



# A Lens to the Past: Using Site-Specific Augmented Reality for Historical Interpretation

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**Abstract.** This demo paper presents a locative, site-specific, augmented-reality game for a WW1 historical site. The work constitutes the preliminary results of a research collaboration between two universities, one museum and a developer of serious games. The challenge was to produce an interactive, playful and educational digital experience based on the results of research into national policy and other cultural forces in relation to food and nutrition in Denmark during WW1. The resulting game needed to have a high technology readiness level and be deployed in the historical site for use by visitors. The research collaboration produced several innovations in location-based augmented-reality games for cultural heritage that are likely to be of interest to researchers and developers working in this space: (a) a way to present complex content that requires multiple perspectives in a geolocatable double structure; (b) the use of a visual aesthetic that resonates highly with the historical period in question in order to encourage reflection that relates the past to the present; (c) an approach to adding supplementary historical information in a fashion that aims not to overload the player with information during the play experience. While we have yet to evaluate the work through a user trial, this demo paper presents our design motivations and solutions that arose from the collaboration and the complex historical material.

**Keywords:** Locative gaming · Augmented Reality · Cultural heritage · Historical Interpretation

## 1 Introduction

In this demo paper, we present a sophisticated site-specific, location-based Augmented Reality (AR) game situated in a historical WW1 fort. The game was developed as part of a research project funded by the Velux Foundations. The research project was a collaboration between Aarhus University, Trinity College Dublin, the museum Museet Mosede Fort Danmark 1914–18 and the game developer Haunted Planet Studios. A primary high-level objective of the project was to explore ways of actively integrating the process of research with the educational activities of the museum, and the game documented in this paper was one of the outputs from the research project.

Entitled *Kampen om maden 1914–1918* (loosely translated, “the struggle for food 1914–1918”), the game had multiple objectives: It needed to engage the general public with an attractive and thought-provoking experience; it needed to encourage reflection around how ideas regarding food and nutrition that were developed during WW1 are still relevant today; and it needed to be based on the latest research into national policy and other cultural forces during WW1 in Denmark. Furthermore, it had to be based on Haunted Planet’s “Longship” game engine, which had been used in previous cultural heritage experiences, such as *Bram Stoker’s Vampires*, which was shortlisted for the 2016 Heritage in Motion Award.

Museet Mosede Fort Danmark 1914–18 is a World War 1 museum based in Greve, Denmark, situated on the coast south of Copenhagen and centred around a historical WW1 fort. Rather than a typical war museum, the museum tells a complex story about how national policy decisions, especially around the scarcity of food, during the First World War led to the development of ideas and thinking that became the foundation of the Danish welfare society and are still relevant today – perhaps more than ever.

## 2 Related Work

Location-based games date back to the early 2000s, and with the success of *Ingress* (2012) and *Pokémon GO* (2016), locative games entered the mainstream in a very serious way. The genre holds considerable potential for cultural heritage sites as a way to present historical and other types of content, and a number of experiences exist, ranging from early experiments such as Geist [1], REXplorer [2] and Viking Ghost Hunt [3] to more mature approaches, such as Jumièges 3D [4]. A study has shown that mobile augmented reality applications with historical pictures and information are of interest to end users and that the level of interest is related to the perceived usefulness and perceived enjoyment of the applications [5]. History-focused projects, such as Media Portrait of the Liberties [6] and Riot! 1831 [7] have explored how media fragments (audio, video and static images) can be situated in locations that were of historical relevance to the story material, and projects such as Geist [1], Oakland Cemetery [8] and Carletto the Spider [9] placed more complex entities across cultural sites in the form of virtual storytellers, which allow more interaction than static media fragments. Sophisticated authoring tools, such as StoryPlaces [10], have reduced the cost of developing locative cultural heritage experiences.

## 3 Core Game Concept

The pretext for the game experience is that mysterious apparitions from the past have appeared across the historical fort. The player must find these revenant apparitions and investigate why they have appeared right here and right now. The player’s smartphone is transformed into a “detection device” to help locate and get close to the revenant apparitions. Each encounter starts with the build-up of a soundscape related to the apparition in question and ends with the player taking a photograph of the apparition.

