
Digital Monuments and Augmented Reality – Study of the American Civil War Landscapes

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1 Introduction

Because the Civil War is perhaps “the most compelling episode in American history” (SELLARS, 2005, p. 26), the preservation of American Civil War battlefields as National Military Parks has significantly benefited today’s American society. They are known as places of reconciliation and remembrance, and contribute to the creation of a national identity. These places are in fact “sacred places” (LINENTHAL, 1991) that are visited by many who consider themselves pilgrims undertaking repeated journeys to a holy place (STODDARD, 1996).

The notion that a battlefield is a repository of memories cannot be argued. The landscape is not only stained with the nation’s suffering but also offers the potential for healing. The battlefield is a place where “the combatants of old could come together, recall the shared horrors of war, and acknowledge their common actions as lessons for the nation” (Associates & Partners, 2003, p. 25). In addition, these annual reunions held on the battlefields served to “draw attention to the need to preserve the fields of battle as well as a symbolic act of healing sectional divisions” (ASSOCIATES & PARTNERS, 2003, p. 26). These battlefields long remained central places for reconciliation among veterans and their descendants and for keeping national memory alive.

1.1 Monuments in the Civil War Battlefields

Even before the war ended on April 9, 1865, Civil War battlefields received enormous attention from the soldiers, the public, and politicians who fought to preserve these historic landscapes. For instance, according to ABROE (as cited in ASSOCIATES & PARTNERS, 2003), during the course of war, active duty soldiers built three memorial structures as a remembrance to their fallen comrades. The first memorial was the Bartow Monument erected by the Eight Georgia Infantry in honor of their brigade commander who was mortally wounded during the Battle of Manassas in September 1861. Then in 1863, Union soldiers built two monuments: the Hazen Brigade Monument, which honored brigade members killed in the Battle of Stones River, and the Surrender Monument, which commemorated General Pemberton’s surrender to the Union army after the Siege of Vicksburg (ASSOCIATES & PARTNERS, 2003).

Besides, SELLERS (2005) notes, the process of creating and marking battlefields with monuments not only serves as part of the commemorative efforts but also as an attempt to “impose order on the past on landscape of conflict and confusion” (SELLERS, 2005, p. 38). After the war ended, the veterans associations made numerous efforts to mark and

accurately place monuments on the sites of significant events. The construction of monuments to represent specific combat units and their lines of battle has improved the ability of today's visitors to understand troop movements and avenues of approach. In fact, the important role of monuments in honoring and preserving the memory of important events was acknowledged more than a century ago when John Howard Wert noted that, "The more the field is decorated with these works of art, the more powerful becomes the impulse of the traveler and patriot to visit or revisit the field of glory" (as cited in ASSOCIATES & PARTNERS, 2003, p. 28).

1.2 Battlefield Monuments: Issues and Challenges in the 21st Century

Various government agencies, private associations, and veterans' organizations have been involved in the preservation of battlefields and the building of Civil War monuments. They organized annual reunions, erected battlefield monuments, and lobbied state legislatures to allocate funds for future monuments on different battlefields (HANSON & BLYTHE, 1999, p. 28). Among these organizations were the Gettysburg Battlefield Memorial Association (GBMA), the Society of the Army of Tennessee, the Southern Historical Society (SHS), and the Association of the Army of Northern Virginia (AANVA).

Despite these efforts, not every battlefield was successfully preserved and marked with monuments. Most of these battlefields remained on private land, which means access and site preservation became more difficult. Even worse, many historic battlefields have been under continual threat from urban sprawl that has brought permanent changes to the physical landscape. Often these changes mean not only the loss of natural vegetation and the alteration of other natural features but also the loss of historical structures or important viewsheds related to the battlefield. For instance, MACMAHON (1991) has noted how landscape changes at the Gettysburg Battlefield impacted later historic interpretation:

*"Through those motels and fried-chicken stands, Pickett's men charged.
The first line faltered in the Burger King parking lot and regrouped next
to the Tastee Freeze"* (MACMAHON, 1991, p. 16)

While monuments have long been used to convey the battle's memories, some scholars argued that they could potentially affect the historic landscape values. According to LINENTHAL (1991), mass erection of these commemorative monuments may simply degrade a battlefield's purified environment. The same concerns are echoed by BIRNBAUM (1993), who noted that contemporary monuments could potentially create a false sense of history when they are inserted in a historic landscape.

