

Heights of Glory: Design Thinking to Enhance Battle Monuments Visits via Augmented Reality

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Abstract

Augmented reality (AR) is a powerful tool for enhancing visitor experiences at cultural heritage sites, including war monuments and memorials. AR implementations should be designed thoughtfully, with input from stakeholders, to ensure that the technology enhances the overall experience and intended messages.

This work presents a case study of a novel AR course developed for implementing AR technology at five iconic monuments in the Golan Heights, honoring the sacrifice and service during the Yom Kippur War in October 1973. To enhance the visitor experience, AR mobile applications that allow users to interact with the monuments using their mobile devices were developed. The students in the course leveraged the principles of design thinking, an innovative and agile method that yielded interesting results, reflected in the responses of students and veterans to the applications.

Keywords

Cultural heritage experience, Augmented reality, Design thinking, Human-centered computing

1. Introduction

Augmented reality (AR) has emerged as a powerful tool for enhancing visitor experiences at cultural heritage sites, including war monuments and memorials. By overlaying digital information onto the physical world, AR can provide an immersive and interactive way to learn about historical events, sacrifices, and stories associated with these sites [11].

Implementing augmented reality (AR) at war monuments presents several challenges that must be carefully considered. One of the primary concerns is ensuring that the AR content is respectful, accurate, and appropriate for the solemn nature of these sites. It is imperative that developers collaborate closely with historical materials, veterans, and other stakeholders to create content that honors the memory of the fallen and accurately portrays the historical events [1]. Another critical factor to consider is the physical environment and the changes it

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has undergone over time, particularly for war monuments that commemorate combats that took place decades ago. The landscape, vegetation, and surrounding areas may have transformed significantly since the historical events, making it challenging to accurately overlay AR content on the present-day setting. Developers must carefully study the available historical documentation, such as photographs and up-to-date maps, to ensure that the AR experiences align with the original battlefield conditions.

This work presents the implementation of augmented reality (AR) technology at five monuments in the Golan Heights honoring the Yom Kippur War of October 1973. Between March and October 2023, seventy monuments were renovated, each featuring a cornerstone, inscription, and audio guide. AR mobile applications were developed to enhance the visitor experience by providing digital overlays with detailed information about the monument's symbolism, battle story, historical footage, photos, and an animated map. The integration of AR creates an immersive, multi-layered experience that brings the history and legacy of the Yom Kippur War to life while deepening visitors' personal connection to cultural heritage sites.

2. Background And Related Work

2.1. Augmented Reality for war monuments

One key feature of AR is the creation of virtual tours or guided experiences, allowing visitors to receive additional information, multimedia content, or simulations of historical events by pointing their devices at specific locations or exhibits [8]. This could include virtual recreations of battles, personal accounts from soldiers, or detailed explanations of the monument's significance and symbolism. AR can also be used to animate statues or display biographical details of individuals represented in the monument [7], fostering a deeper connection with the history and sacrifices represented. Another key feature is the insertion of additional materials, such as translation and audio guide functionality, ensuring effective communication to a global audience [10]. However, it is crucial to strike a balance between leveraging technology and maintaining the solemnity and respect that war monuments demand, with input from historians, veterans, and other stakeholders [7].

2.2. Design Thinking

Design thinking, a human-centered problem-solving approach, can be applied to create meaningful and impactful war monuments. The iterative process involves several key phases: empathize, define, ideate, prototype, and test [4]. In the empathize phase, designers seek to understand the perspectives, emotions, and needs of various stakeholders through interviews, observations, and expert insights [6]. The define phase synthesizes these insights to articulate the design challenge [2]. During ideation, designers generate potential solutions through brainstorming and creative exercises [6], exploring unconventional ideas such as interactive elements or multimedia experiences. The prototype phase involves creating representations of the most promising ideas for rapid feedback and iteration [3]. Finally, the test phase implements and evaluates the final design, gathering feedback to inform further improvements [5].

3. Method

Leveraging on [7], that showed that AR technologies are mature enough to be standardized for cultural heritage sites usage, a course for Software Engineering (SE) students in their fourth and last year of studies, was designed. Each team of students got the task to develop an AR application, showing visitors the details of the battle that took place, while displaying AR objects in 3D, using the personal mobile phone. The main goal of each application was to allow visitors to go back in time to some of the historical and symbolic battles of October 1973. As part of the project, the plan was to embed barcodes in several heritage sites, which can be scanned and viewed on a mobile phone let in the areas described in the battle.



Figure 1: Course schedule and main milestones

The AR app development process (Figure 1) involved design thinking, a tour of historical sites, and a Unity workshop. Students formed 5 teams, each working on a different monument. They practiced design thinking and Unity programming.

In the **empathize** phase, teams investigated the battles using available materials. During ideation, they chose combat scenarios, selected key objects, and built animated maps (Figure 2). The Golan Heights tour allowed them to adjust AR scenes to the current reality, considering the monument's present environment and adapting content while maintaining historical accuracy. This emphasized the importance of research, site visits, and flexibility.

In the **ideate** phase, students used design thinking to choose a specific combat scenario, select key objects, and build an animated map (See Figure 2). The Golan Heights tour allowed them to explore the monuments and adjust their AR scenes to the current reality. Some teams had a sobering realization, discovering the necessity of considering the monument's present environment, such as a forest now standing near a tank that wasn't present 50 years ago. They had to adapt AR content to the present-day landscape while maintaining historical accuracy. This experience emphasized the importance of thorough research, site visits, and flexibility in the design process to effectively bridge the historical narrative and the contemporary setting.

Finally, a key requirement was to build a working prototype of an augmented reality application and run it on a mobile device - **prototype, and test**. The teams were required to show the prototypes to the veterans which they interviewed, to document their review, and to make final changes in the application prior to the final presentations.

4. Findings and discussion

The design thinking process guided the students and helped them achieving decisions established a framework for the AR application, guiding development efforts and ensuring a targeted, cohesive final product. By applying design thinking principles and considering user experience, historical context, and technical requirements, the students made informed choices that contributed to the project's success. (See Figure 2). One of the teams used the combat scenario to develop an AR game, according to game design aspects taught in class [9], where the visitor can actively participate in a famous scene in the battle the demonstrated.



Figure 2: Examples of working prototypes presented at the end of the course

The students successfully collaborated using social media and digital tools, sharing resources and knowledge. They presented prototypes, completed a survey, and expressed satisfaction with the course, noting that practicing design thinking deepened their understanding and motivation, with one student even considering studying AR further. The students agreed that their products will be published in different venues.

We also asked the veterans about the experience of telling their story and contributing to the development: "There is great value in integrating augmented reality technology as a means of illustrating past experiences, for young people as well as adults. The fact that Arab students also took part in the project, who dealt with a subject that apparently could have been expected to choose not to deal with - Israel's wars, is not self-evident and deserves respect."

5. Conclusions And Future Work

The innovative software engineering course presented in this paper, focused on cultural heritage, where students design, develop, and deploy an AR application, showcasing the synergy between academia and the cultural sector. The project emphasizes using AR to conserve and disseminate cultural heritage, ensuring accessibility for future generations. While the case study demonstrates AR's potential to revolutionize engagement with cultural heritage, further research is needed to assess its impact on visitor engagement, experience, and long-term retention of historical knowledge.

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