The game contains four game modes (see Fig. 2) through which the player interacts with the game mechanics: The Map (an overlay on Google Maps) enables coarse-grained

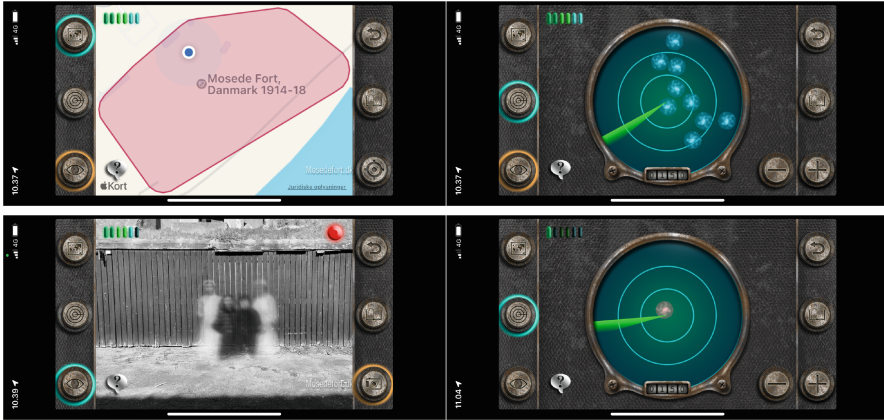
navigation, the Radar (a representation of a naval radar) enables fine-grained navigation and search mechanic, the Ghostviewer (a monochrome Augmented Reality camera) lets players take photos of the revenant apparitions. The Map Mode shows the general play area outlined in purple, but it does not show the specific points of interest, because this would make the navigation and search mechanic too easy to offer an interesting play experience. The Casebook (a list of player photos and descriptions of encounters), shown in Fig. 2 (bottom), lets players review their photos and game text to consider why exactly these apparitions have emerged right here and now. As an interactive experience, the game mechanics are concerned with navigation, capture and collection of the revenants, but the design leaves out many other mechanics known from locative games, such as explicit scoring mechanics, levelling up and territorial conquest. From a game experience point of view, *Kampen om maden 1914–1918* probably has more in common with lighter, more flow-based explorative games [12], such as *Flower* (2009), than it has with *Ingress* and *Pokémon GO*.

During the collaborative design process, our team discussed if we should call this more flow-based explorative outcome a ‘game.’ We considered different other more open-ended descriptions such as an ‘experience,’ an ‘exploration’ or even the more elusive ‘encounter with the past.’ However, in the promotion of this new type of offering, the museum needed to present an unambiguous and easily recognisable description of the activity to potential users, and therefore we retained the designation of *Kampen om maden* as a game.

A typical play experience begins with the player using the Map (Fig. 1 top left) to orient themselves and ensure they are within the play area. The player then switches to the Radar (Fig. 1 top right) and decides which of the encounters they would like to approach (e.g., the nearest) and then starts walking towards it. The player tracks the encounter on the Radar as they are moving and navigating the fort’s irregular terrain. As the player approaches the encounter, its associated soundscape begins to play, evoking the encounter’s theme through its sound design. When the player gets very close to the encounter, they must switch to the Ghostviewer (Fig. 1 bottom left) which shows a monochrome camera feed of the surroundings. Guided by a directional arrow on top of the camera feed, the player now scans the scene until they see the revenant apparition, which is anchored to a fixed compass direction in the location. The player then taps the camera button to capture a monochrome photo of the revenant, which is floating against the backdrop of the historical fort. After reviewing their photo in the Casebook (Fig. 2 bottom left), the player switches back to the Radar and uses it to find the revenant’s companion encounter, which is now the sole encounter shown on the Radar (Fig. 1 bottom right). This companion encounter forms the second part of the geolocatable double structure mentioned earlier. After the player has used the Radar and the Ghostviewer to capture the companion encounter, the Radar now shows all remaining encounters (Fig. 1 bottom right) and the player can proceed to find the next one. Throughout the experience, shows the current game mode with a light blue glow around the relevant button, and gives cues to the player about which game mode to use next by showing a yellow pulsating glow around the relevant button. (See Fig. 1.)

To enhance the players’ possibility to reflect on the messages carried by the revenant apparitions from the past to the present, the players are given the opportunity to get

their personal Casebook sent to their email. This online Casebook contains additional information about the encounters, including the original historical photographs as well as links to relevant articles which the players can explore at any given time.



**Fig. 1.** Left: map mode (top) and Ghostview mode (bottom); right: radar mode showing first encounter (top) and companion encounter (bottom).

When the game is played in the historical fort, the exact location of each revenant apparition is curated to offer a good experience, for example by ensuring historically relevant and aesthetically pleasing visual backdrops to the revenants. In addition, the game has a “random mode” that allows it to be played in other locations than the fort. In random mode, the game stages itself in the player’s location by placing the revenants in a randomized configuration around the player. The random mode is considered an experimental feature, and at the time of writing it does not guarantee that the revenants are placed in accessible locations, but it does allow the game to be played in a park or other open area anywhere in the world.

## 4 Shadow and Light

The game uses and reflects upon the fundamental dialectic figure of the poppy. The poppy, which grew on the battered grounds of battlefields, holds the dialectic relation between life and death – food and war. This dialectic is present in every part of the overall game concept, structure and mechanics and has been the driver for both the visual and the textual content.

