UNIVERSITY OF MALTA
International Institute
for Baroque Studies

COSCH
COLOR & SPACE IN
CULTURAL HERITAGE

WHITE BASTION

4D virtual presentation
GUIDE TO GOOD PRACTICE

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The object

- The fortification known as „White Bastion“ is one of the most impressive and important historical sites in Sarajevo
- Excavated remains from medieval, Ottoman and Austrian-Hungarian period
- GOAL of the CS: to present the historical development of the fortress through an interactive virtual cultural heritage application with storytelling

Cultural heritage (research) questions addressed?

- interactive or linear storytelling?
- Unity or WEB GL?
- stories with characters or documentary stories?
- edutainment value
- overall user satisfaction
- archaeological research questions

Recording technique(s)/method(s) used and why?

- laser scanning of object's remains
  - planned but not implemented due to financial constraints
- 3D modeling for 6 appearances of the fortress in different time periods
- structure from motion (SFM) photogrammetry for digitization of archaeological findings (Athena RC, Greece)
- in our case the process was not limited to recording, we had to visualize appearances which do not exist in reality

Use of technology

- Acquisition
  - data from archaeological excavations (blueprints, findings from the site for photogrammetry)
- Processing
  - photogrammetry
  - 3D modeling
  - rendering
  - web implementation

Constraints (for measurements, processing, realization of work)

  - rendering time
  - different formats conversion
  - online file sizes

How did the data of the recording technique(s)/method(s) support the cultural heritage tasks?

- relevant (characteristics of) content, which is inevitable to answer CH question
- identified factors having impact on the content
- measures to be taken helping to assure required content

- our goal was visualization of CH object, not its recording
- generated content was intended to
  - create immersion of users in the past of White Bastion
  - educate the users about historical context of the object
  - rekindle users' interest in CH
  - support assumptions of archaeologists about development of the object through history

What are the limitations and sources of error?

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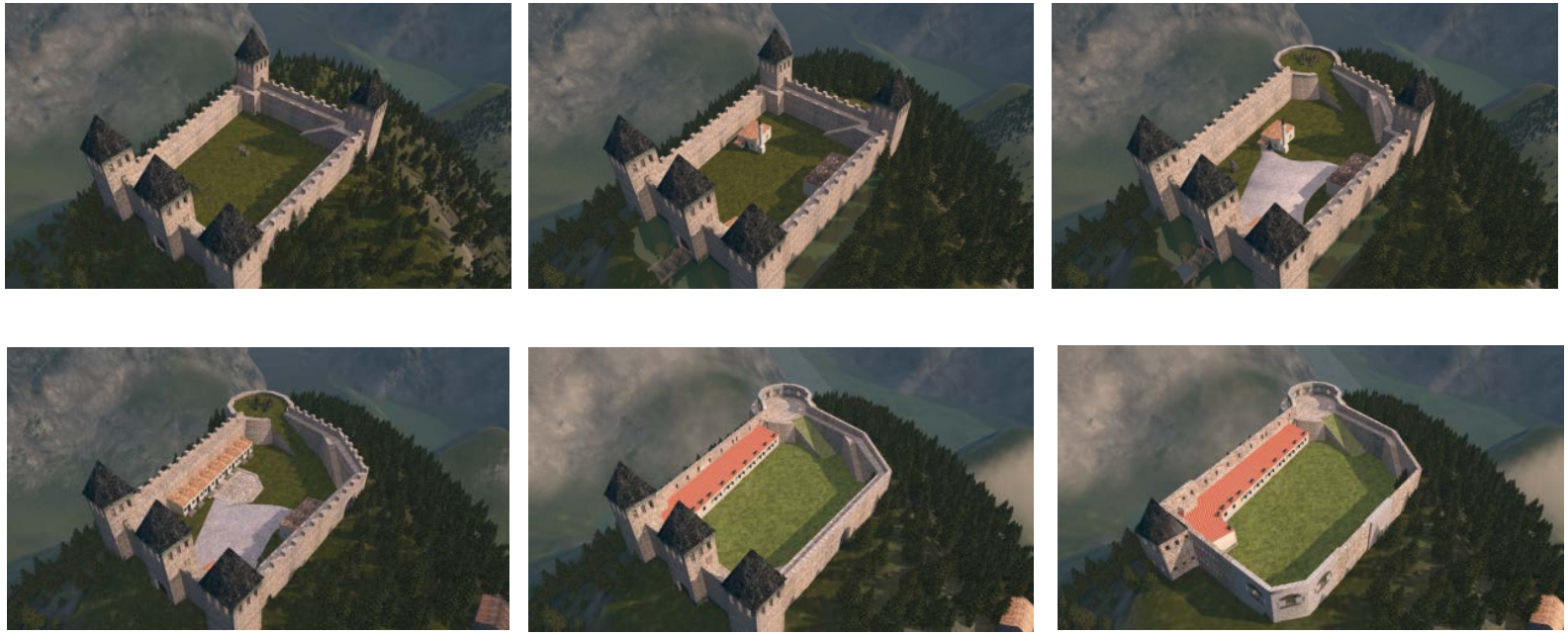
- visualized CH objects are intended for presentation purposes
- precision is not an important issue in this area
- the whole reconstruction is based on assumptions of archaeologists and analogies with similar objects



