

AUGMENTED REALITY AS AN OUTPUT

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Augmented reality will probably be the medium which will, in the near future, be used to communicate with the largest part of the general public. This phenomenon is already gathering the momentum. There are already dozens and dozens of apps designed for smart phones which present archaeological knowledge. If you browse Android market, you can currently find numerous archaeological tourist guides, archaeology news, games, tutorials and field aids.

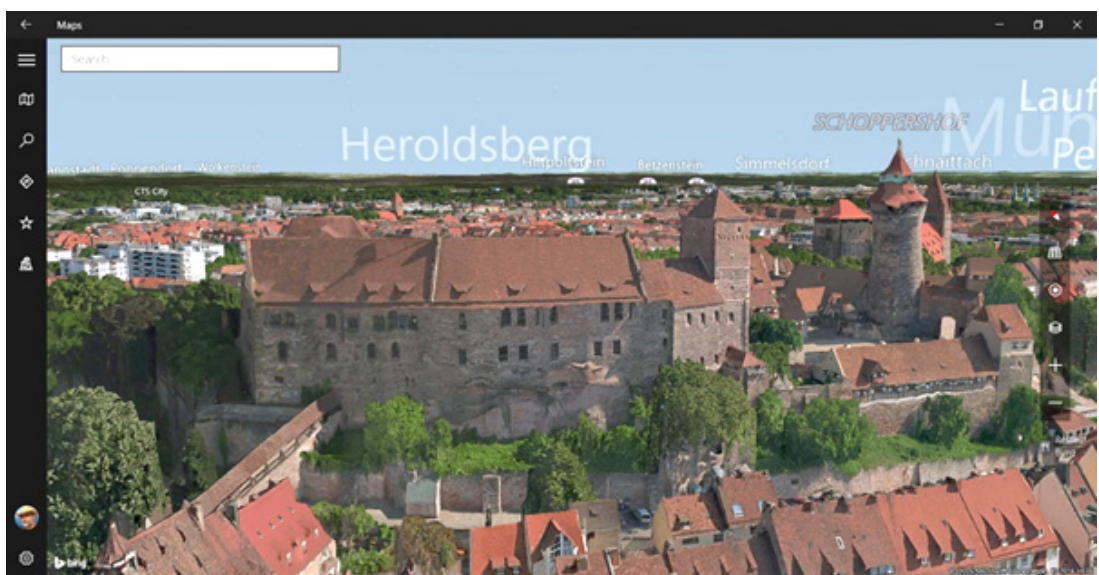


Figure 56. A screen from Bing maps showing simple AR

However, it seems that we are yet to see a market which will fully exploit endless possibilities of the concept of Augmented Reality. There were some attempts even in Belgrade, Serbia and the one named 'Muzzeum project' is closest to mind, because it was pursued by the same IT expert who, in 2003, co-designed ArchaeoPack with the author of these lines and who managed the technical part of the 2004 edition of the virtual reconstruction of 15th-century Belgrade. The Muzzeum project was conceived and realized by V. Jevremović, who has tried to draw attention of the general public to the fact that, at the time (in 2012), Belgrade did not have a single operational museum where a member of the general public could observe archaeological artefacts and other finds. It was the time, and still is today, when the National Museum in Belgrade was closed (since 2002) and its opulent collections were stashed away in depots. The result of the Muzzeum project was augmented reality software triggered by QR codes as activation fields. QR codes were printed and displayed on the walls of the National Museum in Belgrade and 3D models of some important artefacts kept in the dark museum store rooms appeared on screens of smart phones or tablets when these were placed in front of them. However politically naïve and futile this attempt was in its demand to finally open the Museum for the public, it demonstrated one of many opportunities this concept offers for the heritage popularization. To hold up a device in front of a QR code and obtain archaeological content, or see a live image when the built-in camera is placed in front of archaeological drawings, 3D reconstructions etc. (such as in unusually interesting app SkyView) would be extremely suitable for otherwise static and silent archaeological finds that are important, but apparently unattractive. From my experience in the capacity of a tourist guide at the site of Vinča, which is an extremely important Neolithic site composed of almost 10 meters of cultural deposit, what the public needs are reconstructions. Apart from the fantastic view of the Danube and a small museum where one can see artefacts unearthed at the site, the auditorium is offered very little in the way of sensing the place as it was in the Neolithic. And instead of building replicas at this legally protected, multi-layered site, Augmented Reality could bring forward 3D models of individual architectural structures and even provide a walkthrough the Neolithic village from 5000 BC. Introduction of more of the available VR devices would certainly bring life to the site and make the visit to the site unforgettable.

