AN APPROACH FOR REPRESENTATION OF HISTORICAL OBJECTS BY MEANS OF 2D WEB-BASED GIS

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ABSTRACT

On the internet, representation of the historical objects needs complex modeling methods such as 3D Cad models, VRML, and Textured Models. Due to their complexity, most users have some problems to get the 3D data via internet. Because of low internet connection and low RAM capacity, users cannot handle the intensive data easily. To simplify the modeling methods for the historical objects or monuments, we designed a new model. This research represents the whole model in two dimensions. Our aim was to reduce data amount in our 2D model approach while we tried to keep visualization quality at the similar level with the 3D data. Despite limited 2D representation, the model is capable of introducing the whole object properly. To get realistic models in the work, orthophotos of the objects are used. The objects are also presented via internet. Moreover, their attributes are added on their orthophotos. Finally, we created a Web-based GIS for historical monuments.

1.INTRODUCTION

Documentation of cultural heritage objects is not an end in itself but serves as a Historical monuments have different irregular shapes and dimensions. Some of them are mini tool to make information accessible to those (research experts or any interested persons) who cannot investigate the object itself. Different reasons can be found for the necessity of this information transfer:

- The object is not accessible to interested parties
- (e.g. rock paintings in caves).
- The object is too large or too complicated to be overlooked and it would be too time consuming to execute an own investigation.
- The object (or just a part of it) is visible only for a short period of time at its original location (as in archaeological excavations or when unearthed during civil engineering projects).
- Persons living far from the object cannot afford to visit it.
- The object is in danger of slow deterioration valid for inside of a room or a building. (environmental factors) or sudden destruction (earthquakes and other natural disasters, war and After photos are taken in the center of an object, it is vandalism) (F.Karsli, E.Ayhan, E. Tunc).

The aim of this work is to create a simple method to represent 3D objects on the internet. We handle representation in two dimensions. Although two dimensions have some restrictions, it deals with more compact data thana big amount of data.

Therefore, two-dimensional model is considered to represent 3D objects. The concept, in the paper, put forward a representation model in two dimensions.

Web-GIS is improving very fast depending on worldwide network. Users with high speed connected intenet demands more data in their PC. Therefore providers have a good opportunity to introduce their data to end users. To process this opportunity effectively, providers have to maximize modelling concept to get more audience.

Historical monuments have different irregular shapes and dimensions. Some of them are mini object while some of them are huge and complex objects. Especially the work is suitable for representations of big and complex objects.

2. REPRESENTATION OF 3D OBJECTS IN 2D FOR WEB-GIS

In the concept, an object should be represented by orthophotos. Images has got their coordinates by orderly. End of an image is start of next image. The concept is applicable for either inner or outer of an object.

2.1.Representation of the Inner of an Object

Representation of an inner of an object is mostly valid for inside of a room or a building.
After photos are taken in the center of an object, it is registered for a local coordinate system one by one.
However local coordinates must have a relation amongs orthophotos. If the object has not a rectangular shape, pictures may be taken from different places. So more good aspects can be catched for creating orthophotos. Figure 1 taking image step. Figure 2 explains registration of local coordinate system.
In Figure 1, at first image station side a, side b and side h; at third image station side e, side f and side g are taken. Therefore 8 orthophoto represents walls of the room. The local coordinates will be like following figure. (Figure 2).
Base and ceiling also are possible to represent at the local coordinate system. Base of the room places below the sides.
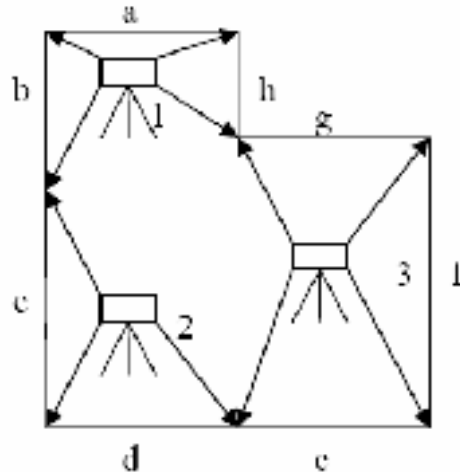Figure 3 shows a room with its ceiling and basement.
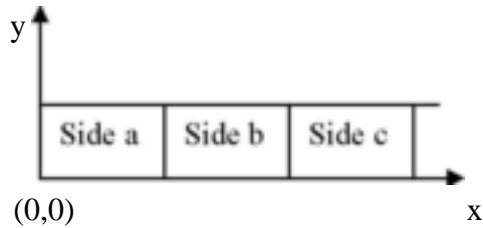

