Creating the Virtual Exhibition “They Shared their Destiny. The Women and the Cossack’s Tragedy in Lienz 1945” with FOSS

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Abstract: On the 75th anniversary of the Cossack tragedy in Lienz (province of Tyrol, Austria), an exhibition focusing on the fate of the Cossack women was planned to be hosted in the local Dolomite Bank. The role and destiny of women during the Cossack tragedy has remained untold until now, in contrast to the men’s viewpoint. The exhibition wants to tell the stories of different women to enlighten their fate. However, due to the strict regulations imposed by the Austrian government in the course of the Covid-19 crisis in spring 2020, it had to be realized in a virtual venue within short time. This report is structured the following way: After a brief introduction to the events that led to the Cossack’s tragedy, the article explains how the virtual exhibition was realized using exclusively open-source software and how the virtual exhibition now presents itself to visitors. For the 3D reconstruction of the exhibition room Blender was chosen. In order to make a virtual tour with the framework Marzipano, 360pictures were rendered from Blender. The final design and interactivity was then implemented in the three main script-languages for websites html, javascripts and css. Finally, a conclusion is drawn pointing out the advantages or disadvantages of the chosen methods.

Keywords: *VR—Virtual Exhibition—360° Pictures—Cossacks—Women’s perspective*

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Part 1: The Events that led to the Cossack’s Tragedy and the Exhibition

Historical Background

Over the centuries, the Cossacks turned from outlaws, pirates and robbers into loyal servants of the Tsars and played a central role in the process of expansion of the Russian Empire. During the Russian Civil War Cossacks fought on both sides (the communistic “Red Army” and the diverse groups besides the “White Army”). After its end, thousands emigrated amongst other countries to Yugoslavia, France and Germany while maintaining their Cossack identity. During World War II, some Cossacks and Caucasians volunteered to fight with the Germans against the Soviet Union for various reasons.

With the withdrawal of the Germans many Cossacks and Caucasians were forced to retreat with their families. Later, they fought in Yugoslavia and Italy, where the Germans promised them a new homeland. At the end of war, they feared being handed over to the Soviet Union, should they surrender to the Italian and Yugoslav partisans. Therefore, the Cossack and Caucasian troops together with their families marched north to the Drau valley in East Tyrol and Carinthia, where they lived – still in their units – as Surrendered Enemy Personnel of the British. About 25,000 Cossack and Caucasians arrived near Lienz.

Although the British administration promised they would be transferred to British Overseas Territories, the Cossack officers, soldiers and their families (about 22,500 people, including approximately 3,500 women and children) were handed over to the Soviet Troops. Around 4,100 were able to hide in the mountains and forests, and others decided to commit suicide. Some women jumped with their children into the river Drau, where they drowned, others gave their children to local families. The events became known as “the tragedy on the river Drau”. At least 1,350 Cossacks were recaptured. However, most of them were not handed over to the Soviet Union. They lived in a displaced persons camp in Lienz together with refugees mainly from Yugoslavia (Fig. 1a).

a *b*

Fig. 1. a) Everyday life at the Spittal displaced persons camp and b) Cossack women during her training as tailors, Spittal displaced persons camp (both © Joseph Plut, Toronto, Canada)

Exhibition Background

Until today, the Cossack’s tragedy of Lienz in 1945 has been and still is viewed primarily from the perspective of the men. Bold deeds, the magic of uniforms, medals, parades and other weapons as well as fateful comradeship were the focus of interest. The women in the retinue, who were not only of Cossack descent but came from many different countries, were left out. Many had joined the convoy in the hope of a better life in freedom. The exhibition tells the fates of these women, most of whom have remained behind the curtain of history (Fig. 1b).

The exhibition was scheduled to open on 1 June 2020 on the 75th anniversary of the Cossacks tragedy, but had to be re-planned as a virtual exhibition on short notice due to the restrictions during the Covid-19 crisis.

Part 2: The Creation of the Virtual Exhibition

The Virtual Reconstruction

After discussing several different possibilities for the realization, it was decided to virtually reconstruct the room of the Dolomite Bank, where the exhibition originally should have taken place, in order to provide the visitors with a genuine “feeling” of visiting the exhibition. Since it was not possible to visit the venue in person, the room was reconstructed in Blender (2019)[1] using a plan and a few photos (Fig. 2).

