Digitization and Preservation of City Landmarks Using Limited and Free Web Services

Sotiris Georgiou[1], Fotis Lazarinis[1,2]

[1]Applied Arts School, Hellenic Open University, Greece
[2]Department of Archival and Library Sciences, Ionian University, Greece
`samgeorg@gmail.com,lazarinf@ionio.gr`

Abstract. This paper presents a practical approach for digitizing city landmarks based on free and limited Web resources. The digital replicas are then placed on the Web using popular services, like Google earth, and are accessible to a huge user base. The method is easily applicable and quite valuable to organizations with limited funding.

Keywords: Digitization, Cultural Heritage, Online services

1   Introduction

The technological development in the past century affected the architectural form of monuments and buildings. Urbanization and migration led to the depopulation of villages and cities with unique architectural structures. Monuments of historical significance and interest due to their architecture have been abandoned and destroyed.

The UNESCO World Heritage List includes monuments and sites that meet the selection criteria and are of outstanding universal value from a historical, scientific, artistic, ethnographic point of view. Many monuments that do not meet the selection criteria are not restored and some of them are now destroyed. Digital technology can assist in virtually preserving these monuments. The digital representation is a new tool for an architect to represent his ideas, as he has done over centuries with other media like "triptych: archetype-medium-representation". This medium however makes it possible to digitalize the architectural boundaries. Hence, it's possible to bridge the gap between physical and virtual spaces. This technology may also contribute to the presentation of old buildings using some data.

The digital representation of the buildings can only be achieved if there is an adequate description of the monument. Luckily, many historical references are detailed and often there are drawings or even pictures, which give us information about their structure. To virtually represent a monument and have the desired result, many scientists as architects, historians and graphic designers must cooperate and use special programs. This requires special knowledge and sophisticated and expensive programs to represent a monument or a building. Google SketchUp simplifies all that enormously, at least for not complicate monuments. Google Earth can be then used for

dissemination of the digital replica to large audiences. In this contribution we analyze the method for digitally representing city landmarks.

2   3D software for Digitization

In the category of 3D graphics software's for creation and representation models there is a plethora of software that covers almost all the needs of artists and designers. One of the most popular programs is the 3D Studio MAX from Autodesk. The big advantage, which could be interpreted also as a disadvantage, is the huge number of complex features. The cost is also high and thus is prohibitive for large number of users. Similar programs are Cinema 4D, Lightwave 3D, VR4MAX etc.

Another popular software is Blender which is an open-source tool. Blender has also many features and can be expanded using add-ons. By being an open-source tool, it can be expanded by programmers to add new functions. There are more free 3D design programs like MakeHuman which specializes in designing human figures, Sculptris specializing in sculpture, Wings 3D etc. Seeking a solution to problems like, cost, ease of use, programming efficiency, we come to the choice of Google SketchUp and the reasons are analyzed below.

Google Sketch up is a 3D visualization software for architects, engineers, directors, game developers or for simple users that experiment with 3D virtual constructing. It is designed to be user friendly. The newest version of the program is 8. One of the software best features is 3D Warehouse that allows its users to add their own models or to find models created by other users.

Google SketchUp is provided by the official webpage of Google [1] and there are two current editions:

- the full edition Google SketchUp 8 Pro which is a commercial tool, and
- the free edition Google SketchUp 8 with fewer functions

The differences between the two editions are the additional functions/plug-ins that the Pro Edition has:

- Creating of professional drawings
- Automatic update of the changes made into 3D models.
- Model-sharing with colleagues and costumers
- The ability to add text and dimensions to the 2D and 3D models
- The creation of interactive presentations.

The big advantage of Google SketchUp is the way of creating the models. Models can be created by knowing their shape and dimensions and by having photographs of all their surfaces [2]. With only these data we can create an exact digital replica. If pictures of the building are not available, the software allows us to adjust and create the colours, the textures, the outline and the architectural style of the building. One of the basic features is the inclusion of the model-monument or building-to Google Earth [3] by giving the coordinates or by placing it on the map. In order to include one building, one needs to have the approval of the Google's 3D Warehouse team. If

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some criteria are met, then the model can be included to Google Earth and be available to millions of users.

Google 3D Warehouse (http://sketchup.google.com/3Dwarehouse) is a huge collection of 3D models that several users, that companies or simple have created. Any user of Google SketchUp can use these models in his own space in SketchUp. There are various categories such as monuments, buildings, furniture, vehicles, human figures etc. All models published to the 3D Warehouse marked as "Google Earth Ready" go through a review process. The models are reviewed for accuracy of location, visual completeness, photo textures, polygon count and overall quality. Only models of buildings that are currently built and are textured by real photographs are eligible. If the model is not accepted, suggestions are provided on how to improve the model and pass the acceptance criteria.

There are today 3 million models on 3D Warehouse published from various users. There are models from monuments such as the Statue of Liberty in New York, the Aghia Sofia Basilica in Constantinople, the Acropolis in Athens etc. There are well-known buildings such as the Empire State Building, the Zappeion Hall, bridges like the Greek Rio-Antirrio bridge etv. A remarkable example of both the SketchUp features and the talent of the designers is the town of Getaria in Spain (Coordinates: 43°18'14.34" 2°12'11.19"). The designers Josetxo and Pedro have won the Google competition "2012 Model Your Town Competition" by creating the 3D digital representation of the historic protected area of Getaria, so all the users of Google Earth can have the opportunity to make a virtual tour in the streets of their town.

