

Digitization - for Games and for Cultural heritage

Different approaches by the digitization of the Indian cultural heritage sites, and the lively Dutch city center for the computer game

Ladislav Dedik, CEO of the STUDIO 727, Bratislava, Slovakia

Peter Nemcovic, head production manager, STUDIO 727, Bratislava, Slovakia

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Introduction

The technical and artistic parameters of every digital scanning and presentation have their roots at the very beginning of every project - when setting up scanning methods and procedures. The setting of the scanning methodology consequently has a fundamental influence on the length of the processing time of the scanned data - post-process. In order to achieve the best possible result, is now almost standard to use a combination of data. First from terrestrial photogrammetric scanning - to achieve the best detail of selected parts, then UAV-drone scanning - for the best possible coverage of the selected site as a whole, and scanning with LIDAR scanners - for the most accurate geolocation and connection of all scanned data to put into one final 3D-model. The quality of the scanned data also fundamentally affects the quality of the resulting 3D-model, which, after major or minor adjustments, moves to the final presentation phase – via computers, VR/AR, or video.

When scanning Cultural Heritage, it is usually most important to capture the complex and integrity of the object or site in its entirety. The pilot project of digitization of Indian cultural heritage for ASI (Archaeological Survey of India) in cooperation with PIQL was implemented in first half of 2022, at three selected Indian UNESCO World heritage sites: Dholavira (one of the five largest Harappan sites and the most prominent of archaeological sites in India belonging to the Indus Valley Civilization), Bhimbetka rock shelters (an archaeological site in central India that spans the Paleolithic and Mesolithic periods, with prehistoric cave paintings, the earliest are about 10,000 years old), and Taj Mahal (worldwide known Islamic ivory- white marble mausoleum).

Rapid Development of Digitization of cultural heritage over the past decade has brought an exceptionally high quality of 3D-models. This situation was made possible mainly thanks to the development of fast 3D-model creation softwares such as Reality Capture, which enabled the processing of a huge amount of scanned data. This is the point where we come to the connection between the digitization of cultural heritage and the creators of computer games. The top digitization

results from the field of digitalization of cultural heritage attracted attention and showed new possibilities for the game industry. The goal of the creators of triple A title games has always been to bring their audience the greatest possible degree of realism, which is just now starting to reach cinematic levels. The days of square and blocky computer game visuals are now irretrievably behind us. Just for comparison, here is a visual of one triple A game, where the first preview is from 2003, and the second is from the current year 2022:



Fig. 1. Call of Duty, 2003, unknown destroyed town during the WWII, eastern front (©Youtube)



Fig. 2. *Call of Duty, Modern Warfare II., 2022, Amsterdam, old town centre (©Youtube)*

The resulting unique realism in the game *Call of Duty – Modern Warfare II.* (Amsterdam level) was also achieved thanks to our partial scanning project for this game title. It is a wonderful example of how today's game engines manage to combine a high level of realism without taking away from the gameplay. This means that the player (in the language of the cultural heritage environment - the visitor) can move completely smoothly and fluidly in the given environment.

One of the foundations for achieving this success lies again in a properly set scanning plan and its process. The goal is not to overwhelm the game engine with a huge amount of equally high-quality data from the entire selected city district. The ideal way is to combine a high-quality base scan with selected elements that are scanned in higher detail, and use them as repeatable building elements to achieve the greatest possible degree of realism.

Thanks to the rapid development of technology and the gaming environment, the gaming industry is reaching new heights today, and it significantly helps to simplify the presentation of huge data outputs from the field of digitalization of Cultural Heritage. Current publicly available game engines enable real-time presentation of the whole cultural and historical sites thanks to a well-set scanning methodology, through which visitors-players can browse and navigate as if in a computer game.

As an example can serve the scope of the planned digitization works for the Pilot project of digitization of the Indian cultural heritage on the location Dholavira. Types of model quality for individual parts of the exterior were divided into 5 levels: a) base, b) standard, c) normal, d) high, and e) ultra:

Dholavira - Scope of planned work

Types of model quality for individual parts of the exterior

- BASE
- STANDARD
- NORMAL
- HIGH
- ULTRA



Dholavira - Scope of planned work

Types of model quality for individual parts of the exterior

- HIGH



Fig. 3. Dholavira location, the setup of the scope of planned scanning works, India 2022 (© Ladislav Dedik)

For each of the three selected Indian locations, Dholavira, Bhimbetka and Taj Mahal, a summary data package containing: 3D-model, Ortho-photos, Docu-photos, Pointcloud, and Videos was submitted. These data packages were uploaded to the resilient long-term storage technology of the Piql, and stored into the Arctic World Archive (AWA) on Svalbard.