Another possible use of AR is related to non-virtual reconstructions of architectural structures such as churches, castles, towns... In these cases 3D models could overlap with the actual structures and show their potential building and destruction phases that date from different periods.

I believe that a rule is still in place that requires one to carry out the reconstruction of a structure in a way that demonstrates the distinction between the original and the reconstructed parts (by using different colour or different building material). However, this rule tends to be avoided or at least bent when reconstructing structures such as castles shown here in Figures 3. Here, as well at many other places, the "educated guesses" of experts and "experts" applied for the reconstructed parts are presented as original elements of the structure. The use of AR would enable the visitor of the site to place their camera in front of the reconstructed structure and trigger layers which would, eventually, produce an image of the original state of the structure and show its history. Different colour shades could indicate different building phases of the structure. The visitor could also be shown the analogies used in the reconstruction of the structure. In such a way, VR could re-instate the "reversibility" of physical reconstructions.

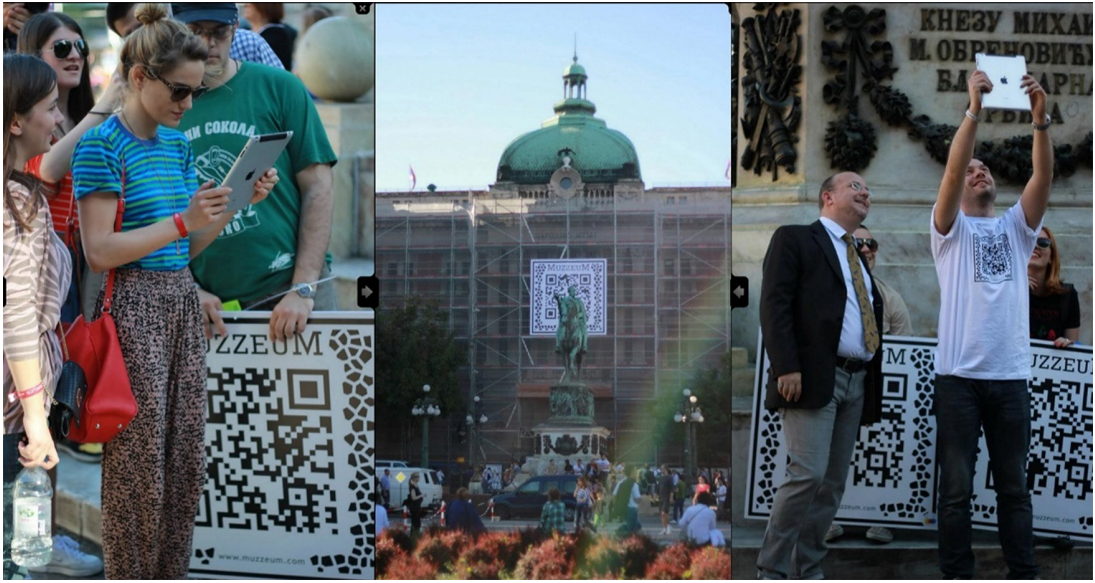


Figure 57. The Muzzeum Project, Belgrade 2012.

Augmented Reality can also be applied in the presentation of archaeological excavations. It is nowadays common that all archaeological field documentation is kept in digital form and the structures discovered are geo-referenced. It would thus be easy to show photos of artefacts at the moment of their discovery, provide ground plans of architectural features, show videos of excavations etc.

In order to acquire an insight into the current stage of application of archaeological reconstruction across the app market, I did searches using terms such as archaeology + field; + professional; + Virtual Reality and Augmented Reality. What I discovered was that there are not as many relevant applications as one would expect in this flourishing market.

At the time when I searched for archaeology + professional (August 2016), www.play.google.com suggested only a handful of apps. Of those, only three could be useful for professional work and these are: Precision GPS, Archaeology Sampler and Heritage Daily. My subsequent search included terms archaeology + field, and this one yielded not much more.

ARCHI Discover Archaeology claims that when using their app one can discover more than 200,000 British Archaeological, Historic and Cultural Sites in the database. According to them, they are the only online service available to the public that offers full details on the location of the sites in the database and the travel directions.

There are a number of archaeological guides (in print or available online) which can be used as a sort of tourist guides for this form of heritage and for Biblical archaeology.

At the end of the day, it seems that neither the technology, nor the method of data collection, nor the state of preservation of archaeological remains are as crucial for virtual reconstruction as is the interaction between the author of the reconstruction and 3D modellers, texture artists and programmers.

