

Design and development of VR games for Cultural Heritage using Immersive Storytelling

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Abstract

In this tutorial we introduce the whole process of creating, designing and developing a serious VR game for cultural heritage using the concept of immersive storytelling. The use of serious games in education is allowing us to offer a different approach to learning. However, designing an application with gameplay parts as well as educational components in specific area such as cultural heritage can be challenging and different to many other methodologies in the creation of similar applications. The goal of the tutorial is to show different aspects of serious game creation and usage of our immersive storytelling methodology called hyper storytelling to help with the educational elements of the game. We will go through the creation of a story for the game; the creation of scenarios for the educational gameplay part; the filming of actors on green screen and filming of 360 videos; compositing of VR videos with actors and ambisonic sound; the creation of photogrammetry items; combining educational parts with gameplay and creating connection between them; application development and finalization of the product. At the end, we will showcase our example of the game.

CCS Concepts

• **Human-centered computing** → **Virtual reality**;

1. Presenters Information

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1.1. About authors

Dr. Selma Rizvic is a Professor of Computer Graphics at the Faculty of Electrical Engineering, University of Sarajevo and president of DIGI.BA. At the University of Sarajevo she founded in 2004 the Laboratory for Computer Graphics - Sarajevo Graphics Group, that she is leading. The unique expertise of SGG in interactive digital storytelling embedded in a number of virtual archaeology projects brought its members invitations in major EU consortiums. From 2011-2015 she was Coordinator for the University of Sarajevo as Partner, in the FP7NoE Virtual Museum Transnational Network V-MusT.net and in H2020 iMARECULTURE.

Presently she is coordinating the EACEA Creative Europe SHE-LeadersVR nad StecakLand projects, and implementing several smaller local and regional projects.

Selma Rizvic is a Steering Committee member of the EUROGRAPHICS Workgroup on Graphics and Cultural Heritage. She is included as an expert in future digital-based research and innovation activities on ICT and Cultural Heritage in the framework of the next work programs of the European Commission. In the last 10 years, she produced and coordinated several VR projects, as well as the first BH VR movie Nine Dissidents. She established the Sarajevo Charter for interactive digital storytelling (<http://h.etf.unsa.ba/sarajevocharter/>).

Bojan Mijatovic is a lecturer and senior teaching assistant at the Faculty of Game Design and Development and Sarajevo Film Academy, Sarajevo School of Science and Technology. He is doing PhD in Virtual Reality on University of Maribor, Faculty of Electrical Engineering - Media Communications. He is involved with SSST through Sarajevo Film Academy from 2013 where he first worked as Lab coordinator and Teaching assistant afterwards. Working with DIGI.BA he contributed to numerous projects on which he worked in different roles from Production assistant, cinematographer, sound recordist and equipment coordinator, and now director of applications.

2. Keywords

- Virtual Reality - Serious Games - Immersive Storytelling - Cultural Heritage

3. Tutorial Length

We propose a half day tutorial; 2x90 minutes with one break

4. Outline

The tutorial will introduce the participants to the design and development of VR games for cultural heritage using Immersive Storytelling, from the story creation, VR video recording and editing, immersive storytelling, green screen filming, to the design and development of VR application. These are proposed topics with time allocated for each part of the tutorial:

- Immersive storytelling (40 minutes) ([ROB20], [SRC*20], [RBM23], [SBR*23], [RBM*22])
 - Brainstorming the idea
 - Collecting historical material
 - Creating a story
 - Turning the story into scenario
- VR video (20 minutes) ([RBB*19], [BSEW16], [Moo17], [PGPF17])
 - What is 360 degree video
 - How can we use it in serious games
 - How do actors fit in?
- Green screen filming (10 minutes) [Fos14]
 - Basics of green screen filming
 - Light setup and costumes
- Photogrammetry in cultural heritage (20 minutes) ([BLB*19], [McC14])
 - Basics of photogrammetry
 - Using cultural heritage artefacts in the game
- **COFFE BREAK**
- CASE STUDY - SHELeadersVR project (90 minutes)

In the second part of the workshop, we will showcase our project SHELeadersVR. In this example, we will go through the whole pipeline of a serious game production. It will be divided into a few subsections as follows:

- Scenario and application structure (10 minutes)
- Concept art (10 minutes)
- Assets creation (20 minutes)
- App development (20 minutes)
- 360 video cinematics (10 minutes)
- NPCs and CRITS (10 minutes)

- Q/A (10 minutes)

Useful materials for this part

(<https://drive.google.com/drive/folders/1CZM07JPkVEyM0vCHkw1EbKX01hiki82V>,

<https://docs.google.com/document/d/1Gek6A0GEpkzIRlyXZCD2iKkI8R9isbE4/edit>)

5. Tutorial Requirements

To follow this tutorial it is recommended to have the following skills:

- 3D modelling basic concepts and understanding
- familiarity with VR games development
- basic skills in Unity programming

6. Similar tutorials

Although no tutorial in immersive storytelling was found, some related topics were covered in previous tutorials.

Eurographic 2016 - Tutorial: 3D Characters for Virtual Reality [ORL16]

This tutorial explains how to create a 3D avatar that looks like a specific person. The authors explain the different stages of a traditional character animation pipeline: modelling, rigging and animation. The key part of the tutorial is their description of how each of those stages binds together and which are the challenges developers face today at each stage.

Eurographic 2017 - Tutorial: Introduction to Crowd Simulation [PP17]

This tutorial talks about crowd simulation. Many simulation algorithms were proposed to simulate crowds. How do they work? How are they concretely used in the field? This tutorial is created for beginners and presents the basics of crowd simulation. It also addresses some related questions such as the one of animation and rendering of crowd characters.

Eurographic 2021: Visualization and Graphics in Mixed Reality [KMT21]

This tutorial presents the challenges and unique aspects of mixed reality visualization applications such as the organization of data for visualization, real-world data sources for visualization, real-time photo-realistic rendering techniques, diminished reality rendering techniques and cognitive and perceptual issues. It was designed to be open both for academia and industry and can be used by a diverse audience consisting of students, researchers and developers who have a basic understanding of computer graphics and computer vision.

Eurographic 2022: Safeguarding our Dance Cultural Heritage [ACC*22]

In this tutorial, the authors show how the European Project, SCHEDAR, exploited emerging technologies to digitize, analyze, and holistically document intangible heritage creations, which are a critical necessity for the preservation of cultural heritage.

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