Fig. 2. Pictures and plan of the gallery of the Dolomites Bank (© Dolomitenbank, Lienz)

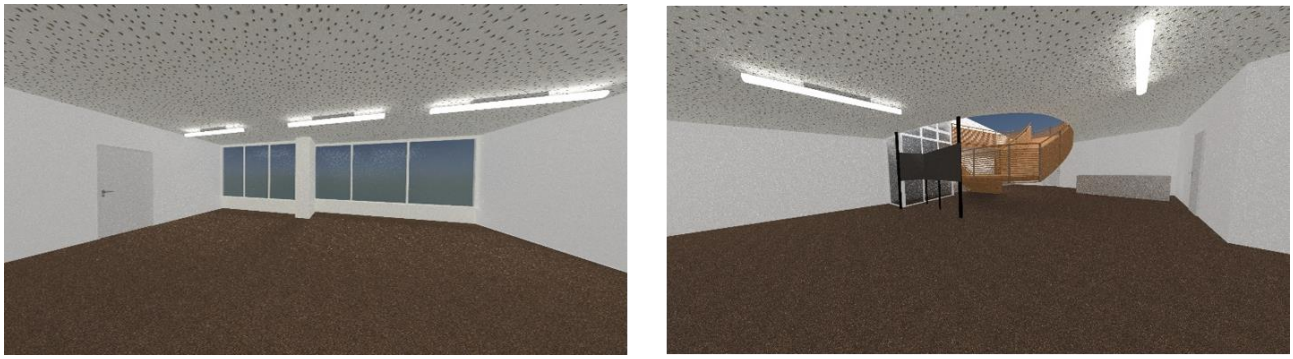

Fig. 3. Reconstructed Room in Blender (© Brigit Danthine)

Blender is an Open Source Software for modelling, texturing and animating 3D content. In the present case, the software was used to model the exhibition space as a 3D environment, to add architectural details such as the staircase or the showcases, as well as to create 3D models of finds like the ceremonial dagger and to add textures to everything. For specific architectural elements, such as the mentioned spiral staircase, the Archipack add-on (2018) was used. With this add-on for Blender it is possible to design and combine different architectural elements without having to model

[1] The older version 2.79 was used for the reconstruction, since a completely new GUI was introduced with version 2.8. However, this did not result in any functional disadvantage.

every detail by hand. For example, a door can be created without modelling the door, the door frame and the door handles.

While this characteristic curved staircase already made the room recognizable as a replica of the gallery of the Dolomite Bank, the textures of e.g. ceiling, floor, lamps and staircase were selected according to the real conditions and added further for better recognition (Fig. 3).

Only one change was made compared to the real conditions to aid the usability of the virtual tour. The actual gallery of the Dolomite Bank is entered behind the stairs. For the virtual exhibition this would have meant that visitors would either have to “click” their way around the stairs, or that the exhibition would have been torn apart (Fig. 4). Neither would have been conducive to the user experience. Therefore, it was decided that visitors would enter the exhibition area via the actual restroom door, in this case acting as the exterior door in the virtual exhibition. Due to the position of this door, the user can overlook the entire room immediately after entering. This solution gives visitors the feeling of entering the virtual exhibition from the outside, without complicated navigation or confusing distribution of content.

