Virtual environments don't typically have 'experiential comfort zones' but such zones would great more variety and interest. Video games where climate, weather or topography affects the ability or experience of the player's avatar include Bethesda's *Elder Scrolls* (*Oblivion* and *Skyrim*), EA Digital Illusions *Frostbite 3* and Hinterland Game's *The Long Dark*.Commercial video games already feature weather that affects the gameplay (Fahey, 2014), the next step is to leverage these technical features in order to evoke a richer sense of place.

Case study: evaluation of Palenque

Figure 4: The Warm-up Screen for the Palenque Prototype

For a Lonely Planet-assisted PhD project, I attempted to test these assumptions by modeling and scripting a virtual heritage project withthree different interaction modes (Figure 4). Thanks to the help of Australian and American archaeologists I was able to design virtual learning simulations of the Mayan temple City Palenque in Chiapas Mexico.
In Adobe Atmosphere (a Second Life like world designer than ran as plugin inside Internet Explorer), I created three different modes, in order to evaluate whether cultural learning was best afforded by activity, by observation, or by talking to others (scripted avatars). In order to separate game-like activity from the more straightforward archaeological learning simulations, I gave the participants the option of teleporting through Mayan portals to the more mythic and game-like environments when they finished each task in each of the three archaeological learning environments.
One modewasactionbased,andtheparticipantshadtopushbackslabstofindthehiddentomb(thiswasactuallywhathappenedinthediscoveryoftheTombofPakalundertheTempleofInscriptions).Iftheymanagedtopushbackthesarcophaguslidof Pakalwhentheyreachedthetomb,aportalappearedthattooktheмtoareconstructionofPalenque'sBallcourt(theMayanBallcourtsymbolizedwar,lifeanddeath,thegrowthofmaize,andthevictoryoftheMayanancestorsovertheLordsoftheUnderworld,Xibalba).
The second mode was observation based only, and participants were asked to find artefacts located in the large and navigationally confusing Palace. In the third mode, the three major temples of the Cross Group had scripted guides, representing a Mexican tour guide, King Pakal, and his son. Their movements and speech were proximity-based, and they got angry or fell over if participants ran into them. The goal was also to click and read information relating to the giant inscripted tablets in each of the Temples. At the end of the experiment people were asked to answer six questions for each interaction mode, to see if they had learnt and were able to extrapolate information from what theyhad seen.
Evaluation results were conducted using a stage one archaeology class of forty-three first year university students, and twenty-fourmore experienced participants who were either virtual environment designers or cultural historians with an interest in virtual heritage.

I also created four more imaginative and less authentic 'worlds' based on the cultural perspectives of the ancient Mayans in Palenque, Mexico. As part of the evaluation participants were asked to rank the imaginative worlds against the archaeological worlds in terms of a range of presence criteria.

In the Mayan 'Primal Mountain' World, fog was used in one world to convey a mythical setting and in the more archaeological environments glare was used at regular intervals to indicate where spiritually valuable artefacts were located. They were asked to find the beginning of the world (the Mayan sacred Sky-Tree) and click on it for information. They were then asked to find any other people (there were two Mayan paddler gods paddling around the mountain). They were also asked if they noticed the mountain they were on was actually a giant crocodile (the Mayans believed the world was created from a crack in the back of a caiman or turtle). Not a single person said they had noticed unless it was pointed out to them or they had fallen off the mountain.

In the Mayan Village world, users could select an avatar (a three dimensional representation of themself) that was either one of four western-style backpacking characters, or an avatar in local Mayan dress. Photographs of real people available via the Lonely Planet Images database were mapped onto the face of each avatar.

The Mayan avatars were also sized appropriately (less than five feet tall) and only by changing into that smaller avatar were participants able to explore the interior of the Mayan huts. The aim was to find the other participant by orientating themselves against large Mayan carvings in the jungle.