What are the benefits of the recording technique(s)/method(s)/data in comparison to traditional methods?

- benefits of interactive over linear digital storytelling:
  - shorter durations of stories save users' time
  - users can come back many times to explore different stories and virtual environments
  - interaction increases user immersion
  - characters from digital stories emotionally engage the users creating empathy
  - computer animation recreates parts of the fortress which do not exist in reality
  - storytelling introduces the users with history of the object, events and characters from its past

Which COSCH Primary Tasks (PT) and sub-tasks (st) are addressed (see COSCH MoU)?

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- PT6: Development of recommendations for solution providers as well as end users. These recommendations would facilitate a deeper integration of optical technology into CH applications through an improved correlation between optical means and requirements

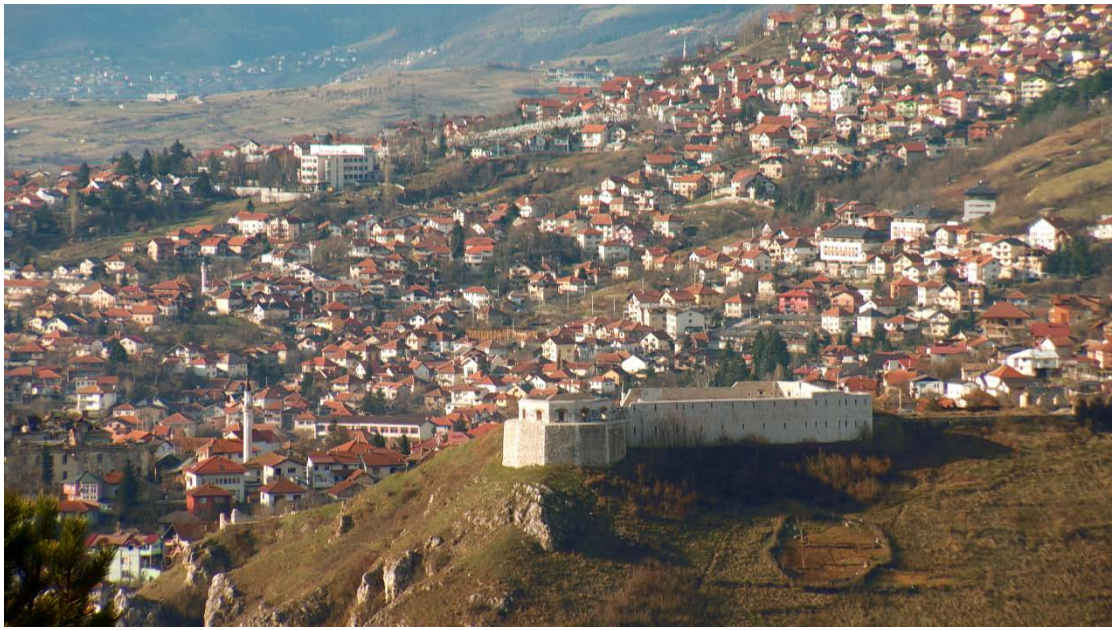
- Task st5.1 Identification, planning, implementation and testing of typical applications of visualization within CH domains
- Task st5.2 Further development of visualization techniques

Guide to good practice
- structure -

- objectives
- CH visualization basics
- Interactive digital storytelling (IDS) principles, examples and methods
- White Bastion application
  - goals
  - IDS methodology
  - workflow
  - user evaluation
- experiences and recommendations

Guide to good practice
- objectives -

- White bastion case study aims to present the historical development of this cultural heritage object using virtual reality and interactive digital storytelling, in order to support archaeological research of the site and raise awareness of general public

