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### ► To cite this version:

Vanessa Cesário, Rui Trindade, Sandra Olim, Valentina Nisi. Memories of Carvalhal's Palace: Haunted Encounters, a Museum Experience to Engage Teenagers. 17th IFIP Conference on Human-Computer Interaction (INTERACT), Sep 2019, Paphos, Cyprus. pp.554-557, 10.1007/978-3-030-29390-1\_36 . hal-02877669

**HAL Id: hal-02877669**

**<https://inria.hal.science/hal-02877669v1>**

Submitted on 22 Jun 2020

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# Memories of Carvalho's Palace: Haunted Encounters, a Museum Experience to Engage Teenagers

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**Abstract.** While museums are making great efforts in updating their communication and engagement strategies to include a wide variety of publics, teenagers (15-19) are still identified as an audience group that is often excluded from a museum's curatorial strategies. As consequence, this audience appears to be generally disinterested in what museums might offer. Our installation, deployed at the Natural History Museum of Funchal (NHMF), in Portugal, makes use of mobile interactive technologies and gaming strategies to promote more engaging museum experiences for teenage visitors. *Memories of Carvalho's Palace: Haunted Encounters* is a location-based game that prompts teenagers to uncover the science in the museum, through investigating the site, which is presented as haunted. In order to complete the quest, the audience needs to find and collect scientific information about specific exhibits while interacting with their Augmented Reality (AR) three-dimensional (3D) models. The audience's interactions with the museum exhibits are rewarded with pieces of a map, which when completed, will guide them to the hidden scientific library where they can finally unlock the mysteries they have been trying to solve.

**Keywords:** Museums, Teenagers, Gaming, Augmented Reality, 3D Models

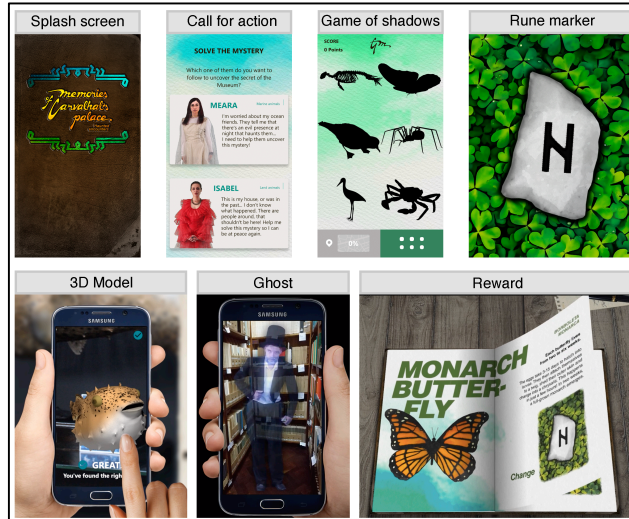
## 1 Teenagers and Museums

Museums are slowly moving away from being places where exhibits are collected and displayed to a general public, by becoming centers where people can actively engage in active discoveries and personalized challenges [1]. Thanks to the huge uptake of interactive and mobile technologies, audiences are turning from passive to active participants. Museums adapt to this change by giving their public the opportunity to interact with the exhibits, although many remain behind glass shelves [2]. Augmented Reality (AR) three-dimensional (3D) representations of exhibits are promising technologies to be employed to expand the physical context of the exhibit and museum space by providing virtual and location-specific information [3]. Moreover, location-based AR games are valuable when applied to cultural heritage as a way to display historical

content and context [4]. According to Falk [5], the so-called “one size fits all experiences” does not apply to the museum visitors. In particular, the “digital natives” generation’s (15-19 years old) beliefs and behaviours are recognised as being quite different from previous generations [6]. While museums often offer guided tours tailored for children and/or adults, very little is designed for the “digital natives” and teens’ generation in general [7].

## 2 Features on Enjoyable Museum Experiences for Teenagers

According to formal studies about teenage preferences regarding museum engagement, Cesário et al. [8, 9] identified that teenage audiences particularly appreciate mobile experiences that include 1) Gaming and storytelling aspects, 2) Interaction elements, 3) Social media connections, and 4) Museum and exhibits relevant information. To contribute in filling in the gap regarding teenage engagement in museums, we designed the *Memories of Carvalho’s Palace* dual experience, geared towards better understanding teenagers’ preferences and needs in museum contexts. Based on the same museum premises and exhibits, the authors designed a storyfied game (*Haunted Encounters*) and gamified story (*Turning Point*), making use of the same characters and similar content, but different engagement strategies. The two experiences are currently being studied and compared in order to understand teenage preferences. The scope of this demonstration submission is to describe the *Haunted Encounters* game experience in detail.