They were then asked to find the village using the interface guides and the sound of music. If theywalked straight into trees, their avatar slowed down and cried out in pain. Which objects they found and how quickly they found them was also automatically recorded. Participants were asked at the end the relative sizing of the avatars and the results are being statistically compared to how well the participants answered other questions.

In the Mayan Cave world, when the avatar walks into the water, they automatically start swimming under water, blue fog appears and the sound of bubbling water drowns out the ambient Mayan music. If the participant does not keep pressing the forward arrow they slowly ascend back to the surface of the water. By finding, collecting and then dropping artefacts at a hidden shrine, a Mayan sky-snake appears and so does a portal that takes them back to the start.

In the Mayan Ballcourt world, each participant turned into a Mayan ball player, and was asked to try to get the rubber ball to touch the hoop. If they did so, thunder and lighting were triggered.

Asthisarticleiswrittentodiscusstheissueandrelevanceofrealismandfidelitytovirtualheritageandarchitecturalhistory,theresultsoftheexperimentshave beenpresentedinmoredepthelsewhere(E. Champion, Bishop, & Dave, 2012).However,wecanmakementionofseveralinterestingfindingsfromtheexperimentsthatmaybolstersomeoftheargumentsalreadydiscussed.

Althoughparticipantsindicatedtheypreferredthearchaeologicalenvironmentstothemoreimaginativeenvironments,itwashardertostoptheparticipantsfromcontinuingpastthetimegivenforthegame-basedworldsratherthanthearchaeologicalworlds.Thiswastruebothforthestudentsandthepractitioners.

Theywerealsoaskedthequestion'Infuturewhichwouldyoulikesuchenvironmentsfor?' andtheresultsareasfollows:

	AnswerChosen	Students	Practitioners	Total
A	Tosocializewithfriends.	3	1	4
B	Toexploreonyourownasascientificandaccuratereconstruction.	13	12	25
C	Toexperiencetheaestheticexperienceofthatparticularplacethroughdigitalmedia.	16	10	26
D	Notdecidedeitherway.	11	1	12
	Total	43	24	67

The students in particular were keen to explore all the capabilities of the avatars rather than the archaeological modeling they were meant to be interested in. Some wished to know what parts ofthe environment and others they could find and destroy. It is possible that the closer to a game we design virtual heritage projects, the more genre-trapped they become, persuading the student to see them only as a game, and a destructive one at that. However the results above indicate that even many practitioners as well as the majority of students are keen to explore more imaginative versions of virtual heritage sites.

CONCLUSION

While we may have initially praised virtual reality for*not* being constrained by limitations, the continued success of games that are based on challenges and thematic constraints have shown us that limitations may be desirable rather than a necessary evil. Technology can create artificial freedom, but it is a shallow type of freedom if there is nothing to escape from. So embodying and socially embedding a visitor in a virtual world may at first seem more confining than the liquid freedomproposed over a decade ago for virtual built environments(Novak, 1991) but it may actually improve the user experience ratherthan detract from it.

While clear and cohesive evaluations of why certain places appear to be rich and meaningful may elude us – for how do you test the experience of a city in a laboratory – virtual worlds and other types of digital environments still require places if they are to be memorable, rich experiences and returned to.

Place-making is experiential, the success of organically developed historic towns versus the criticism of modern architecturally designed urban spaces should remind us that uniform design frameworks may look aesthetically pleasing but they are not necessarily experientially fulfilling. While architects can create wonderfully evocative and atmospheric sketches, the built environment seldom conveys the spirit of their doodles and visualizations precisely becasuse the imagination is not required to look past the lines and the dots, the experience is already filled in. So my response to Professor Fascari is not so much a negation of his criticisms as a request for reflection. To suggest that digital technology cannot be evocative or memorable is to avoid the real issue: how do we digitally design or otherwise afford a sense of place? That said, I don't suggest there is any one concrete and clear definition and prescription of place. I have suggested five aspects of place that my students and I have attempted to evoke in our projects in order to break down the spatial monotony and shallowness of many digital environments, I am sure there are many more aspects of digital place-making to explore.

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