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Virtual Archaeology and Digital Storytelling: A Report from Rosewood, Florida

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By Edward González-Tennant

Abstract

The utilization of virtual worlds as a research and collaborative practice is rapidly growing in archaeology, although largely restricted to prehistoric and monumental sites. This article outlines the application of virtual technologies to the historic site of Rosewood, Florida. In addition to reviewing a wide range of creation and delivery methods for virtual content, the author discusses the ability of digital storytelling to produce multi-vocal representations of archaeological contexts. While the central goal focuses on elaborating the current possibilities of virtual archaeology, a secondary current invites readers to conceptualize the transformative potential of new media in regards to historical archaeology. As new media practice, the combination of virtual archaeology and digital storytelling offers a new toolkit for engaged scholarship. This innovative approach stimulates a democratized practice that is not restricted to classic forms of mass standardization routinely found in traditional forms of interpretation and dissemination.

Introduction

The use of virtual world environments by archaeologists continues to grow. Presently, this encompasses literally hundreds of projects around the world and plans for a multimedia journal on the subject are in the works (Bawaya 2010). The term “virtual archaeology” entered the archaeological vernacular twenty years ago, referring to the use of 3D models to represent archaeological contexts (Reilly 1990). Common usage during the 1990s centered on visualizing sites and producing static two-dimensional images for publication and short videos. Since the development of Web 2.0 and the ability to deliver interactive content, the creation of virtual world environments allowing for group interaction is defining the widening field of virtual archaeology. Perhaps the best known example of the potential for delivering archaeological

content via the internet in an immersive and interactive format is the virtual reconstruction of archaeological work at Çatalhöyük in the popular online virtual environment Second Life (Morgan 2009).

While virtual archaeology has come into its own as of late, the application of such technologies to the archaeology of the contemporary past remains elusive. Again, a recent term in the archaeological vernacular (Buchli and Lucas 2001), it represents a "dynamic new field which engages critically with what it means to be 'us', with the politics of late-modernity, and with the nature, shape and relevance of archaeology as a contemporary research practice" (Harrison and Schofield 2009:186). Gonzalez-Ruibal (2008) has called for this type of work in regards to the sites destroyed/erased by supermodernity, and opens his article with a brief discussion of Marc Auge's application of the term in regards to the late twentieth century's revolution of speed, new modes of communication, and new spatial relations of non-places where no one dwells but many of us pass through. One of Gonzalez-Ruibal's main themes examines possible alternatives to narration in terms of presenting the past. Briefly, he argues that narration and storytelling remain the dominant forms of dissemination among academics in regards to their research, and calls on archaeology to explore alternative forms of dissemination. This includes the use of technologies like interactive computer mapping as well as traditional ones like illustrations and paper maps. While Gonzalez-Ruibal's project focuses on negative spaces where terrible things happened (and in many instances continue to), he specifically states that his is not a crippling pessimism, it is a call to action.

I position my work with the Virtual Rosewood Research Project (http://www.virtualrosewood.com) at the confluence of these trends, particularly as they might apply to the archaeology of the African Diaspora. In order to do this, I explore a variety of methods to both create and deliver virtual content. This is a conscious strategy designed to maximize access to the data and results for other researchers and the broader public. As an engaged project (Gonzalez-Tennant, in press), this approach balances the requests of descendants with the demands of academic consistency. The purpose of this article is to share my experiences with this project over the past several years, and focus on the virtual methods and delivery options currently available to historical archaeologists interested in doing this type of

work. The next section presents a brief overview of the Virtual Rosewood Research Project. This includes a description of the theories, data, and questions I am asking. Then, I introduce the three separate virtual world environments under development. These are (1) a now traditional approach in virtual archaeology using expensive and time-intensive methods derived from the entertainment industry, (2) an inexpensive and quickly learnable method using Google SketchUp, and (3) the creation of an interactive virtual museum in Second Life. Finally, I discuss three different ways of delivering the content including images and digital storytelling, interactive 3D worlds via the internet, and an augmented reality application to deliver 3D heritage information in the physical world. This article is not a how-to, nuts-and-bolts presentation of the methods, but rather an overview drawing on specific examples from this ongoing project as a way to introduce the reader to the exciting variety of possibilities currently available.

Overview of the Virtual Rosewood Research Project

I began researching the tragic history of Rosewood, Florida in the spring of 2005 as a graduate student with James Davidson at the University of Florida. Initially, we worried that previous examples of local hostility towards remembering the site and its history would hinder traditional archeological research, and decided to draw on methods from historical geographic information systems and virtual archaeology to document and analyze the site (Davidson and Gonzalez-Tennant 2008). Today, we realize that many local residents, all of whom are white, are open to historical archaeology, only to be faced with new problems of poor site preservation, persistent looting, and the ephemeral nature of the structures themselves. Therefore, even as we are increasing our work with local communities, the need to explore additional methodological possibilities remains paramount.

A Brief Introduction to the Rosewood Race Riot of 1923

Rosewood was settled nine miles from the Gulf of Mexico in northern Florida (Figure 1) during the mid-nineteenth century by a diverse group of people, and experienced rapid economic growth following the Civil War. By the early twentieth century the town's economy began to slow and demographically had become a majority black town. These factors were possibly in reaction to the economic rise of neighboring Sumner following the opening of a large sawmill

there in 1914 or so. Sumner became a company town with a mix of black and white workers. Then, on New Year's Day 1923, a white woman in Sumner fabricated a black assailant to hide her extramarital affair with a white man. A white mob quickly formed, headed for Rosewood and encountered the home of Sam Carter, a long-time black resident of Rosewood. At first, they interrogated him by hanging him from a tree by the neck, then when it seemed the mob might release him an unidentified man leveled his gun at Carter's face, and New Year's Day ended with the sound of a shotgun blast.