3   Design a Model in Google SketchUp

There are many different ways to create a model in SketchUp. Below, we provide step-by-step directions for creating a model. The monument constructed is a clock in Heroes Square, located in northwestern Greece, in the city of Florina. The clock is an identical copy of the older monument which was demolished during the Greek civil war. The process is decomposed to the following steps:

1. We take photos of all the surfaces of the building. We can also use, if they are available and in high resolution, pictures that found in Google Street (Fig. 1).
2. With any image processing software we cut and edit the picture in even and flat pieces (Fig. 2).
3. In SketchUp software we design the 3D outline of the building using the drawing tools. (Fig. 3).
4. We then place the edited photos on every surface of the building. (Fig. 4).
5. We add colors, textures, materials, drawings wherever is needed. (Fig. 5).
6. Finally, we upload our model on 3D Warehouse, giving specific coordinates or we place it on the map by ourselves (Fig. 6).
7. Once the project is accepted, it is placed on Google earth (Fig. 7).
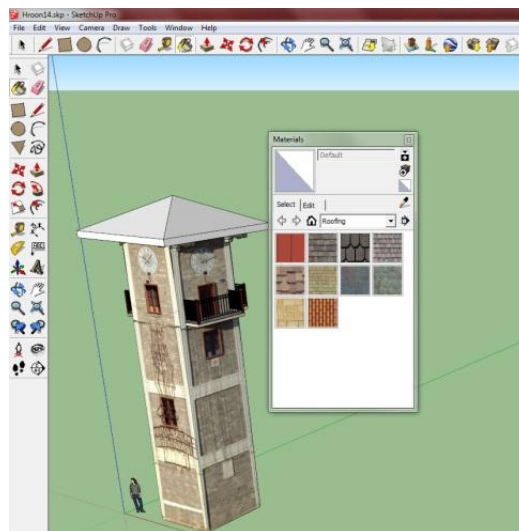
Fig. 1. Surfaces of the building
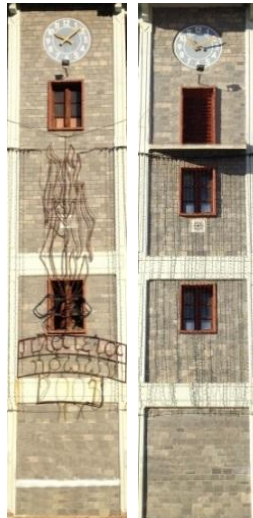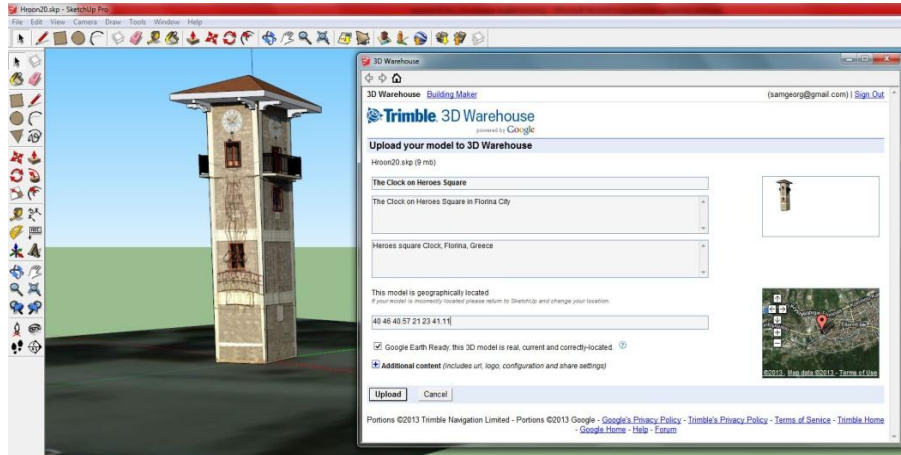

Fig. 2. Processed images
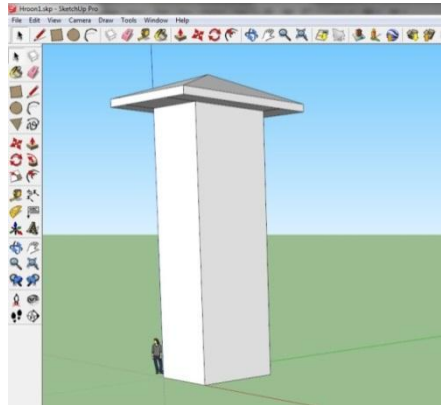
Fig. 3. 3D outline

Fig. 4. Inserting images in surfaces

Fig. 5. Adding textures and colors

Fig. 6. Uploading the model on 3D Warehouse

Fig. 7. The monument in Google earth

4   Conclusions

The more distinctive features of Google SketchUp for digitizing city landmarks are that it is easy to learn and easy to use it for digitization. These features make it accessible to a large number of non-technical users all over the world. Google Earth is also available to millions of users. Both tools are free and could be used for preserving heritage by organizations with limited resources.

More complex methods exist for 3D digitization of cultural heritage [4,5,6]. Most of these methods concern complex constructions and require expensive hardware. The method described above has some limitations compared to more sophisticated techniques. Complicated drawings and surfaces are difficult to create and thus the quality of the models is inferior. The options for animation are limited to camera animation only and the rendering options are limited. Nevertheless, our proposed method has the advantages of being affordable, promptly applicable and with minimum hardware requirements.

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