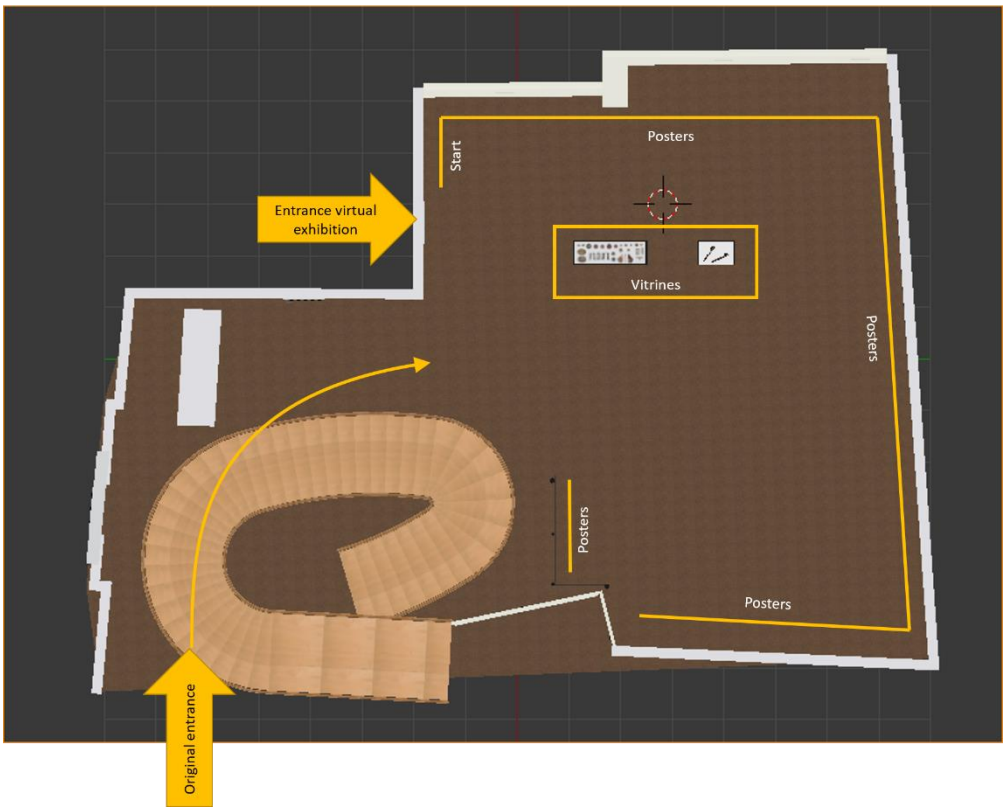

Fig. 4. Original entrance compared to virtual entry and visitor guidance (© Brigit Danthine)

In the reconstructed room, the posters of the exhibition were arranged along the walls according to their narrative sequence. Originally, it was planned that posters would also hang in the room along the picture rails in the floor plan (see Fig. 2). However, this was abandoned in favour of a better overview, otherwise visitors would not have been able to see the entire space from every position and that would have made orientation more difficult. This more “simple” layout, which probably has seemed a bit boring in an exhibition in a real physical environment is correspondingly a user advantage in the virtual space.