Figure 1. Location of Rosewood, Florida (all images by the author unless indicated otherwise).

At first, it seemed that the violence might end with Carter's lynching. However, a little over a day later, whites in Sumner heard that the (fabricated) black assailant had returned to Rosewood with a local resident, Sylvester Carrier. Carrier's distrust of whites was well-known and before the night was out, at least two whites lay dead on his doorstep after attempting to set fire to his family's home. Rumor and hatred spread quickly through rural Florida, eventually reaching the Klu Klux Klan in Gainesville, only forty miles away. Residents of Rosewood knew the response for killing whites would be swift and violent, black men armed themselves and

headed into the woods, women and children hid with one of Rosewood's only white residents, John Wright, to wait out the violence. However, by the sixth of January three other blacks had been brutally murdered and the white mob, now numbering in the hundreds, began the systematic burning of Rosewood. During this time a train was brought through town at four in the morning to pick up women and children, who had moved to the swamps and spent the previous night or two hiding after John Wright was unable to guarantee their safety. The train took dozens of families to towns like Otter Creek, Archer, and Gainesville's black district where descendants live to this day.

Residents of Rosewood, those who survived long enough, would have to wait more than seven decades to receive any justice. While a grand jury convened in January 1923, no convictions were made and the jury's records have been lost. Rosewood lingered at the edges of collective memory for decades. Then, in a 1994 landmark decision, the State of Florida decided to pay compensation to survivors and descendants. The story of Rosewood speaks to a range of larger issues and has much to offer concerning questions about extralegal violence, communal trauma, and America's (un)willingness to discuss the darker aspects of our collective past. As a way to communicate this tragic history, and the lessons it holds for modern America, the Virtual Rosewood Research Project is exploring a variety of methods for analyzing, reconstructing, and disseminating information about this historic community.

First Steps for Reconstructing Rosewood

The handful of families currently living in the area where Rosewood once existed have little or no personal attachment to the history and events of 1923. Most have moved into the area in the past couple of decades, and as such know little about Rosewood's spatial layout. The events of 1923 remain at the very edges of living memory and survivors have difficulty remembering the spatial organization of a town they last saw as small children nearly ninety years ago. Reconstructing a virtual version of Rosewood requires, at the very least, a basic spatial template locating structures on the landscape. To accomplish this, I begin with geographic information systems (GIS), property deeds, census records, and historic aerial photographs. This methodology involves the following steps; (1) identify the appropriate historic property records, (2) translate the boundary information in the document into a GIS file,

(3) identify the owner in the census, (4) add census data to the GIS record, and (5) overlay this information on other forms of data including aerial photographs from the 1940s to help visualize the exact locations of structures. In regards to Rosewood, these steps are repeated hundreds of times for a period beginning in the 1860s and continuing until the 1930s, providing a basic template for the virtual reconstruction.

Three Methods for Creating Virtual Rosewood

This section describes the three different methodologies being drawn upon to create the virtual world environment of Rosewood. It also highlights how I decide the appearance of structures, since only one confirmed building from before 1923 still exists, and no photographic evidence exists from the town otherwise.

Traditional Methods of Virtual Reality

Virtual reality was developed in the 1960s as part of Ivan Sutherland's work with head mounted displays and flight simulators (Lenoir 2000:292-295). The directions Sutherland pointed to during this time remain consistent with modern computer generated imagery (CGI). Sutherland first called for visual realism; where the images on a computer screen or head mounted display became so lifelike, or photorealistic, that they were indistinguishable from an image from the physical world. The second direction involved a new phrase he coined, 'virtual worlds', to describe "systems in which users are immersed in scenes created completely by computer graphics" (Lenoir 2000:295). Finally, Sutherland postulated the creation of an augmented or mixed reality where virtual objects could interact with the physical world and vice versa, an aspiration only recently realized in the development of augmented reality, increasingly popular as an marketing strategy (for an example, see Esquire's augmented reality issue with Robert Downey Jr. at http://www.esquire.com/the-side/augmented-reality). Sutherland's first direction has become a staple of the entertainment industry, and CGI is now routinely employed by movie studios in Hollywood and around the world (e.g., George Lucas' Industrial Light and Magic, Steve Jackson's Weta Digital in New Zealand).

Currently, a handful of programs dominate the entertainment industry in terms of creating 3D content. These include 3DS Max, Maya, and Vue among others. These are expensive

software packages with full licenses typically costing thousands of dollars US. They're also complex programs with steep learning curves. In the past, the steep cost and lack of training resources limited the exploration of these packages to specialty programs and concentrations in anthropology/archaeology departments in the US and Europe (particularly England and Italy). Fortunately, the company which owns 3DS Max, 3DS Max Design, Maya, AutoCAD, and others recently began offering free, one-year education licenses to all of their programs. Educators and students can download and activate these programs by visiting http://students.autodesk.com. Additionally, in order to encourage more adoptions of its software and train the next generation of CGI practitioners, a large library of training resources are now available at this site as well.

I am using 3DS Max Design 2011 to create a virtual world environment version of Rosewood. There are numerous reasons for choosing this program. First, it is specifically designed for architectural visualizations of structures in their environments. Also, as an industry standard, there exists a sizable support community on the internet to consult. Finally, there are numerous pre-constructed assets on sites like http://www.turbosquid.com that I can incorporate into a 3D model for relatively little money.