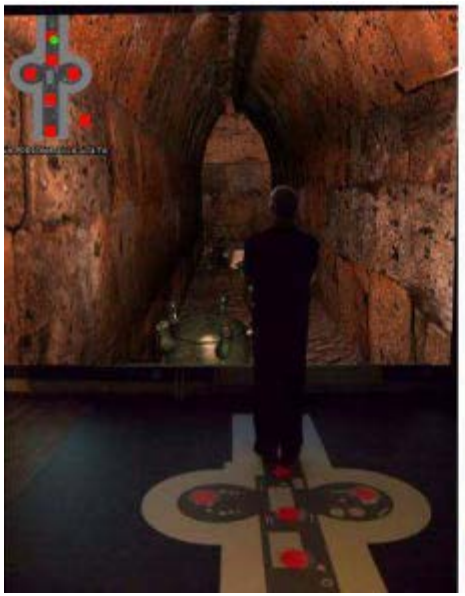


Guide to good practice
- CH visualization -

- age of interactive communications changes the expectations of people
- digital technologies penetrated in every aspect of human life, introducing a new language and ways of conveying information
- cultural heritage does not remain in museums any more
- seeks to be communicated to the people using the state-of-the-art communication methods and tools
- CH visualization can recreate objects which do not exist any more or exist only in fragments or remains
- one of the most successful CH visualization methods is interactive digital storytelling

Guide to good practice
- Interactive digital storytelling -

- interactive 3D models of cultural monuments interconnected with digital stories about their past
- online applications, museum setups, onsite installations



PIETRONI E., PAGANO A., RUFA C.: The Etruscanning project: Gesture-based interaction and user experience in the virtual reconstruction of the Regolini-Galassi tomb. Digital Heritage International Congress 2013 2 (2013), pp 653–660

Guide to good practice
- Interactive digital storytelling (IDS) -

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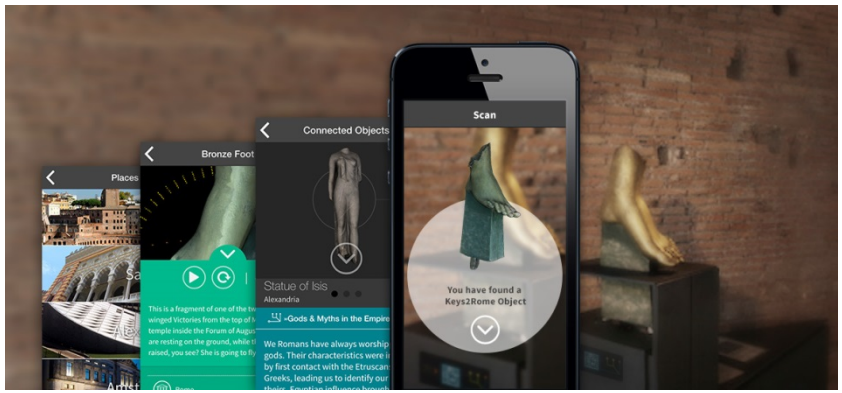


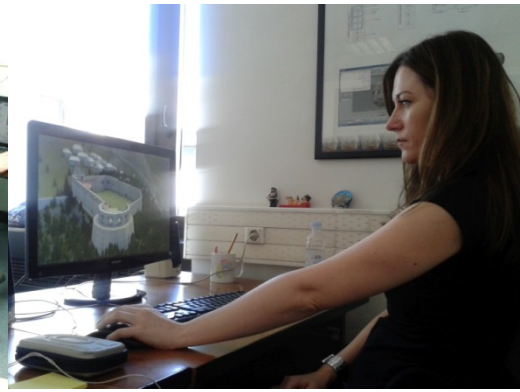
PESCARIN S., D'ANNIBALE E., FANINI B., VIGLIAROLO P.: Keys to Rome. Roman culture, virtual museums. CNR ITABC. 2014

Guide to good practice
- White Bastion application -

- 4D Virtual presentation of White Bastion is created with aim to introduce the past of this valuable cultural monument to the general public through visualization of its assumed appearances through history
- Archaeologists and historians will use this project as foundation for their further research
- The project was created by a multidisciplinary team of computer scientists, historians, archaeologists, writers, music composers, actors, translators, graphics designers, visual artists and TV professionals.



