

2.2.3 Cultural Heritage

Introduction for this section: Nguyen et al., 2019, Bec et al., 2019, (Chung et al., 2018), (Noh et al., 2009)

Museum

- The museum *The petite Gallery*¹⁹ offers 360° views and the rooms can be changed by mouse clicks on an icon or they can be selected in a bar, showing the preview of the room. Additional information to exhibited pieces are shown by clicking on the questionmark icon.
- *museoTorino*²⁰ (Minucciani and Garnero, 2013) shows a map with marked locations in the surrounding of Turin. These locations can be filtered by different categories. For example: Culture or Architecture. When clicking on a location an image and a short description is shown. The information can be about places, people, events or itineraries. The website allows the user to choose a specific year. After selecting a year the map shows only locations, which were available at this time. It is also possible to move across the contemporary city, as Google Maps is integrated.
- The *Archaeological Museum of Thebes*²¹ provides beside 360° tours, online games (especially for children) 3D models and videos of exhibition items.
- (Kiourexidou and Sciences, 2019) presents a digital multimedia museum of Anatomy.

Sights

- *Archeoguide* shows the visitor, depending on their position, reconstructions of ruined cultural heritage, using AR, while they are standing in front of the ruin in Olympia. The visitor is also able to watch the historic Greeks, who are animated with high realism and historical accuracy, competing in ancient Olympic games. (Augmented Reality, 3D reconstructions of monuments and artifacts). While the user has contact to the natural surrounding he can listen to an audio commentary. (Vlahakis et al., 2001).
- (Chalmers, 2008): describes how the cultural heritage (Stecak, destroyed Sarajevo City Hall) in Bosnia and Herzegovina, that is damaged or does no longer exist were reconstructed with methods like 3D scanning. The

¹⁹<https://petitegalerie.louvre.fr/visite-virtuelle/saison5/>

²⁰<http://www.museotorino.it/resources/navigator/index.html>

²¹<https://www.mthv.gr/en/virtual-museum>

developed applicatin contains panoramic photos, video walkthroughs, stories and interactive 3D models. Additionally, animated avatars are telling stories about Bosnian tradition and history.

- (Voinea and Girbacia, 2019): Digital Data, Virtual Tours, and 3D Models Integration Using an Open-Source Platform The Balsignano village ²² is shown with 360° and 3D models.
- Anne Frank house: ²³ The user can chose to move in a 360° view (Similar to Zugspitze 360, only without audio) or watch the Google Arts and Culture presentation (Includes only photos with text information)
- Louvre ²⁴ In order to visit a place, the user has to select predefined observation points in an interactive 2D map
- Machu Picchu ²⁵ 360° view, with speaking guid or same information in text. Possible to open related pictures and youtube videos for current location.
- Youtube play list ²⁶ offering reports and talks from famous people. But there is no 360° view or interaction in video possible
- Colosseum²⁷ Uses 360° street view to inspect the colosseum

Virtual Tour creator

- (Gomes et al., 2011) presents the Virtual Exhibition Builder, an interactive software tool aimed at the creation of virtual exhibitions, given a 3D model of the physical environment of the museum described in an X3D file, and information about the artworks. The development of this tool involves inputs proposed by museum experts.

Virtual Guide

- (Hammady et al., 2020) presents an museum guidance system called *Museum-Eye* to enhance customer experience and reduce number of human tour guides. The application uses the Microsoft HoloLens HMD and mixed reality to project interactive images, 3D antiques, sound effects and characters from acient times

²²<http://www.casaledibalsignano.it/index.php/tour-virtuali>

²³<https://www.annefrank.org/en/museum/web-and-digital/frank-family-home-360-degrees/>

²⁴<https://www.louvre.fr/en/visites-en-ligne>

²⁵<https://www.youvisit.com/tour/machupicchu>

²⁶<https://www.youtube.com/user/louvre>

²⁷https://www.google.com/maps/@41.8901932,12.4926913,3a,75y,319.01h,78.68t/data=!3m6!1e1!3m4!1saMGFKIHZPiNSg-qo1_yIYg!2e0!7i13312!8i6656?hl=en

in the museum. The user can interact and move the projected objects. 3D representations of historical scenery is shown and historical content is narrated, animated and performed by the virtual guide avatar King Tutankhamun, who directs users with hand gestures. For deaf people subtitles can be shown.

Interaction by hand gestures such as air tapping is possible in several ways: moving between scenes, revealing item's images, revealing item's script text, using the User Interface (UI) navigation buttons, and spinning or rotating the virtual replica of the item. Interactions can boost the level of engagement with visitors. As long as the user keeps interacting with the system, it means the information continues to feed into the user.

Interactive game for discovering further information about specific antiques are provided. Collaborative experience, which means all interactions are accessible to covisitors using the same network connection. This function encourages social interaction and opens prospects for open discussion between visitors. Interact with an Antique virtual replica The MuseumEye system augments immersive audible storytelling and narrative progression with detailed visualisations inside specific museum rooms. The system positions the visitors in the middle of the story of the pharaohs and engages people with two-ways of interactions.

- (Dattolo and Luccio, 2008) multi-agent adaptive system to support tours of virtual museums. The system stores users' personalized views in zz-structures, particular data structures capable of representing both hypertext information and contextual interconnections among different information. They present an extension of the standard zz-structure model in terms of computational agents. These agents co- operate and collaborate in order to help users visualizing their personalized views. The

Virtual Tour

- (Argyriou et al., 2020) Virtual Tour immersive interactive virtual tour at the historical centre of the city of Rethymno in Crete, Greece. (360°) immersive video applications for HeadMounted Display (HMD) devices offer great potential in providing engaging forms of experiential media solutions especially in Cultural Heritage education. A gamified design is used to enhance the user with the historical tour

Study

- (Park et al., 2018) examined the effects of a video- based virtual tour, applied via film-induced tourism, on post-VR attitude and behavioral visit intention to a cultural heritage site, compared with those of a basic virtual tour.
- (Voinea and Girbacia, 2019): Paper DinofelisAR Users' Perspective About a Mobile AR Application in Cultural Heritage Study about a cultural heritage application *the Roman Ruins of Conimbriga*, evaluating the user's perspective regarding to personal satisfaction,including cultural enrichment acquired, ease of use and their intention to use it. The application projects the *Roman Forum* on the smartphone, when the user reached the position, where the forum was built.
- (Voinea and Girbacia, 2019):From Exploration of Virtual Replica to Cultural Immersion Through Natural Gestures As natural gestures play an important role for engaging users in experiencing the cultural dimension of a given environment, different configurations and controls were developed and then evaluated by a userstudy.

Paper pointing to further interesting literature

- (Voinea and Girbacia, 2019)
- (Jung et al., 2016): Dublin AR (Han et al., 2013), AR at Deoksugung palace in South Korea (Lee, Chung, Koo, 2015) or Manchester Art Gallery (Leue, Jung, tom Dieck, 2015) show.
- (Chung et al., 2018)
- (Guttentag, 2010)
- (Noh et al., 2009) This paper will present an overview on augmented reality in Virtual Heritage system and also consists with the explanation of techniques to reconstruct the historical sites.
- (Voinea and Girbacia, 2019): Exploring Cultural Heritage Using Augmented Reality Through Google's Project Tango and ARCore