The general production pipeline for producing a 3DS Max Design version of Rosewood begins with modeling individual structures. Since only one confirmed structure from before the 1923 race riot exists in Rosewood, other structures being modeled are based on similar structures from the area dating to the same period. The size and type of structures modeled for Virtual Rosewood are based on information from the property documents, census records, and accounts passed down between survivors and descendants. Some of the property deeds include basic descriptions of structures. When this is not the case, the census records provide a basic idea of the numbers of people living in a structure, often indicative of a large household, small family, boarding house, and so forth. In addition, the size and construction of public buildings like stores, churches, schools, and masonic lodges were fairly standard for the area at the time and photographic evidence of similar structures (Figure 2) from the this time period in nearby locations are being drawn upon as templates.

An additional benefit of using 3DS Max Design is its ability to create dimensionally accurate models. For example, one of the house forms in Virtual Rosewood is based on a

farmhouse to the northeast built in the 1880s located at the Dudley Farm Historic Park. Measured drawings of this structure were created in the early 1990s and provide precise measurements for re-creating the building virtually. Once the modeling is created, the next and in many ways most crucial step involves texturing the model. Texturing, as the name suggests,

Figure 2. Elzey Methodist Church, built in 1860s ten miles from Rosewood (University of Florida Special Collections).

refers to the placement of colors, patterns, and/or images on the 3D model. It involves a flat image pasted onto the 3D surface of a virtual model, similar to rubber-sheeting an aerial image to a surface model in 3D GIS (Figure 3). Texturing a model can be as simple as dragging images onto a surface, or involve hours of finding the right image and editing these together in an image manipulation program like Adobe Photoshop. For the 3DS Max Design version of Virtual Rosewood, the more complicated and more visually appealing route of editing images in Photoshop is being used to improve the overall appearance of the virtual world environment. Finally, a rendering setup and engine is selected to increase the realism of the 3D model. Rendering refers to the final production of an image or video using the textured 3D model. The process involves the computer calculating how light would interact with the 3D model as though it were a physical shape. This produces the shadows and adds an increased sense of realism to

the model. The sources of light in the virtual world include global light sources like the sun and/or local lights such as a lamp or fire. Figure 4 shows the HABS/HAER style drawing

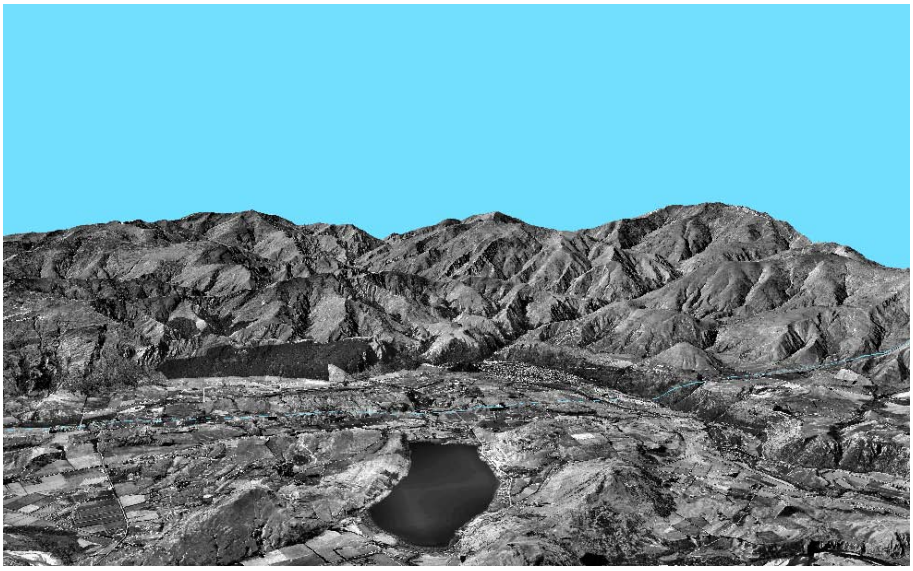

Figure 3. Rubbersheeting of Aerial Image on 3D Terrain Surface in GIS

Figure 4. HABS Drawing, Non-Textured Model, Texture Map, Near Complete Model.

(Florida 1992), a non-textured 3D model from 3DS Max Design, the texture map, and a near complete render of the same structure.

Inexpensive Methods of Virtual Reality

In addition to the virtual world environment being constructed in 3DS Max Design, I am creating a second model of less complexity using Google SketchUp. This program, available as a free version, offers many of the same benefits of a program like 3DS Max Design. It is becoming an industry standard for architectural visualization in its own right, as recent textbooks demonstrate (Tal 2009). SketchUp allows for precise and accurate dimensioning of virtual models. There are also sizable collections of free SketchUp models available for download at http://sketchup.google.com/3dwarehouse/. Many archaeological sites are already available for download via this service, and it is clear that this resource is becoming an important tool for public archaeology. Just as Autodesk does for 3DS Max Design, Google provides considerable learning resources and a novice user can typically navigate SketchUp's intuitive interface and produce fair representations of structures and sites quickly.

There are differences between SketchUp and an entertainment industry standard like 3DS Max Design. SketchUp users are limited in their choice of textures, and SketchUp has no native rendering engine, resulting in SketchUp models possessing an unmistakably 'cartoon' look and feel to them. There are third party programs that expand the capabilities of this program, including advanced texturing and rendering options. This includes the freely available Kerkythea rending engine available at http://www.kerkythea.net/. I have personally used this combination to create large-format, architectural visualizations of Kingsley Plantation (Gonzalez-Tennant 2008) for use by a local theater company in a recent play about the life and times of Anna Kingsley (Figure 5).

