A multimedia museum application based upon a landscape embedded digital 3D model of an ancient settlement

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In its traditional sense, cultural heritage, whether tangible or intangible, can be defined as monuments, cultural and natural sites, museum collections, archives, manuscripts, etc., or practices that a society inherits from its past, and which it intends to preserve and transmit to future generations. Digital technologies in this regard increasingly assume a high significance due to their contribution in digital preservation and the abilities for three dimensional digital reconstructions of cultural assets. In terms of a sustainable digital preservation the development of common principles and standards for the handling of digital content play an important role. Initiatives like the London Charter, which aims on establishing internationally recognised principles for the use of three-dimensional visualisation by researchers, educators and cultural heritage organisations, or the development of the OGC 3D modelling standard City GML exactly pursue these goals.

Considering the principles of the London Charter this abstract describes the development of a digital reconstruction of the celtic hillfort "Altburg" (Germany), which was generated in the context of a museums exhibition in the Hunsrück-Museum Simmern (Germany) and which refers to the City GML standard.
The spoken to exhibition highlights the art of living of the regional iron-age cultural group "Hunsrueck-Eifel-Culture" (HEK), which denotes iron-age tribes of the Hunsrueck and Eifel mountains in the West of Germany. Especially during the 5th and 4th century BC these regions became increasingly important in far-ranging trade or political connections, archaeologically detectable in precious imported grave-furnishings. As a result of these processes of social development a considerable number of hillforts was constructed to protect people or supplies in times of crisis. Almost all archaeological evidence of the HEK derives from graves and has to be judged on the background of varying burial rituals. In contrast hardly anything is known about settlement activities from that time, because hardly anything else than post-holes from wooden houses or simple pits have survived the centuries. Since no visible traces above ground remain from these iron-age farmsteads, it is very hard to locate them and therefore only few sites are known. For that reason it became clear that in order to convey a picture of the circumstances of life about 2500 years ago, the exhibition relies mainly on reconstructions.

Besides reconstructions of contemporary objects like costumes, jewellery, an authentic replica of a post-built granary and cinematic re-enactments of life and craftsmanship in Celtic times, a multi-media based application serves as a platform for detailed information about the HEK. In this regard a 3D-model of the celtic hillfort "Altburg" near Bundenbach (Rhineland-

Palatinate) was developed, a site belonging to the best preserved remains of that kind. Several excavation campaigns in the 1970ies could ascertain four building phases of the hillfort and due to the excellent preservation of the site, which is manifested in the remains of postholes and ditches in the subsoil a very detailed image of the hillfort could be derived. In the first building phase (ca. 300 BC) the Altburg consisted of few larger houses, where its inhabitants lived, a number of granaries for food-storage and a round-house of maybe public character, whose precise purpose is not yet known. The settlement was surrounded by a simple wooden palisade guarded by a fortified gateway. Since archaeological sources are outstanding, the community of Bundenbach decided to reconstruct the settlement of one of the later settlement phases at the original location, using even the excavated post-holes for the buildings. Unfortunately this reconstruction is neither complete, nor does it succeed in conveying an authentic impression of the iron-age settlement. The valley below is nowadays densely wooded, so that the Altburg seems remote, but back in the iron-age all trees and undergrowth would have been cleared to make the settlement a visible landmark. Therefore the only way to convey an impression of the earliest settlement seems to create a virtual 3D-model of its building phase I.

With regard to the London Charter and the requirements of the City GML standard, which defines several Levels of Detail (LOD) for multi-scale 3D modelling, the decision was taken to define both the landscape model and the model containing the ancient buildings as close as possible according to the CityGML standard. The implementation, however, was done by using different off-the-shelf software. Thus in a first step the digital landscape and the digital reference for the 3D models of the buildings is generated. The input data consist of:

- Digital Elevation Model (DEM) with a resolution of 10 m
- Ortho image with a ground resolution of 20 cm
- True scaled finding plan in a 1/400 scale

The ortho image is used for georeferencing the finding plan and the plan in turn is used to assess the positions of the single buildings by creating point features, which are positioned in the center of the digital footprints of the buildings. The results of these steps are visualised in the 2,5 environment of the software ESRI ArcScene. Finally the hillfort buildings, which are constructed and textured in the 3D sketching software Google Sketchup are imported as 3D marker symbols and are adjusted to their orientation and the topographical situation (Figure 1).

Figure 1: 3D Model of the celtic hillfort "Altburg"

In order to acquaint the museums visitors closer with the historical scenery an animation was generated in ArcScene in the form of a retrospective virtual flight over the landscape and around the mount, where the hillfort was situated. To achieve this objective the land use presentation sequentially changes from today's situation into the presumed ancient celtic time. Afterwards transitions as well as textual information in the form of a lead text, subtitles and end titles are added by use of the software Windows Movie Maker. Additionally a painted representation of the hillfort scenery was created and appended to the animation in form of a slow cross fade after the last frame of the animation to the artistic representation. Finally the video product is integrated into an overall multimedia presentation about the HEK, which is developed by means of HTML and JavaScript techniques.