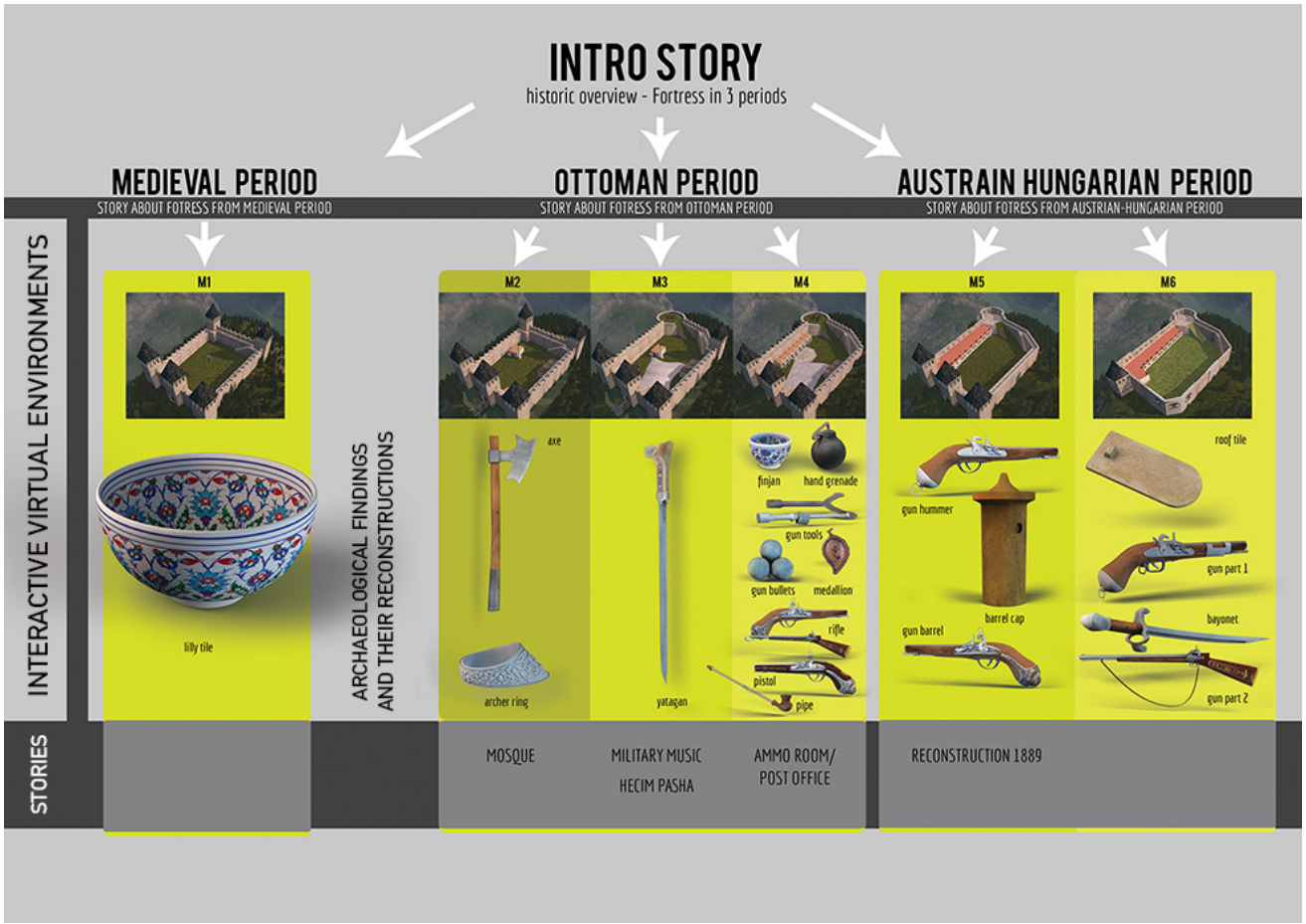




Guide to good practice
- White Bastion application - IDS

- interactive virtual environments interlinked with stories into common hyper-structure
- story is divided into story units, or sub-stories
- users can watch them on demand, after they are introduced with all content elements in an intro story
- intro story presents an overview of the object's history, while stories about medieval, Ottoman and Austro-Hungarian period give more details on the object's transformation during these historic periods.
- 6 interactive models of different phases of the fortress as well contain digital stories
- digitized artifacts and their virtual reconstructions are inside interactive virtual environments