The first virtual model of Rosewood was created using SketchUp. The inexpensive cost and low learning curve of this program allows users to quickly produce models and publish them online via 3D Warehouse. Also, if coupled with GIS data (a relatively easy conversion process) these models can be placed into accurate geographic contexts via the free geoweb browser Google Earth (see below).

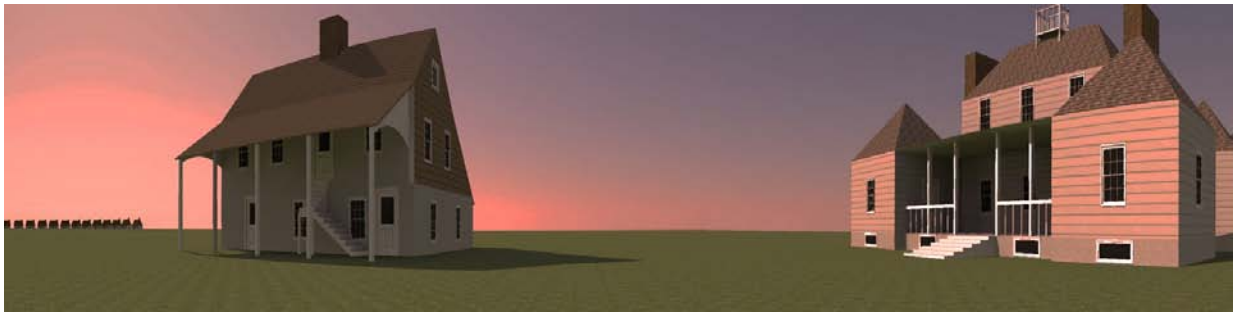

Figure 5. Virtual Kingsley Image used as Theater Background for Local Play.

Virtual Rosewood Museum in Second Life

The creation of online virtual world environments portraying archaeological sites is a relatively recent addition to the practice of virtual archaeology. Numerous sites have been re-created in Second Life, and as mentioned previously the partially reconstructed site of Çatalhöyük (termed Okapi in Second Life) remains the primary example (Morgan 2009). Joining Second Life is free and open to anyone, and therefore is accessible without charge besides the initial cost of the computer and internet access. Once you create an account in Second Life, you are able to customize your avatar – the representation of yourself (or alter ego) as a three dimensional model in the virtual world. Avatars are fully customizable and can take any shape or appearance a user desires, from humanoid to dragon, and everything in between (Figure 6).

Figure 6. Same Avatar, Different Appearances.

Two options are open to users of Second Life for building 3D models, and are determined by one's willingness to purchase additional rights. There are areas of Second Life, called 'sandboxes' where anyone can build anything. However, items placed in these areas are eventually deleted once a user logs out of Second Life. Two additional steps are required in order to build structures and objects that exist regardless of a user's online status. First, accounts must be upgraded to premium status resulting in a monthly, quarterly, or annual fee. Then, the user must also purchase virtual property resulting in an additional monthly fee. Once a user is both a premium member and virtual property owner, they can build freely on their land.

My exploration of Second Life in relation to Virtual Rosewood centers on the creation of a virtual museum. The basic form is that of a repurposed, historic building converted into a local history museum (Figure 7). This decision is based on the fact that at least one structure has survived onsite dating to 1901. Presently, the Florida Department of Parks and Recreation and a

Figure 7. Virtual Rosewood Museum in Second Life.

group of interested researchers are looking into the possibility of repurposing this building to use as the foundation for opening a Rosewood park. This group's primary motivation is to create a park and physically reconstruct the site of Rosewood as a tourist destination. As the only voice of dissent to this plan, I am using the Virtual Rosewood Museum in Second Life to suggest an

alternative. In many ways, I disagree with the goal of turning the site into a park. My primary concern results from the fact that the descendants have been excluded from the conversation. Another reason focuses on potential issues of representation resulting from physically rebuilding the site; both in regards to the whitewashing of history, and the harm of casting local Whites in the area as racists through geographic proximity to the park.

The virtual museum allows visitors to experience the site in two different ways. In the main museum building, visitors walk in and can explore the history of Rosewood through museum-like displays, including a diorama of the town as it stood in the early 1920s (Figure 8). In a second, modern-looking building, virtual visitors can take a seat in a theater and watch a short (~25 minute) video about the history of Rosewood. If you are interested, you can visit this museum by logging into Second Life and searching for Virtual Rosewood Museum, and then teleport there. Again, as in a physical museum, donations are gladly accepted (Figure 9).