The game experience is structured around nine double encounters. Of each double encounter, the first brings to the fore a particular problem related to food shortage and malnutrition that manifested themselves in Denmark (neutral during the war) through the dark shadows of WWI. The second part of the double encounter is a “companion encounter” that relates to the same theme as the first but shows how new solutions to the food-related problems grew out of the war shadows and formed new ways of organising Danish society. The player can choose freely between the different first encounters (see

Fig. 1 top right), but once they have engaged with a first encounter, they cannot proceed in the game until they have found the matching second encounter (see Fig. 1 bottom right). To help make this possible, the remaining first encounters will temporarily disappear from the Radar and only the matching second encounter is shown. First encounters are marked in blue and second encounters in red in order to mark the distinction visually.

The encounter visuals – the apparitions – are taken from historical photos from the time of the war and hence appear in black and white. To enhance the experience of engaging with apparitions from the past, the Ghostviewer (AR camera mode) is also in black and white (see Fig. 1 bottom left; as well as Fig. 2 top left and right). In this way the game encourages the player to see the present in the light of the past and vice versa.

The encounters with the revenant apparitions are intentionally placed on locations where the historical site in different ways create an aesthetic background, which enhances the atmospheric and symbolical experience of the apparitions and their messages from the past. In this way the site-specific nature of the game is based on the historical fort's unique atmosphere. The atmospheric experience of the apparitions are further aided by the game's elaborate soundscape.



**Fig. 2.** Ghostviewer (top) and casebook (bottom) for one double encounters: battlefield (left) is the first encounter and cornfield (right) is the companion encounter. The Casebook screenshots are from the online version of casebook, which contains additional information and links to historical sources.

Every apparition is accompanied by an intentionally surprising heading and a short text, which evokes the theme that the apparition symbolises. To show the dialectic relation between the apparitions that emanate from the war shadows and the ones that represent new growth, the pictures taken with the Ghostviewer are framed by either withered black branches or a blooming poppy flower décor, as shown in Fig. 2 (bottom left and

right). The dialectic relation is also reflected in the text that accompanies each revenant apparition in the Casebook. For the Battlefield/Cornfield double encounter, the text for the first (Battlefield) encounter is: “The battlefields were soaked in the blood of soldiers. The slaughterhouses were soaked in the blood of animals. The war time vegetarians saw a connection.” (Fig. 2 bottom left.) For the companion (Cornfield) encounter, the text is: “The cornfield produced food from the farmers’ labour. It was hard work, but peaceful.” (Fig. 2 bottom right.)

## 5 Conclusions

The game launched in 2020 and is available as a free (and free of advertising) download for both Android<sup>1</sup> and iOS<sup>2</sup> platforms. While it is intended to be experienced in the museum’s historical fort, its random mode allows it to be played in an open area anywhere in the world, such as a park. User trials were scheduled for summer 2020, but were postponed due to the Covid-19 pandemic. While lockdowns in Denmark were lifted towards the end of 2021, winter weather conditions in Denmark combined with the exposed location of the historical fort has prevented user trials from taking place until the early summer of 2022.

The development of the game was an ongoing dialectical process between the characteristics of the Haunted Planet Studios’ “Longship” game engine and an analytical investigation of the historical content presented in the game. The existing game engine had an inherent ghostly aesthetic character [11], which came to determine the overall idea of the game from the beginning. However, the outcome of the historical research and insight that the game should convey spurred a new development of the game mechanics so it could reflect and enhance the rather complicated results of the museum’s historical research. In this way both the development of the game and the historical research went in new and unforeseen directions. Specifically, the following features were added to the game engine as a direct result of historical research:

1. The double-encounter structure was added to support the poppy dialectic. We consider the double encounters are feature that could be generally useful for locative cultural experiences that deal with complex historical material, specifically material that require two complementary perspectives to be presented as part of the same experience.
2. The ability to show the AR camera in monochrome was added to the game engine’s Ghostviewer in order to give an aesthetic that resonates more with the time of WWI than conventional colour AR views used in nearly all smartphone-based AR, including the earlier version of the Longship engine [11]. The resulting player photos are aesthetically pleasing, and highly representational to the extent that they frequently resemble real historical photos from the time of WWI. The intention is that this will encourage reflection that relates the past to the present.

<sup>1</sup> <https://play.google.com/store/apps/details?id=com.hauntedplanet.branded.mosedefort>.

<sup>2</sup> <https://apps.apple.com/ie/app/kampen-om-maden/id1533193718>.

3. The ability to upload the player photos to an online version of Casebook with additional information about the historical aspects was added to support player reflection.

The user trial will be an important next step to examine whether the complex structure and content of the game achieves its intended purpose. In the trial we will measure the level of engagement and reflection that players experience while playing the game and attempt to establish the extent to which the complex historical material that we have tried to capture in the game format is understood by and reflected upon by the players.

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