Guide to good practice
- White Bastion application - structure



Guide to good practice
- White Bastion application - workflow

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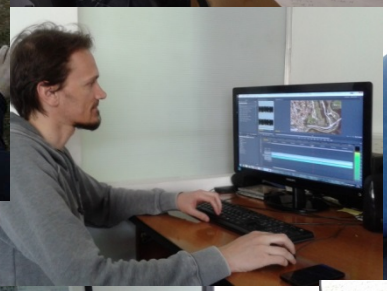
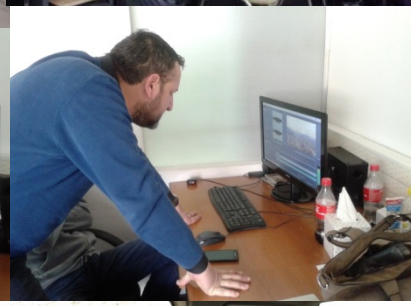
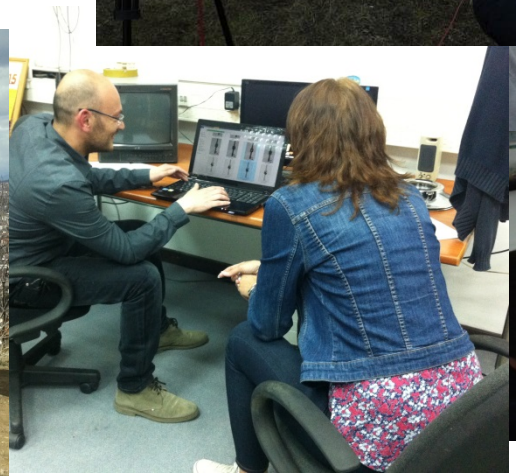
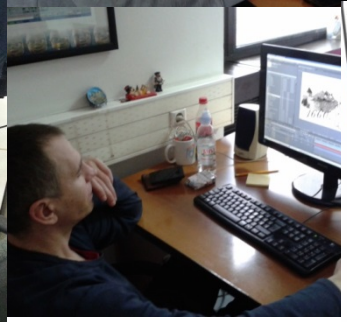
1. Project design and data collection
2. 3D modelling
3. Digitization and reconstruction of archaeological findings
4. Digital stories production
5. Web implementation




Guide to good practice
- White Bastion application – user evaluation

- to **evaluate the success of the new IDS method** implemented in White Bastion project we conducted the user evaluation survey

Design of user evaluation survey

- user evaluation covers the following topics
  - user personal data (to identify the target group where the user belongs)
  - information perception
  - interactive digital storytelling
  - interactive 3D models
  - overall user satisfaction

Guide to good practice
- White Bastion application – user evaluation

Experiment design

- qualitative user experience methodology
- 12 users, 8 from Bosnia and Herzegovina and 4 non Bosnians
- three of them were under 25, seven between 26 and 50 and two over 50 years old
- one reported poor computer literacy, six medium one and 5 declared themselves as expert computer users
- six of them sometimes play computer games, four of them do not and two are gamers
- seven users visit museums occasionally and 5 are regular museum visitors

The users were requested to visit the web site of the project, explore its content and, upon completion, fill out an online survey questionnaire

Guide to good practice
- White Bastion application – user evaluation

Results

In this user study we established the following hypotheses:

- H1: Users learn about cultural heritage objects from virtual cultural heritage presentations
- H2: Through interactive virtual cultural heritage presentations users feel immersion in the past
- H3: Users prefer interactive cultural heritage presentations over documentary movies