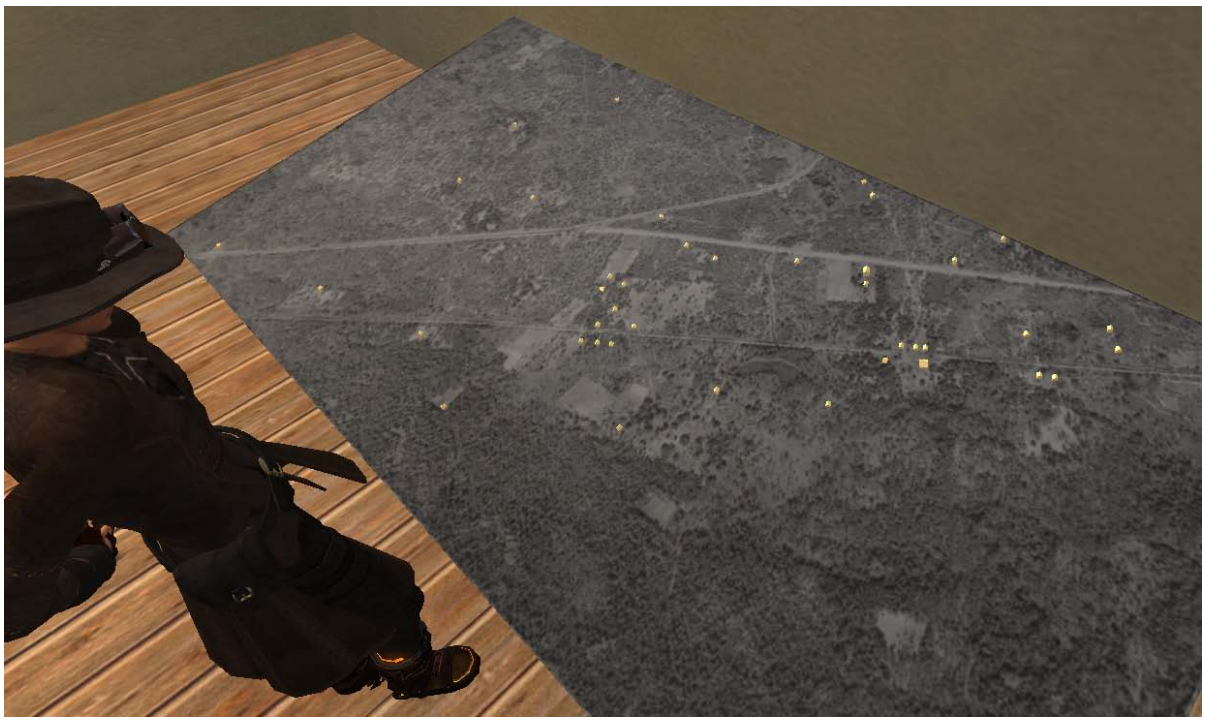

Figure 8. Diorama of 1920s Rosewood in Virtual Rosewood Museum.

The use of Second Life for virtual history remains a powerful medium, and its use as a pedagogical tool is increasing. In many ways, Second Life provides, for a fee, a complete

package for the creation and delivery of virtual reconstructions of archaeological contexts. Second Life allows a user to control many aspects of their virtual land. For instance, while

Figure 9. Suggested Donation at Virtual Rosewood Museum.

building and outfitting the virtual museum, I kept the land closed to others. Now that the land is open to visitors, I have put restrictions into the land, including removing visitors' ability to fly (although this can be circumvented by experienced users with a simple hack). In order to deliver the virtual museum content, all a creator has to do is open the land to visitors. The content is delivered in the same format it was created, without any additional modification. This is not the case for the other two methods of content creation outlined above. Instead, to deliver content created with 3DS Max Design or inexpensive software like Google SketchUp, alternative methods are necessary.

Delivering Virtual Archaeology Content

In this section I outline three ways of delivering virtual archaeology content. These include (1) traditional methods producing static images or video, (2) as self-navigable models via

the internet, and (3) a mixed reality approach using location-aware, handheld devices to overlay 3D models on the physical world in real-time.

Digital Storytelling as Delivery Method

The majority of virtual archaeology content has been delivered in the same way as non-digital data, as images in publications or as animated segments in documentaries. Interaction has remained a central goal of creating virtual world environments since Sutherland began his experiments in the 1960s. Unfortunately, those traditional delivery methods of print and video remove this vital aspect of virtual world environments, meaning that "many archaeological three-dimensional representations currently displayed in books and videos are not VR systems because there is not this sensitive interaction" (Barceló et al 2000:3), including this article.

Of course, delivering content via images and video remains popular, and is currently a primary focus of my research. I am drawing upon an established tradition of digital storytelling to create multi-vocal representations of Rosewood. Digital storytelling is the use of digital media to tell personal and/or group stories, and emerged as a recognizable practice in the early 1990s with a series of American Film Institute workshops in Los Angeles (Lambert 2009:7-9). It focuses on the small-scale, is often completed by one or a few people, and is becoming a central tool for developing media literacy (Ohler 2008) and self-expression (Lundby 2009). My first attempt at digital storytelling resulted in a short (25 minute) documentary (Figure 10), prepared in consultation with descendants for use in educational bus tours to Rosewood. A central mission of these bus tours and many of the descendants is to simply keep the story of Rosewood alive. I was attracted by digital storytelling's emphasis on small-scale, personal perspectives. The short documentary used medium quality video I took in 2009 with the last two living survivors, both in their 90s. It describes the historical and geographical context of Rosewood from settlement in the mid nineteenth century until the race riot of 1923. Then, it examines what has happened to the community during the past 87 years, as related by the two survivors.

The second documentary will use the virtual world environment created in 3DS Max Design as a filming stage. Since the entire community of Rosewood is being reconstructed, it is possible to create an animated walk-through or tour of Rosewood as it existed prior to 1923. In the final version of this 'digital documentary' narration is shared between myself and survivors

and descendants, whose stories have been collected as oral histories. The core of this documentary involves a digital tour of the site narrated by a truly multi-vocal group of researchers, residents, and descendants. It is being tailored to junior high age students and above.

Figure 10. Scenes from Remembering Rosewood -- A Digital Story created by the Author.

In addition, I have designed and constructed a portable, non-expensive automated virtual environment (P-NAVE) to use at public talks and in classrooms (Figure 11). This P-NAVE consists of one large screen three feet high by twelve feet long. Three projectors are linked via a low-cost video splitter to a laptop. The result is a portable and adjustable, medium-sized immersive screen for viewing the virtual world environment or digital documentary. It can also allow individuals to freely navigate the 3D world. The digital documentary and P-NAVE are already scheduled for use in spring 2011 at a local middle school as part of a larger storytelling project, where students will be shown the documentary and then asked to interpret the story of Rosewood themselves through any creative medium they chose; including their own personal story, poetry, dance, and so forth. In this way, the digital documentary meets a central descendant request of keeping the story of Rosewood alive, and functions as an introductory tool encouraging media literacy and self-exploration in students.