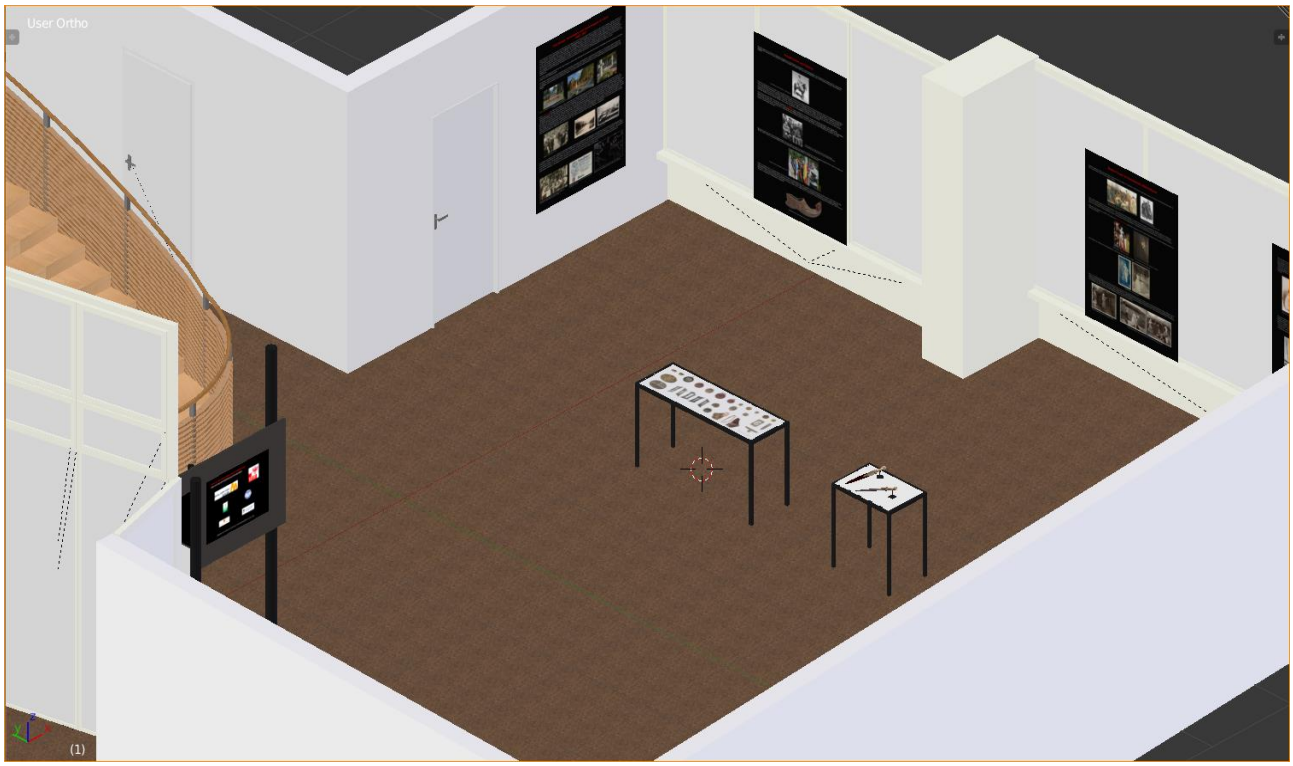

Fig. 5. Reconstructed room (© Brigit Danthine)

As planned, two showcases were reconstructed in the centre of the exhibition. In one of them, the finds of various surveys were arranged to show the spectrum of objects found. For the other smaller showcase, the outstanding find of a ceremonial dagger was reconstructed three-dimensionally with the corresponding UV-texture based on two find pictures (Fig. 5).

Fig. 6. Distorted, as it is a flat 360° image (© Brigit Danthine)

The Virtual Tour

In order to provide the visitors with a tour through the museum room with a full 360° view, several 360° pictures were rendered with the Cycles Render of Blender (Fig. 6). Cycles Render is an alternative render engine to the old Blender Render or the new Eevee Render pre-installed with every Blender version. Simplified, a render engine controls how surfaces of different objects are visualized. So these programs, in a sense, translate the 3D scenes into 2D images or animations. With this render engine, it is possible to render equirectangular panoramic images (Fig. 7).