Guide to good practice
- White Bastion application – user evaluation

Results

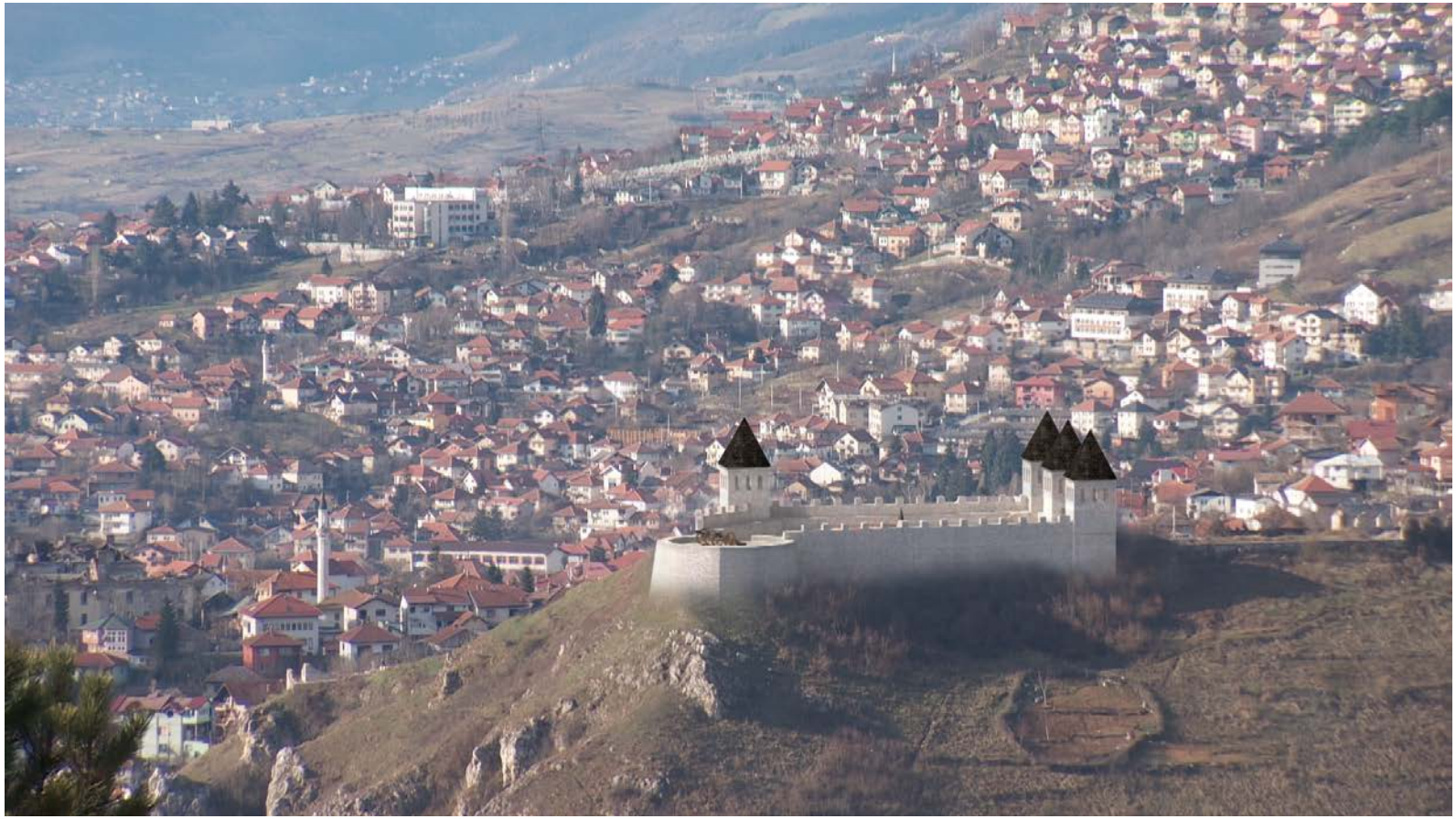
- Majority of both Bosnian (62,5%) and non-Bosnian users (100%) answered correctly the questions about topics mentioned in the stories. From these results we can conclude that our **hypothesis H1 has been proven**.
- Eleven out of 12 users reported they had a feeling of immersion in the past, which **confirms our hypothesis H2**.
- Ten out of 12 users prefer interactive virtual cultural heritage presentation over a sequential presentation in form of a documentary movie, which **confirms our hypothesis H3**.

Guide to good practice
- White Bastion application – user evaluation

User comments

- Most of the users reported to feel more engaged and pay more attention in interactive presentations
- They appreciated the possibility to explore the IVEs which they could not do in a movie
- They like the combination of digital stories and models because "models are described by stories and can display the information from stories"
- Two users noted that in this kind of presentation information is scattered and they are not sure if they missed something
- They prefer to be offered an already tailored story then to tailor it themselves through interaction

Movie



Guide to good practice
- Recommendations -

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- IDS applications are a very powerful tool for cultural heritage presentation
- digital stories should be interactive
- information in the stories should be conveyed by the virtual characters
- navigation in virtual environments should be suitable for all user target groups (not only gamers)
- projects should be implemented by interdisciplinary teams of professionals
- web implementation should be HTML5 portable
- same or modified digital content should be displayed online, in museums and onsite

Future work

- Enhancing our IDS method taking in consideration users' comments
- Involving psychologists, graphic designers, screenwriters, interaction designers, game developers, visual artists
- H2020 CULT-COOP-08-2016 call: Virtual museums and social platform on European digital heritage, memory, identity and cultural interaction
- Horizon 2020 project **i-MARECULTURE** - Advanced VR, iMmersive serious games and Augmented REality as tools to raise awareness and access to European underwater CULTURal heritagE

iMARE Culture

THANK YOU!!

http://h.etf.unsa.ba/bijelatabija/