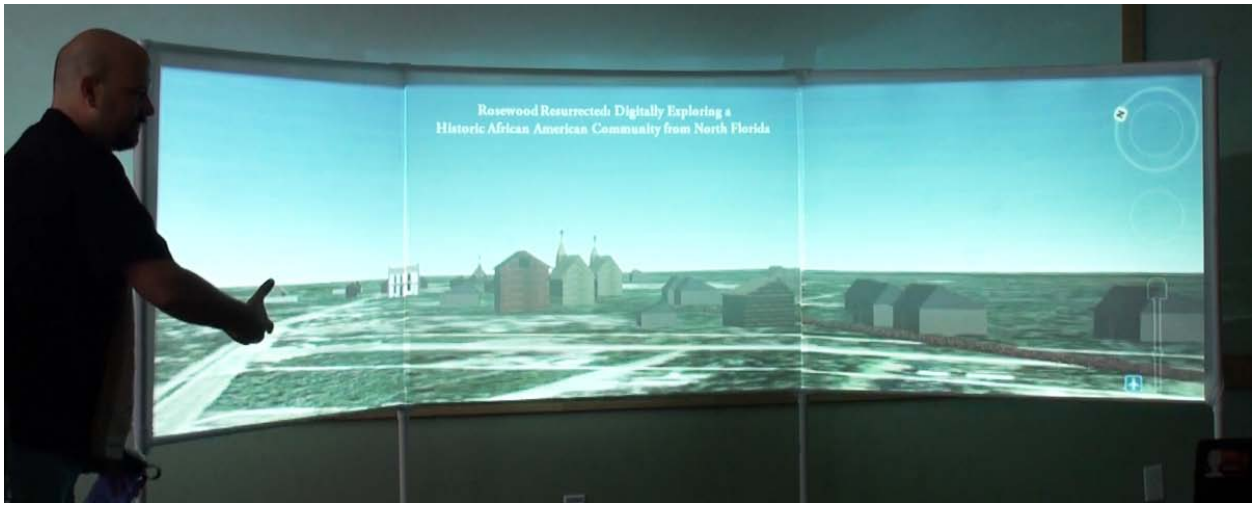

Figure 11. The Author and P-NAVE at a Spring 2010 University of Florida African-American Studies Program Brown Bag Lecture.

Geospatial Web and Online Game Engines as Delivery Method

While the creation of traditional media objects (e.g., images, video) remains useful in sharing virtual archaeology content, the enjoyment of navigating a landscape freely remains an important goal for many practitioners. This is why Second Life has been so appealing to so many researchers interested in sharing their virtual content, but there are other methods available. A leading example is the well-known and free program Google Earth, which has been recently used by archaeologists as a remote sensing tool in Afghanistan (Thomas et al 2008) and to offer a critical commentary on Camp Delta in Guantánamo Bay, Cuba (Myers 2010). These uses of the program only draw upon Google Earth's ability to deliver aerial imaging, but this program can also deliver georeferenced 3D content in the form of converted Google SketchUp models (a conversion process SketchUp handles seamlessly). The first version of a virtual Rosewood was delivered this way via a website. It offers quick and free access to virtual world environments, and with the recent release of a Google Earth plugin can be delivered as a window embedded within a webpage. The drawbacks of SketchUp models described above, such as the lack of realism, are unfortunately translated to this delivery method. Plus, multiple individuals cannot 'cohabitate' the virtual world environment as they can in Second Life, removing the ability for group interaction in the virtual world environment. One method to overcome this is to upload Google SketchUp models to the 3Dvia website (http://www.3dvia.com), which allows multiple users to quickly explore models simultaneously at no cost.

It is also possible to create higher quality versions of virtual archaeology sites and deliver them via an internet server so that multiple users can explore the virtual content in unison. One such resource is the Unreal Development Kit (UDK) game engine. A game engine is a software program designed for the creation and development of video games. UDK is an interesting program to explore because it represents one of the most successful game engines of all time, and in late 2009 became freely available to use, provided the content created is not-for-profit. Assets created with 3DS Max Design can quickly be transferred to UDK, and the resulting 'game' version can be uploaded to a server and 'played' simultaneously by multiple visitors. There are a couple of drawbacks to this program, including a steep learning curve similar to 3DS Max Design, although excellent online tutorials are available. In addition, there is no real-world scale in UDK, so creating content with accurate spatial dimensions is difficult. Finally, navigating a world (called a level) in UDK retains the feeling of playing certain popular video games (e.g., Borderlands, Gears of War). However, for some the creation of visibly stunning levels coupled with the ability to explore them collectively outweighs these potentially minor concerns.

Augmented/Mixed Reality as Delivery Method

While delivering content via traditional methods and through interactive virtual worlds remains important, the ability to overlay 3D content onto the physical world has grabbed the imagination of some heritage workers. Augmented reality (AR) and mixed reality (MR) are used somewhat interchangeably and represent one of the most provocative technologies to recently emerge. AR refers to the integration/overlay of 3D digital information into the physical environment; a popular Science Fiction example is R2D2's holographic projection of Princess Leia (Bimber and Raskar 2005). Augmented reality involves three basic qualities; the mixing of real and virtual in three dimensions, in real-time, in a format inviting interaction between the user and content. In order to meet these requirements, the AR system requires a video input, a projection screen, knowledge of its location in reference to the virtual content to display, and access to the stored 3D models (either saved to local memory or delivered over the internet).