One should not forget the prospect of publishing in the interactive form, as exemplified by the excellent presentation of the Roman site of Torreparedones in Granada, Spain. In this interactive publication, downloadable from <https://play.google.com>, one can see an abridged version of the site's monograph, chapters and all, just like in a "real" printed book. The chapters are ordered in the way they would be in a monograph: the introduction is followed by a chapter on the landscape, then comes chapter on the history of research, followed by chapters on the individual investigated structures. In each of them, the elements used in the virtual reconstruction are provided. In addition to the gallery of photographs and drawings, which form part of the field documentation for the site, video-material is also offered, as well as 3D reconstructions and Augmented Reality, completing the well-rounded guidance of this interesting site. This example provides an overview of all of the currently available options offered by virtual reality technology. What is problematic, but certainly not a responsibility of the authors of this outstanding presentation, is that, according to the play.google.com record, the application was downloaded by only a little over a hundred people.

This kind of applications is rare on the application market. Unfortunately, in case of some other similar applications, the number of downloads also remains below 500. The reasons for this situation are diverse and can be found in:

- The present lack of interest of the culturally competent audience for IT achievements;
- Poor marketing of the products that mainly relied on funding from the local communities and/or ministries of culture, and thus did not require marketing for fundraising;
- The view that presentations of this kind are only useful if incorporated in the actual tourist offer of the respective cultural heritage monument;
- The absence of interest in the commercial sector for the products publicising cultural heritage.

A question arises as to which types of audience VR in fact targets? This is where the situation becomes highly complex. Namely, VR is not a product that can be created rapidly – quite the opposite. From the moment one decides to venture into this sort of enterprise, it takes years to realise the idea. The VR production process could be divided into two equally complicated and demanding stages: fundraising and creation of the reconstruction.

The new version of Android, released in the course of writing of this book, introduced Android Nougat and the accompanying split-screen display mode in which two applications can be snapped to occupy halves of the screen. An experimental multi-window mode is also available as a hidden feature, where multiple applications can appear simultaneously on the screen in overlapping windows. This will be particularly suitable for the VR content requiring the use of VR eye-glasses, and there will be more and more of this kind of content. This is a window of opportunity for archaeology.

Also, any VR demands high input of time and labour that is not cheap. One should not forget that, unlike archaeologists and art historians, IT engineers are very well-paid and do not lack job offers. It is thus essential to raise enough of funds to be able to hire good modellers, programmers, texture artists and others, in order for the VR to be sufficiently interesting to the spoilt and difficult-to-please audience in the habit of watching Hollywood mega-spectacles such as 'Captain America' or the mastodon series of the kind of 'Game of Thrones'.

Thus, young generations that, once they grow up, will represent the consumers of our VR creations, have already been used to 'surreal', to the products of imagination; there are not many of them that will have concerns about whether or not a cultural monument was reconstructed according to the latest scientific discoveries.

However, given the present state of circumstances, despite the exceptionally well designed and attractive offers there lacks a public interest, especially in the field of Classical Archaeology.

A sudden boom of smart mobile phones and tablets started in the last quartile of 2010 with the introduction of the Gingerbread version (Android 2.3) which, as a novelty, included the support for SIP VoIP internet telephony. Besides, this was also the time when the support for higher resolutions and faster screens was introduced, which was conducive to the development of 3D content, above all games. As a by-product of this advancement, the profile of the target audience changed.

The nature of the target groups is as follows: the ones growing up, so-called *millennials* or digital *natives*, who are surrounded by computers and screens and 3D models as part of the video games they play. They only pay attention to the models in the context of the event shown on the screen or, clearly, if the 3D model is of inadequate quality. This has set high standards to be achieved by 3D modellers and texture artists. Also, these generations do not understand virtual reconstructions if the action is missing, they see them only as the beginning of a game in which the characters do not turn up after all; thus, bored and contemptuous, they abandon them after only a few seconds, with the typical question-answer "So?".

In the summer of 2016 the PokemonGo game was released, amidst enormous interest worldwide, and it overnight attracted millions of users, cashing in an admirable amount of money already during the first week after the release. The profit-making trend continued and, in the following months, over ten million dollars were earned daily! It is anticipated that the sale of "pokecoins" will bring three billion dollars to the company Apple in the next year or two. The game essentially uses a GIS platform on which FIGURINES are placed. They represent characters from the eponym animated movie (Pokemon). What is of interest to us who are concerned with the cultural heritage and its preservation and promotion is the fact that, within the game, on the maps that the players observe and find their way around during the game, the shown landmarks quite often represent real cultural monuments.