Besides, conveying historical lessons to today's tech-savvy visitors is more challenging. These visitors are highly dependent on computers, television screens, and movie theaters as a source of information (MOSS, 2008). According to MOSS (2008), this phenomenon has brought new patterns of learning, especially for "millennial learners" or "the net generation." It is very important to integrate visual technologies with historic landscape elements in order to bring on-site educational excitement. Although some of these technologies have been employed in interpretation and visitors centers, less effort has been made to bring these technologies closer to the actual ground. A combination of these elements could play a significant role in educating visitors in the near future.

Therefore, this study explores the potential of using digital technologies to convey historic memories in landscapes that are physically and visually inaccessible. Specifically, this study identifies the possibilities of using virtual 3D monuments as an alternative visual platform to commemorate historic events and facilitate users' ability to comprehend the horrific lessons.

2 Study Area

The Battle of Cedar Creek in Middletown Virginia, was fought on October 19, 1864. Major General Philips Sheridan commanded the Union troops, while the Confederate forces were led by Lieutenant General Jubal Early. This battle is considered unique by military historians because of the brilliant night maneuvers used by the Confederate forces to launch their surprise attack on the Union camps. Although the surprise attack was considered a victory for the Confederate forces, because of hunger and a lack of coordination, they were eventually defeated.

Cedar Creek and Belle Grove National Historical Park (CEBE) was officially created in 2002. It is partially situated in three different counties: Frederick, Shenandoah, and Warren in Virginia. The creek for which the battle is named served as a natural defensive feature, which both the Union and Confederate armies tried to maximize during the battle.

3 Methods of Study

The methods used in this study focus solely on the development of experimental 3D model layers used in an augmented reality platform and are divided into three stages. The first stage explains the process of developing a 3D model of battlefield monuments. The second stage involves developing augmented reality layers based on the battlefield's points of interest and integrating those layers into a mobile augmented reality browser known as LAYAR. In the third stage, several field tests were conducted by the researchers to review the quality of those models and to identify technical or user-related issues when viewing the model.

3.1 Developing Battlefield 3D Monuments

SketchUp 8 was chosen to create the 3D monuments because of its ease of use and simple interfaces that allow easy construction, manipulation, and visualization of 3D concepts. For this study, we constructed a 5-by 14-foot obelisk as an experimental model (Figure 1). The shape was chosen because it is one of the most common types of monuments used to commemorate soldiers at the Civil War battlefields. However, in order to be used in the LAYAR browser, the SketchUp (.skp) obelisk model file had to be converted to a 3D object file known as (.l3d).

This process required two phases of file conversion. For the first phase, Bable3D online file translation service was used to convert the (.skp) file into a geometry definition file format (.obj). The new file format allowed geometrical characteristics such as the position

of each vertex and texture coordinate vertex to be universally accepted by other 3D graphic applications. The (.obj) file was then imported to the LAYAR 3D model converter where the model vertices, faces, and material should be overviewed. It also allowed the editing process on the obelisk materials, textures, color, shininess, rotation, and scale. Once finalized, the model was then converted to the (.l3d) file (Figure 1).