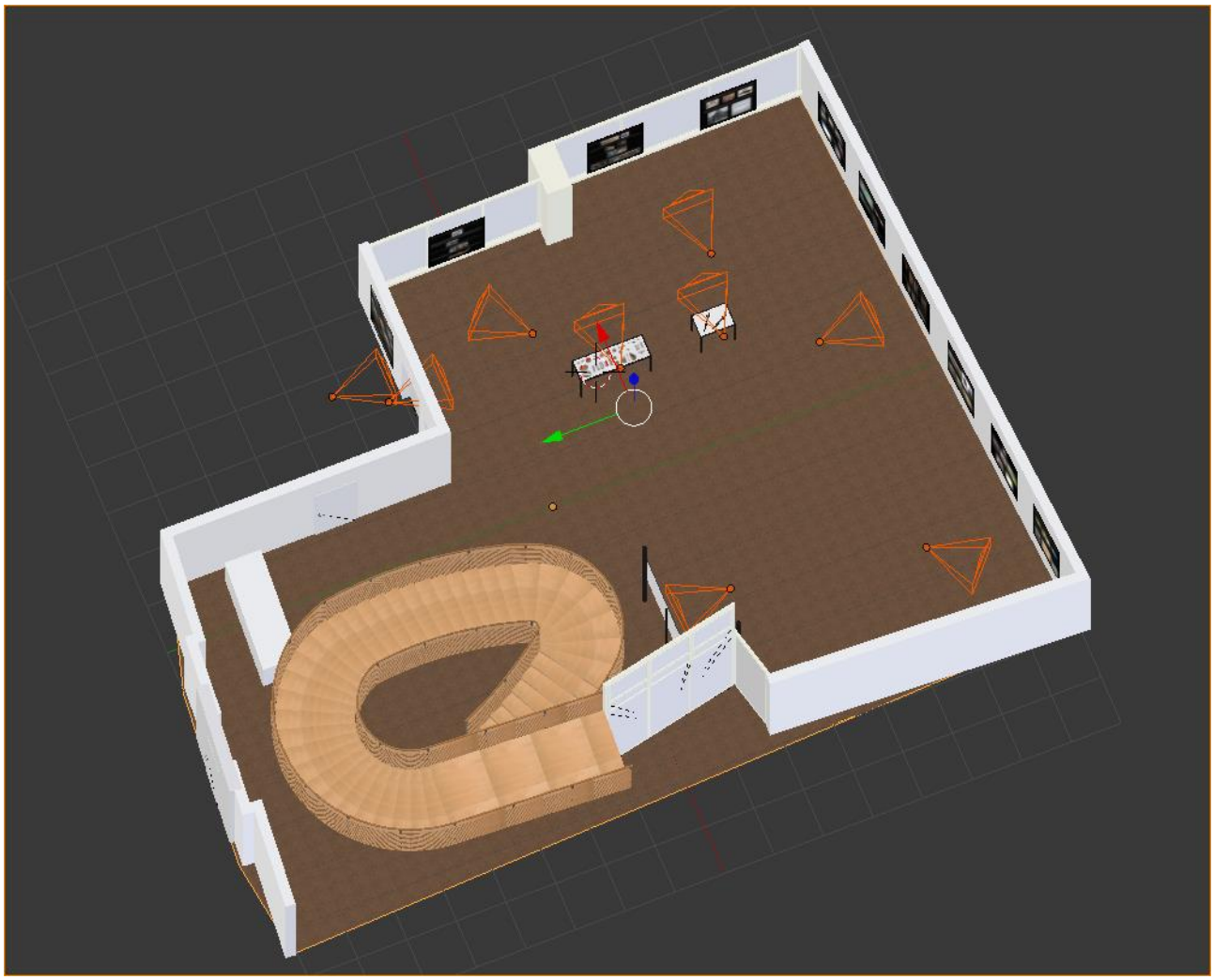

Fig. 7. Camera position (highlighted in orange) of the different scenes (© Brigit Danthine)

The 360° pictures were then assembled into a “walkthrough tour” with the help of the Marzipano Tool (2020), a free interface for Marzipano (2020), which is an open-source 360° media framework. Within the Marzipano Tool, it is possible to link different 360° scenes with each other via link hotspots, so that the visitors can move from one camera position or scene to the next by clicking on the respective hotspots – similar to Google Street View. Within the tool, it is also possible to set up info hotspots. One was placed at each poster and object in the showcase.

After setting up this basic structure, the tour was exported as a folder structure with the images, the libraries and various javascript, html and css files – these are the three main languages or scripting languages that together make up a homepage. Reduced to the basic skeleton, css defines how

something looks, the java-script-file controls the interactions and html is used to compose the content of the website.

Next, using the open-source text editor Notepad++ (2020), the information to be displayed within the hotspots was entered into the html and javascript files. While the artefacts in the large showcase were simple text and image blocks, the posters were not only to be displayed in large size, but info buttons at certain terms, places or persons offer the possibility to get further information about them. Unlike in a text, however, there is no way to hyperlink individual parts or specific pixels in images; only the whole image can link to something else. To still be able to place several different links at very specific parts of the image, a (transparent) svg overlay was "placed over" each image in every hotspot. Through this responsive svg-overlay it is possible to define specific shapes in certain sizes at positions defined by html, which link to other resources.[2] Finally, the 3-dimensional reconstruction of the ceremonial dagger was uploaded to Sketchfab, annotated and embedded as an iframe in the respective hotspot so that visitors can view it in full 3D from all sides. Sketchfab basically is for 3D content, what Youtube is for Videos: A platform to present the own content—in this case 3D models—to a community and the public.

After the appearance style of the virtual exhibition was defined via a correspondingly edited css-file, the entire folder structure was uploaded to the server and integrated on the homepage.

Part 3: The Virtual Exhibition

The final virtual exhibition now offers visitors the following options (Fig. 8): each image or scene can be viewed completely in 360°. The viewing angle can be changed either by clicking-and-dragging the mouse or by using the buttons located at the bottom of the screen. It is possible to switch between the different scenes either by using the link hotspots pointing in the corresponding direction of the new scene or by using the menu in the upper left corner. Above this menu are the buttons for showing and hiding the menu, as well as for autorotation—which is switched off by default—and full screen view. The posters as well as the information about the objects in the showcases can be opened by clicking on the info hotspots. The "eye button" in the upper right corner of the poster hotspots can also be used to open the posters as normal, machine-readable websites. The info buttons on the posters and on some find hotspots also link to further information.