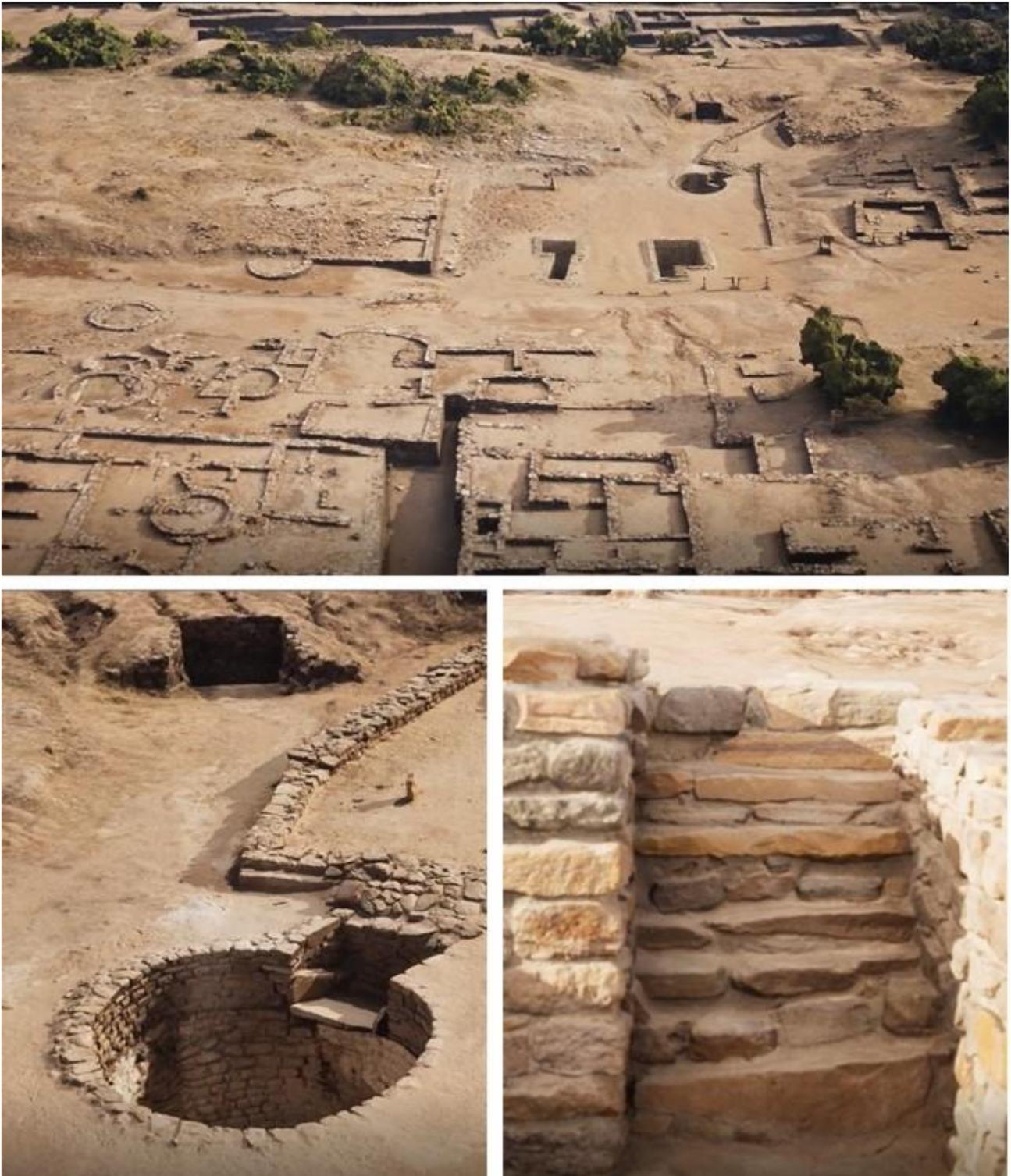


Fig. 4. Dholavira location - the overall picture, medium level, and the detail - an example of trying to achieve a balanced level of detail, India 2022 (© Ladislav Dedik)

It was this qualitative division of the scanning work that made it possible to create a virtual tour for each of the mentioned locations, which reaches the parameters of today's top computer games. Administrators of cultural and historical heritage should already be thinking about how to best prepare for the arrival of full-fledged virtual tours. Thanks to technological progress, these may soon become the new normal, as well as an interesting source of income for cultural institutions around

the world. Today's world is facing hitherto unknown global pandemic and new security challenges, which is also why the further development of digitization is not only desired but also almost necessary. Not only as a source of new potential financial income, but also especially as an ultimate insurance for the protection and preservation of cultural heritage. Examples from the former Yugoslavia, Syria, Libya, today's Ukraine or even the recent fire in Notre Dame Cathedral speak for themselves.

The Dutch historian Johan Huizinga already discussed the origin of culture in play in his work *Homo ludens* from the first half of the 20th century, and similar ideas long before him, as one of the first forerunners, Jan Amos Komenský in his work *Orbis pictus* already in 1658. The connection of cultural heritage with computer or virtual games is basically nothing new. Their mutual relationship will only deepen in the future.

Although the game industry is the leader in presenting the most realistic digital content right after the film, it does not try to create perfect digital-twins, but realistic and believable digital-twins. Individual selected details are much more important, even at the expense of giving up the so-called perfect mirroring of the presented object. And it is precisely this philosophy that cultural heritage administrators should adopt from the point of view of presenting virtual tours. In terms of making the best possible use of the possibilities of today's game engines, this is the best possible way for the future masses of virtual visitors.

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