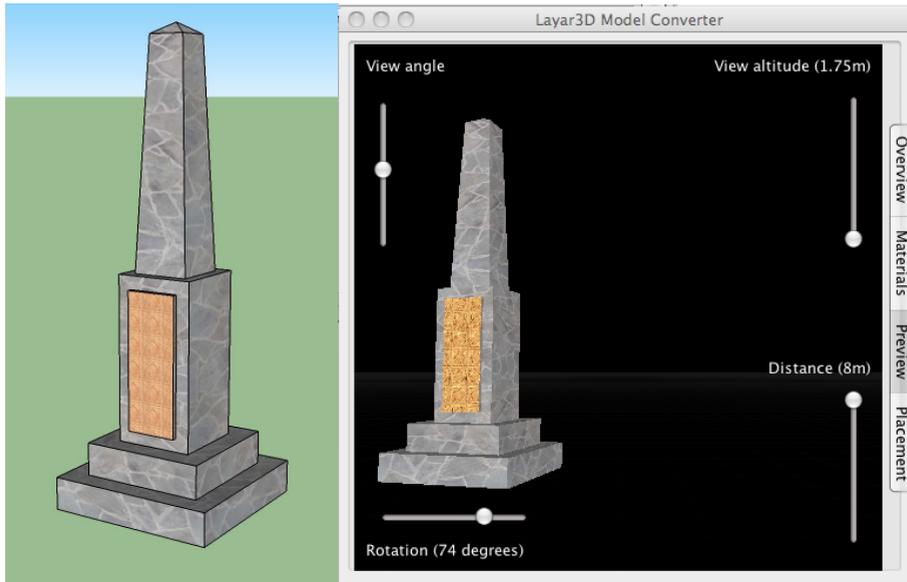


Fig. 1: Constructed 3D obelisk monument in SketchUp and its preview in LAYAR 3D Converter

3.2 Developing and Integrating the Layers

Using layer creation tools (LCT) known as Hoppala Augmentation, several points of interest (POI) identified from the Cedar Creek Battlefield events were used to create an augmented 3D monument model layer. Details were added to these POIs such as military unit descriptions, commanding officers, weblinks, sounds, and geo-referenced locations (Figure 2). Using the Hoppala content platform overlay uniform resource locator (URL), this layer was then linked to the mobile browser through the researcher's LAYAR developer account. The LAYAR browser generally allows developers to customize the augmented reality layer interface according to specific user preferences and launch the experimental layer in the LAYAR mobile application. For this study, the iPhone 3G with iOS mobile platform was used to visualize the final results.