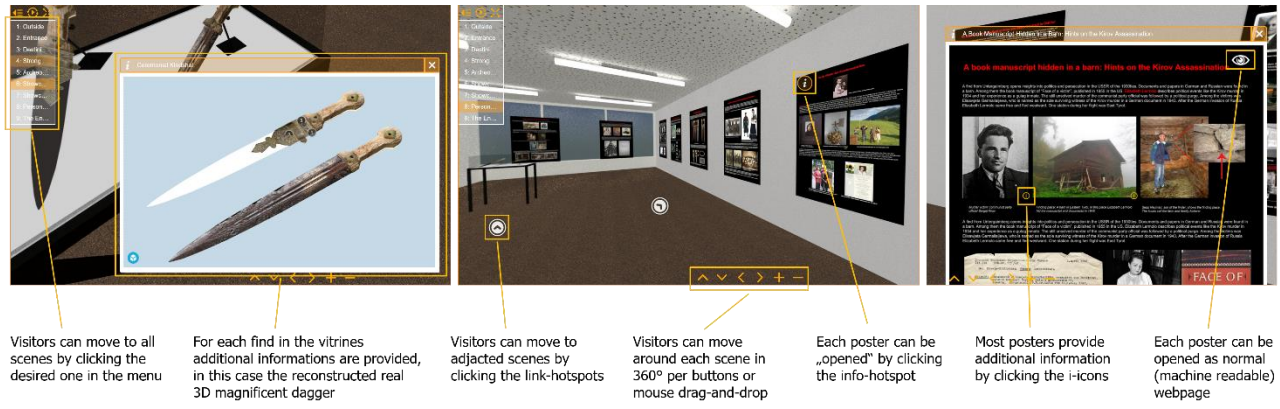

Fig. 8. Options of the visitors of the virtual exhibition (© Brigit Danthine)

[2] A good overview of svg overlay options and possibilities can be found here: https://dev.to/damjess/responsive-svg-image-overlays-4bni

The virtual exhibition can be visited here:

https://www.kosaken-lienz1945.com/virtuelle-ausstellung--63364468-de.html

or by clicking on the desired language qr-code or by scanning the respective qr-code:

Part 4: Advantages and Disadvantages of the Chosen Method

The advantages were that after the reconstruction in Blender all further work steps were relatively straightforward. Rendering the images only takes time, assembling the different scenes and integrating the hotspots for the different interactions is simple with the Marzipano Tool. The exported html, javascript and css files provide a good template so that they can be edited properly even with few scripting skills.

For 360° tours, various solutions are offered online. First of all, a distinction has to be made between mostly open-source frameworks and providers that also take care of hosting directly. While one of the former was chosen for this project with Marzipano, many commercial providers would have saved the last step of editing various files in scripting languages, as they offer a wider range of annotation and interaction possibilities. In the case of most commercial solutions, the respective annual fees are an obvious point to be considered. The free offered possibilities are mainly only available without an option of extension, and the data is then bound to exactly this solution. In contrast, frameworks like Marzipano offer more freedom to extend the possibilities by implementing the appropriate codes in html and javascript.

But whether open-source framework or commercial software or service, these solutions are based on 360° images that must first be rendered using Blender. This is a step that is not really necessary in this constellation, since the room is already 3-dimensional. Therefore, another possibility would have been to publish the room directly as a 3D model through which visitors can move. One solution specially developed for Blender would be for example blend4web (2021) or its (not Open Source) successor Verge3D (2022). Other open-source solutions are different frameworks like ThreeJS (2021), ATON (2021) or 3DHOP (2020) or game engines like Godot (2020). This would make it possible to publish not only 3D models for viewing, but also to provide them with appropriately defined interactions, camera positions or viewpoints. With this, the tour would have offered visitors the same possibilities of interactions. The advantage of this is evident: there is no need to render 360° images, as the 3-dimensional reconstruction itself is published directly. So, if a change of the reconstruction was necessary, it would be integrated directly without having to render new images first, which would then have to be integrated into the tour manually again. A small disadvantage, on the other hand, is that the Cycles renderer generates images that are closer to reality, so with a solution like blend4web or Verge3D, a reconstruction quickly looks a little flat.