When augmented reality research began in the mid-1990s the systems used were large and awkward, typically consisting of huge backpacks and cumbersome head mounted displays.

A handful of researchers explored this initial form of AR for archaeology, creating a system called Archeoguide (Vlahakis et al 2002). Units like the one built for Archaeoguide combined the necessary hardware for creating location aware machines. This involved a processor (typically a laptop), a GPS receiver, inertial sensors, a camera, and a head mounted display (large video goggles). These units were prohibitively bulky and expensive for use by the general public. Then, a number of cheap and/or free AR applications for desktops appeared over the past ten years. You can experience this technology on your home computer with the popular ARmedia program (http://www.arsights.com), which allows users to view Google SketchUp models in 3D on their desktop. All you need is a computer, a webcam, and a printer. This type of AR use tags printed on paper, which are then read by a program and a 3D model is placed in relation to that tag (usually over it).

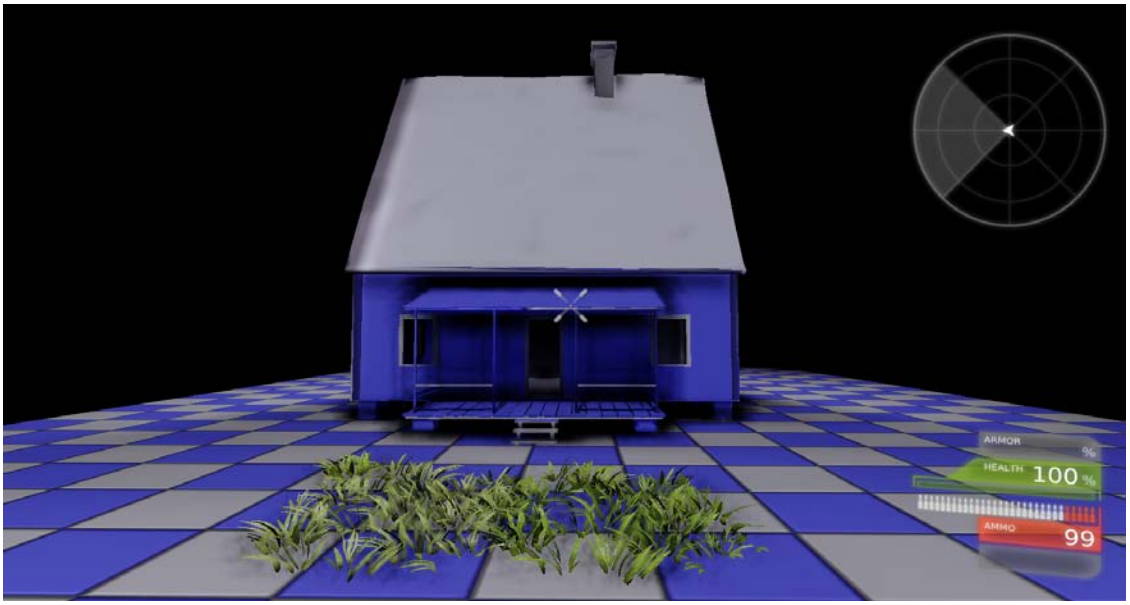

Figure 12. Untextured Model from Virtual Rosewood in UDK Game Engine.

The days of heavy backpacks and HMDs are gone, and handheld AR is becoming increasingly common. For most AR developers today, handheld AR means deploying augmented reality applications to mobile phones. In order for a phone to function as a handheld AR device it must meet a few basic requirements. First, the phone needs a camera to feed video of the physical world. Second, the device needs to be location aware, requiring an onboard GPS receiver. Third, the device needs to know which direction it is pointed, which requires a (digital) compass and accelerometers (for tilt data).

Figure 13. Rosewood Historical Marker; note damage from shotgun pellets.

When I first began exploring augmented reality in late 2008, not even the iPhone met all these requirements, but within a year mobile phones began meeting and exceeding these requirements. Owners of the iPhone 3G and any Droid mobile phone possess a fully-handheld, AR platform. All that's missing is the software, which appeared in late 2009 in the form of a free application called Layar (http://www.layar.com). Layer is described on its website as a "beautiful, fun augmented reality app that shows you the things you can't see." Users download the Layar browser and download individual augmented reality layers from a central server. The only requirements for delivering AR heritage applications today is knowledge of webpage authoring, php scripting, and basic MySQL database entry. While these skills are certainly not

common items in the archaeological toolkit, they are not difficult to learn and online tutorials provide instructions for creating your own AR application.

Figure 14. Mobile AR Rosewood Application.

There are presently notable drawbacks to this exciting technology. The central problem stems from the inability of small portable devices to accurately locate themselves on the landscape. The GPS precision of mobile phones is a few meters. The result when looking at the augmented landscape is a tendency of buildings to slightly move around the landscape. This shifting quickly lessens the longer one stands still. For an application like that envisioned for Rosewood, where a user stands in one spot (the historical marker – Figure 13) and views structures situated around them on the landscape, this application in its present form provides an excellent resource. Even with this slight movement, individual structures remain in their correct location well enough to allow users to move around them at close range and view the 3D model from different angles (Figure 14).

Non-technological concerns arise when creating AR versions of archaeological sites. While the test AR project for Rosewood is complete, the realization that placing historic structures back on the landscape may assist looters has stalled my plans to go live with the Layar application. It should be noted that it is not local residents who pose the greatest danger to the site through looting, but rather other research partners who, in their haste, have gone to the site without archaeologists and removed artifacts themselves. The loss of provenience information, as well as the inability of these individuals to properly care for artifacts is an obvious cause for concern. At present, I am exploring this technology to overlay past historic structures in protected locations around North Florida, such as Kingsley Plantation.