The creators of the PokemonGo game have understood one thing that we, unfortunately have not — that the figurines appear alive and attractive only if in action. In the game they fight against each other, respond to the challenges placed by the player, they have personalities. Obviously, it is not wise to expect that academic projects will be overpowered by the challenge and start creating characters based on ancient heroes in bloody battles in order to secure decent 3D models of the cultural monuments. They will continue to rely on anyhow modest financial support that they obtain from either local council of the territory in which the cultural monument is located (as is the case with almost all VR products in the application markets), or the local ministry of culture and tourism, or will benefit from the enthusiasm of small groups of private companies. No matter how high, these funds are nowhere near as high as the budget available to

the various teams working on developing video games. In other words, the introduction of a more substantial interaction, in addition to the simple walk through the models, is still far from sight. What we can, at best, see in present-day 3D visual reconstructions is smoke coming out of houses and huts and, in case of video rendering, one can even see a person or two walking aimlessly around the stage. Even if done to perfection, these kinds of reconstruction of the past are to the young people boring and can occupy their attention for a maximum of eight minutes.

So what do we do about this? How to proceed with creating virtual reconstructions when even the most attractive of them do not get downloaded from Android market more than a thousand times? How to make millennials interested in the cultural heritage?

One possible direction that I recognize is incorporation of authentic elements of the reconstructed cultural heritage into the entertainment industry. Whether this will be in the form of video games with bloody encounters in an authentic setting of a medieval fortress, or a time-travel game in which the characters explore past landscapes, is not of prime importance. What is important is to find a way that will enable the production of 3D models derived from archaeological investigations and their subsequent use in the domain of lucrative video-games.

Another possible direction would be the introduction of 3D reconstructions in school curriculums, their inclusion in textbooks for history and other subjects, where they would undoubtedly enrich the teaching and learning process.

So, the right question in the end would not be whether Virtual Reconstructions are good for archaeology or not, but instead: how do we get the means to do it as a standard procedure not only for presentation but also for analytical purposes and field documentation. 3D models of multiple objects geo-referenced and integrated in the field are still expensive undertaking, but building one using photogrammetric procedures is not. It can be saved and used later when an opportunity emerges that the entire excavated field could be fit together as an authentic recording of archaeological research.

So, is there a solution to this problem?

QR codes and image recognition solutions appear to have a great potential for further practical use, such as linking audiences and virtual reconstructions, thus making virtual reconstructions much more marketable. They represent the fastest links between the world of print and the world of digital, and are easily shareable. So we already have within our reach an effective way to offer/push additional digital information, and offer it to the audience in the form of a palpable object. On the back of a beer mat, on a kitchen tissue, on a placemat in a restaurant, on the side of a tram, stuck to a lamp post or on the wall of a museum or shared on a social network website, why not?

Augmented student textbooks, readers, tourist guides or maps could be amazingly handy source for including links to the contents of lessons in audio, video and 3D mode, presenting them in a way which is understandable to a digital native. Even without the need for re-publishing! Image recognition of existing contents of textbooks and other

printed material can overcome this obstacle. As far as interactivity is concerned, flourishing social networking could feature in different subjects taught at schools and universities, which could, in effect, significantly widen the target group for all sorts of cultural content. Printed items listed above are still popular even in the Age of Digital. Will the end of printed publications eventually change this? Who knows, probably yes, but there are still some years ahead for us to promote the importance of virtual reconstructions in archaeology and cultural heritage, and meet our objective which is – to incorporate possibilities of IT in our everyday praxis.

In the end, it turns out that the most vicious threats to the well-being of priceless monuments throughout the World are coming not from the usual set of risks described by experts in charters and declarations, but from ideologically instrumentalized people who have, through their abominable mindless actions, destroyed numerous world heritage monuments such as Palmira, Nimrud, Niniveh, Hatra and many more. And for that reason, after the destruction of Palmyra in August 2015, the Institute for Digital Archaeology (IDA) in Oxford, announced plans to establish a digital record of all historical sites and artefacts threatened by the ISIL advance. In order to accomplish this goal, the IDA, in collaboration with UNESCO, will despatch 5,000 3D cameras to their partners in the Middle East. The cameras will be used to capture 3D scans of the local heritage. Unfortunately, it is a bit late for Palmira, but this indeed shows the importance of accurate 3D scanning and virtual reconstructions of cultural heritage.