However, it can be stated that in conclusion, the advantages of the chosen methods outweighed their disadvantages, which is why the approaches explained above were chosen.

Part 5: Future Prospects

In accordance with the FAIR principles, all files of the virtual exhibition (in packages of the particular language) were uploaded to Zenodo so that they are findable and accessible for everyone (Danthine et al., 2020a–d).

To make them also interoperable and reusable, the goal of a next project is to process the information about different objects, persons, places or events on the basis of the event-centered ontology CIDOC CRM (Fig. 9) (Bekiari et al., 2021) and to model it into a semantic network. With the help of this formalized ontology, which is focused on the cultural field, a wide variety of information can be formatted in a standardized way and linked with each other. Thus, it would not only be available for future projects, but could also be integrated on an international level with data edited by the same ontology.

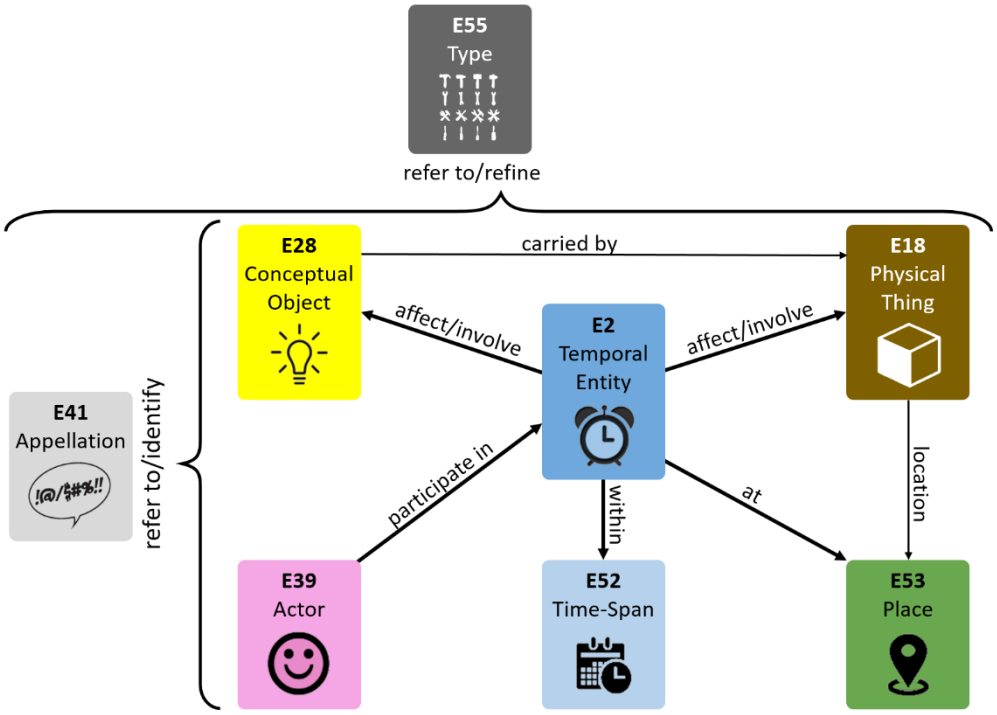

Fig. 9. CIDOC CRM classes (© Georg Bruseker)

In the future, both the standardized knowledge and other information such as pdf-files of technical papers (e.g. on academia.edu) or Wikipedia articles will be made accessible (e.g. the Yalta conference with https://de.wikipedia.org/wiki/Konferenz_von_Jalta). The texts within the virtual exhibition are accompanied by links that lead to information on the Internet, to locations in Google Maps or to nodes in the Knowledge Graph (Fig. 10).