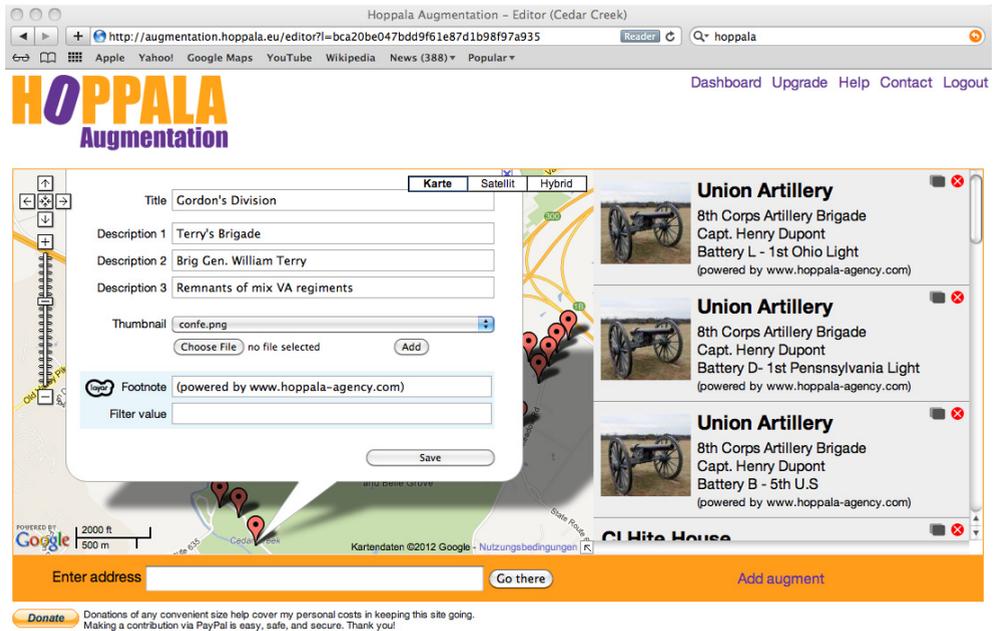


Fig. 2: Layer creation tools (LCT) known as Hoppala Augmentation were used to augment several points of interest (POI) to create a monument layer using the 3D models (source: <http://www.hoppala-agency.com>)

4 Results

Several valuable outcomes were observed through the demonstration. First, the 3D obelisk model layer can be integrated and launched easily using both the Hoppala content management platform and the LAYAR mobile augmented reality browser. Next, the scale of the augmented model varies based on its location when viewed through the mobile phone's camera (Figure 3). The scale was found to be very useful in constructing "conceptual distance" between models and the user's location. Additionally, the Hoppala platform allows easy controls of 'z'¹ values for the models to be placed within the historic landscape.

Meanwhile, integrated information linked with the model's pop-up interfaces enable users to have a better understanding and experience of the landscape's historic contexts (Figure 4). However, the materials and textures assigned to the obelisk model have lower image quality compared to the earlier model developed in SketchUp and the LAYAR 3D model converter. The reduced image quality may be caused by the size of smartphone screen, which limits pixelated details of the model's materials. In addition, it was found that the model's positions (x,y) have an acceptable 9 to 15ft level of accuracy in open areas. The

¹ Models' altitudes from ground level.

accuracy for the ‘z’ value however is more difficult to estimate, although the results show it is more credible.

Several difficulties were found when researchers used the application. For instance, the mobile electronic compass occasionally gave false orientations toward POIs. On sunny days, the user often faced difficulty seeing the models’ details due to reflections and glare on the mobile’s screen. Finally, users should also be aware of safety issues when using this application close to moving traffic.

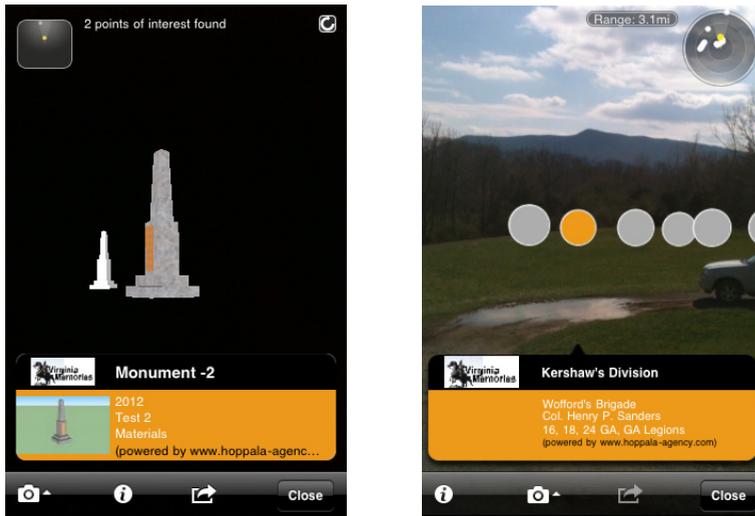


Fig. 3: 3D models provides better ‘conceptual distance’ between POIs than 2D symbols