**Figure 1.** In this collage, from left to right, the image lists: 1) The opening splash screen of the game; 2) A screenshot of the two main characters and the call for action; 3) A screenshot of the shadows’ interface of the game; 4) A Rune shaped marker used to unlock the 3D models; 5) A 3D model of the Blowfish displayed as Augmented Reality; 6) The ghost from Meara’s storyline; 7) Details of the digital book reward.

### 3 Mobile Experience and Its Game Mechanics

The *Memories of Carvalhal's Palace: Haunted Encounters* is a location-specific non-linear game deployed at the Natural History Museum of Funchal (NHMF) in Madeira, Portugal. The museum was once the residence of a noble Madeiran family, and now, according to the game backstory, some obscure forces are at play, disturbing the museum spaces. In this section, we describe the gameplay and mechanics of *Haunted Encounters*.

*Call for action.* Upon launching the app (Fig. 1), two fictional characters – Meara and Isabel – ask the user for help (Fig. 1). Depending on which character the players choose to help, two different museum tours and game endings are delivered. Meara leads the player to explore the marine species collection of the museum, while Isabel leads them to get to know the terrestrial fauna.

*Game of shadows.* To uncover the truth about the haunting of the museum the players need to interact with the species in display on the glass shelves. The players engage in a game of shadows (Fig. 1), where they have to match museum exhibits with the silhouettes proposed by the application screen, one at the time.

*Markers and augmented reality exhibits.* Since not all the species in display are part of the game, special markers, designed in the shape of Runes (ancient Nordic divining alphabet) contradistinguish the species that are part of the game. When the users find the animal that they recon corresponds to the shadow displayed on the app, they can capture the Rune shaped marker (Fig. 1).

*AR 3D models – freeing species from the glass shelves.* By identifying the correct species from its shadow, the players unlock a corresponding AR 3D model (Fig. 1), which they can explore in detail by manipulating the 3D model on the mobile screen. They can rotate the model in all directions, complementing the knowledge and the experience gained from observing the exemplar in the glass shelves.

*Quiz.* After capturing the marker and the corresponding AR 3D model, the app requests the audience to answer a quiz related to the animal in the shelves. This is a question which requires the user to look closely at the exhibited species, as the question is related to an aspect of its physical details. After answering the question, correct or incorrectly, the audience is presented with a text reporting on several scientific facts about the animal.

*The puzzle and the treasure hunt mechanism.* For every completed interaction, from finding the silhouette corresponding animal, to receiving the scientific information, the audience is rewarded with a piece of a puzzle, representing a map. Once completed, the map will guide the players to a hidden location, the scientific library of the museum. In the library, the audience is asked to look for a small chest, containing the answer to their search for the truth. The chest can be found among the scientific publications of the library. Opening the chest reveals a final Rune (marker), which will present them with one of the two potentially different endings, depending which character they decided to help at the beginning. One character will lead the audience to discover a ghost (Fig. 1), who has been haunting the museum for almost a century while the other will menace the players herself with a malignant turn of events.



*The reward, a token for later reflection.* In the end, regardless of whom they have been helping, all players receive a reward for finishing their quest. They can take a selfie photograph with the specific ghost or malignant spirit they encountered, which will be emailed to them along with their game score. Moreover, they will receive a book (in a printable PDF format) containing pictures and scientific facts of the animals they engaged with during the tour (Fig. 1). The book also contains the Rune markers which can be recaptured at any time to release the AR 3D models of the species.

## 4 Conclusions

Through this teenage targeted mobile game deployed at the Natural History Museum of Funchal (Madeira, Portugal), the audience is called to solve a mystery by looking for and interacting with the museum exhibits, collecting Augmented Reality three-dimensional models of the species in display while gaining scientific knowledge about such species. The next phase of our work involves extensively testing this prototype inside the museum's premises in order to validate its game mechanics, and comparing results with its sister story-driven experience, *Turning Point*. The results from these studies will help us understand and facilitate the design of engaging interactive museum experiences for the understudied museum's teenage audiences. **Acknowledgments:** ARDITI, project number M14-20-09-5369-FSE-000001.

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