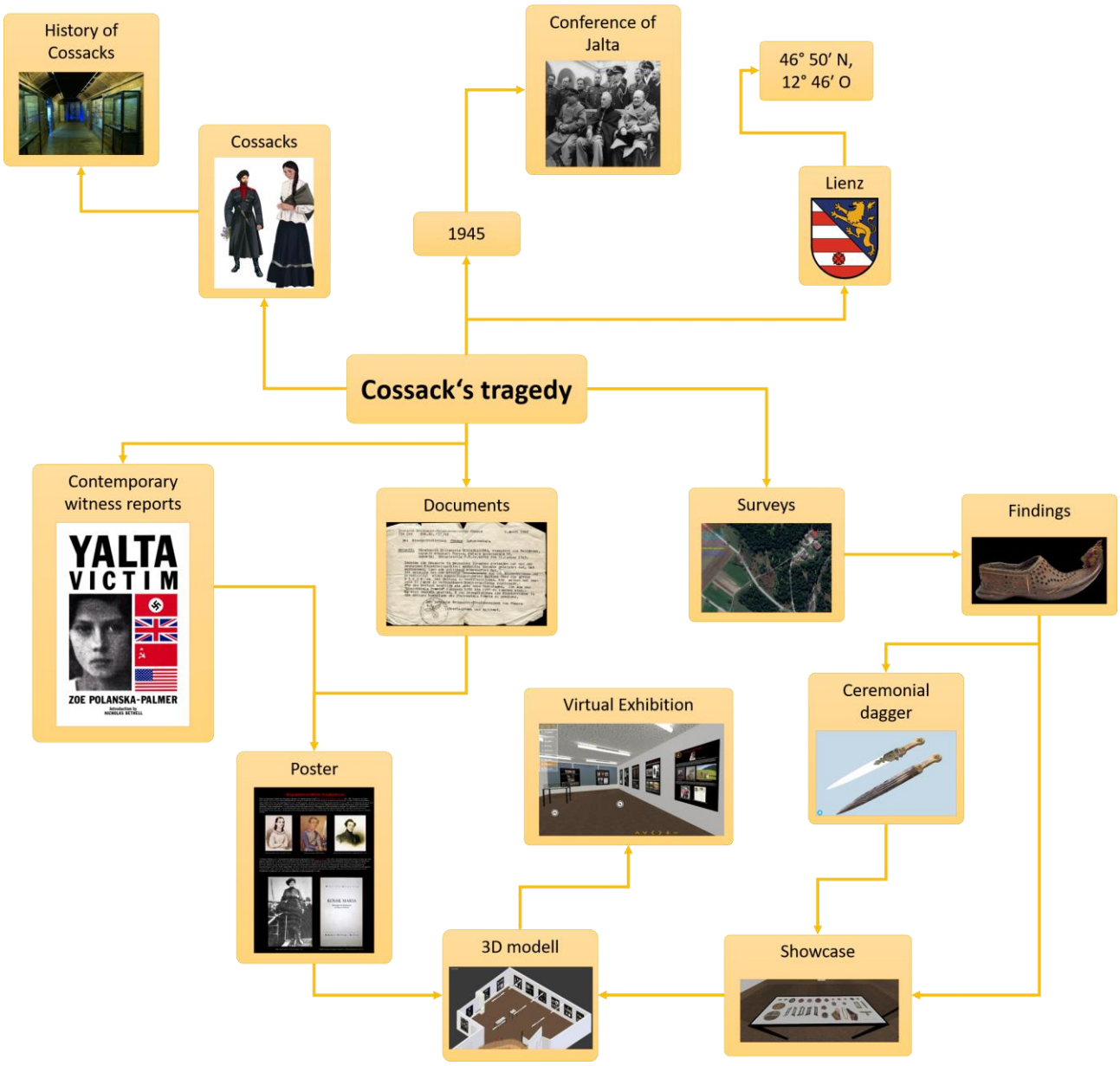

Fig. 10. Semantic linking of virtual exhibition and historical events with CIDOC CRM ontology (© f.t.l.t.b.r.: Andreas Blaickner, Institut for Archaeologies, University of Innsbruck; U.S. Signal Corps, Library of Congress, Franklin D, Roosevelt Library & Museum, Public Domain, Wikimedia Commons; Anna Pasechnik, Fulpmes; Archive of the Verein zum Gedenken an die Lienzer Kosakentragödie vom 1.6.1945; Institut for Archaeologies, University of Innsbruck; Google Earth; Tyrolean State Museum Ferdinandeum)

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Methodology: Brigit Danthine
Project Administration: Harald Stadler, Gerald Hiebel
Visualization: Brigit Danthine
Writing – original draft: Brigit Danthine
Writing – review & editing: Brigit Danthine, Gerald Hiebel, Harald Stadler

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