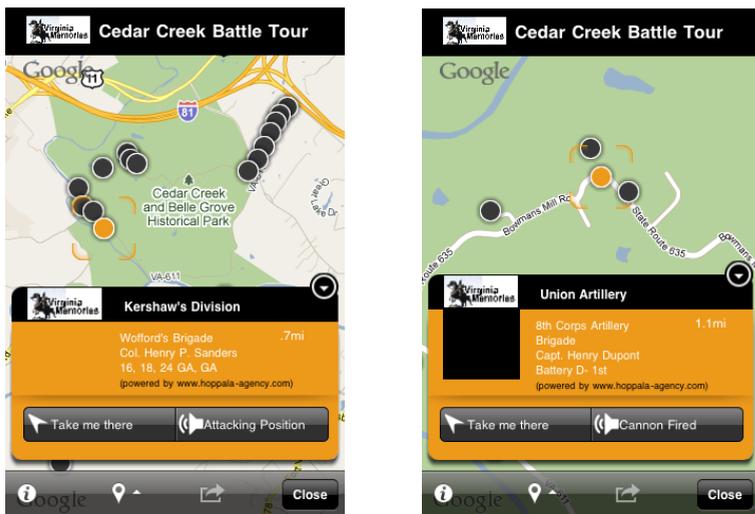


Fig. 4: The POIs ‘pop up’ interface provide additional historic contexts and experience

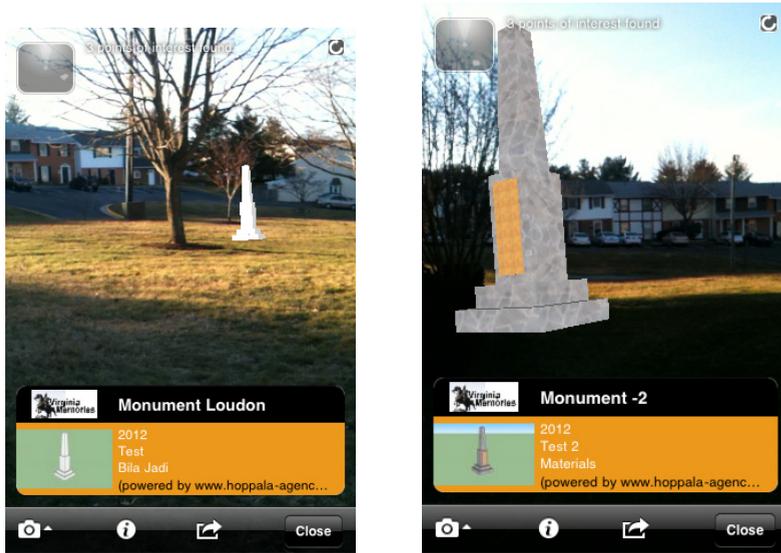


Fig. 5: 3D Monuments were simulated within a degraded landscape

5 Conclusion

This paper explores the potential of using 3D models within physically and visually inaccessible historic landscapes to augment the memory of past events. Based on our observation, instead of using typical 2D objects to represent the POIs, the 3D models have shown its potential to facilitate user imagination to commemorate relevant lessons learned from the battle. We also believe that the new technique used to visualize 3D monuments could attract and provoke user interest to better experience the battlefield.

This technology can also be used to make the invisible visible. Important historic structures that have been removed or destroyed in the historic landscape such as bridges, fences, and stonewalls can be easily constructed. The use of new technologies to visualize historic events can certainly act as a contemporary communicator of social remembrance. In fact, based on this approach, the historic integrity of the battlefield can be enhanced and new ways of experiencing the historic landscape can be promoted. We speculate that 3D models can be an important visual representation tool in understanding historic human conflicts.

In addition, this technology allows users to easily access the historical battlefield and maximizes their opportunity to explore different points of interest. Considering the rapid adoption of smartphones, particularly in the younger demographics, AR can be a valuable learning tool. Some computer scientists, for instance, believed that in the future, an increasing percentage of information would be visual rather than written (STALEY, 2003).

Finally, this study also offers opportunities to further investigate the potentials and limitations of using 3D monuments in the Civil War landscapes. For instance, future studies may involve use of eye-tracking technology to determine usability of the applica-

tion or user perception of the quality of 3D monuments. These will lead to better understandings of the potentials and limitations of 3D monuments within an augmented reality environment to commemorate lost historic events.

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