The promise of AR and virtual museum applications will add a new dimension to arguments for and against the creation of static, physical reconstructions of the past like those found at traditional archaeological parks (e.g., Colonial Williamsburg). The ability of (virtual) archaeologists to modify interpretations at parks delivered to the public via these applications represents a fundamental turn. As these technologies continue to cost less, the ability of visitors to access virtual content in the physical world will become more common. After all, the first camera on a mobile phone appeared in 1999, imagine what our handheld communication devices will contain in another ten years. Furthermore, the ability to combine real-world and virtual content means that new interactive programs can be designed for parks with physical reconstructions that go beyond self-guided audio tours. This highlights an important aspect of AR, the ability to deliver a variety of digital content to mobile devices, including audio and video. There is also a democratizing aspect to AR centered on the ability for anyone to create such content. This could include workshops where descendants, collaborators, and visitors are invited to contribute their own impressions to a public conversation about a place; an invisible dialogue, floating in space until each individual interacts with the content in their own time.

Discussion

Lev Manovich, in his pivotal work *The Language of New Media,* not only provides us with the most concise definition of this term, but also presents five characteristics useful in conceptualizing virtual archaeology from creation to delivery. New media is the “translation of all existing media into numerical data accessible through computers” (Manovich 2001:20). This

includes the translation of analog materials (e.g., photographs, movies, records) into digital formats as well as the creation of fully digital artifacts like digital images and 3D models. New media is what happens when media and computer technologies meet. Manovich's characteristics of new media are useful for organizing the various ways virtual content is represented, constructed, modified, changed, and culturally affected/affecting.

"All new media objects… are composed of digital code" (Manovich 2001:27) represents the first characteristic, and while modern media such as film follow an industrial logic (large scale production studies, expensive equipment costs, scores of labors), new media provides us with a post-industrial method, one not regulated by mass standardization. This aspect of new media means its potential as an emancipatory form is literally hardwired into its very structure. Secondly, new media is modular; parts can be deleted, re-arranged, and added without destroying the original. This invites experimentation and exploration. This feature is easily coupled with pedagogical interests at the core of digital storytelling in regards to teaching media literacy.

A third aspect involves automation, and this is particularly important for creating the immersive experience of virtual world environments, or simply delivering a 25 minute documentary via an online video service like YouTube or Vimeo. The most common form of automation is the creation of programs to access information, and while Manovich's central concern here is the proliferation of access agents (e.g., Google search) for sorting through the bewildering amounts of information now available online, without the ability to automate something as simple as access to virtual content, the dream of immersive virtual reality would still not exist.

The fourth characteristic revolves around the variability of new media objects. This flexibility is useful for virtual archaeology, allowing us to posit alternative interpretations side by side, a practice nearly impossible to do in full-scale, physical reconstructions of structures. This also means that we can create a variety of interfaces with the same content. Drawing on the examples above, the same content can be delivered via traditional formats like print images and videos, through individual online worlds like Google Earth, or in settings conducive to group interaction like Second Life and UDK.

The final characteristic of new media is cultural transcoding. This involves the interaction between cultural ideas and new computer methods. At present, this is dominated through analogy with traditional media, the printed page becomes a webpage, cinema becomes online video (edited and navigated based on analog concepts like fast forward), the human computer interaction of fingers on keyboard become fully immersive virtual reality. In regards to virtual archaeology, this takes the form of interacting with AR applications, and as with the birth of any new technology, we can only begin to hypothesize about the range of potential applications. The term "transcode" means to translate, and how researchers and collaborators chose to translate traditional archaeological knowledge into these new formats, and the reciprocal affect on our practice as archaeologists is only beginning.

Conclusion

The goal of this article was to introduce the reader to current and emerging practices of virtual archaeology, specifically as I am exploring them in my research with Rosewood. Some of what I discussed may not strike you as new, but I hope that at least some parts will excite others to begin exploring these technologies. I believe that the use of virtual world environments has been restricted to monumental and/or prehistoric sites for far too long. The creation of new media – whether that is virtual world environments, digital stories, or some other object – represents a powerful research, teaching, and collaborative toolkit. Additional potentials for engaged archaeology are developing at the intersection between dropping hardware and software costs and rising technical literacies. I choose to use these tools in an openly political project in hopes of joining that chorus of archaeologists drawing on community service learning models to engage with the modern world (Nassaney and Levine 2009). My work with the Virtual Rosewood Research Project seeks to find a truly multi-vocal methodology for use in heritage work. This is driven by a desire to bridge virtual and public forms of archaeology in the analysis and interpretation of the contemporary past. The new forms of knowledge produced by such a synthesis highlights the experiences of descendants and other interested parties, provides tools for critically engaging with history and media, and offers researcher new techniques for crafting the way their work is interpreted by others. While this article's primary goal is to share my experiences with new media and historical archaeology as engaged academic praxis, it is also an

invitation to join in this work. In many ways, I feel that new media offers a new set of tools, ones not found in the master's house (Lourde 1984:110-113) and therefore potentially very liberating, a constellation of approaches and technologies not regulated by gatekeepers and tradition - although certainly in dialogue with such things. Obvious and sizable obstacles to full participation in the creation of new media are seen in the digital divide, roughly tracing the lines of racial and class inequalities in this country, and between nations generally. However, just as the printing press was utilized in the past to democratize knowledge, so too can we teach ourselves and others to draw on new media methodologies for the same. Of course, only time will tell if this optimistic viewpoint will produce transformative fruit or if mass standardization will again assert itself and crush individual creativity and expression.

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