Figure 1. Taking images.
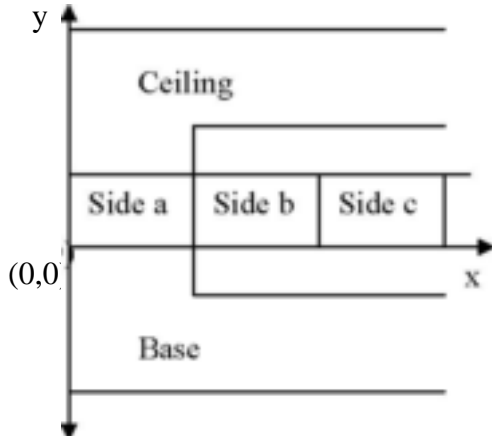
Figure 2. Local coordinate system

Figure 3. Local coordinate system represents the whole inner of the room.

2.2.Representation of the Outer of an Object

The same method is used for outer representation like inner of the object. In the outer representation, photo stations places around the object. After taking photos, orthophotos should be obtained in a local coordinate system. Figure 4 explain taking photos for an outer object.

There are five points to take photos. Five points are enough to take six sides (a, b, c, d, e, f) of the object.
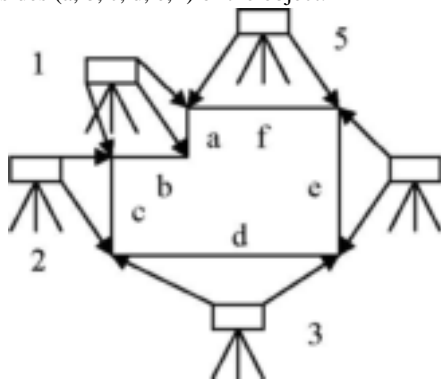

Figure 4. Taking photo for representation of the outer of an object

Local coordinate system is similar to Figure 2.

3. A CASE STUDY

We designed a case study to apply our approach. A historical object was choosen as an object. The object is Ahmet Aga Cesmesi. Ahmet Aga Cesmesi is a fountain in Istanbul. It was built in 1817.

3.1.Taking Photographs

The fountain is about a rectangular. Three photographs were taken at the first side due to their detailed surface. Six images were taken totally to create orthophotos. Ceiling of the fountain were not be taken into account in the project.
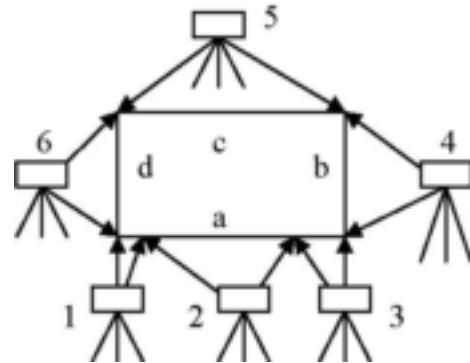

Figure 5. The Design of Ahmet Aga Fountain

The fountain include 4 sides: a, b, c, d. 'Side a' has three parts. An orthophoto was created for each part of the side a.

3.2.Creating Orthophotos and Local Coordinate System

Ortho-photos (orthographic photograph) are images that have been remapped to remove the effect of surface variations and camera position from a normal perspective photograph. Remapped orthophotos are useful aids for mapping and presentation because all the perspective distortion has been removed. This makes the photograph have the 2D geometry of a drawing. It can be useful also to change the view point (e.g. from a photo taken on the ground to one taken from a high-flying aircraft) (EOS Systems).

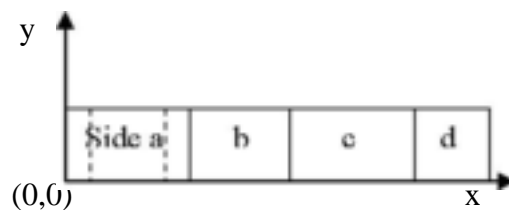After evaluating of images, six orthophotos were obtained.

Figure 6. Local coordinate system for Ahmet Aga Fountain.

Lower left corner of the side a has 0,0 coordinates. The others were stitched to each other.

3.3.Web Services

To serve our object we used ArcIMS. ArcIMS is working with Apache web server and Tomcat servlet. Some features are added. Map server is able to respond some requests. We also added a feature which gives depth degree of modeling of building. Figure 7 shows depth degree values for each side.
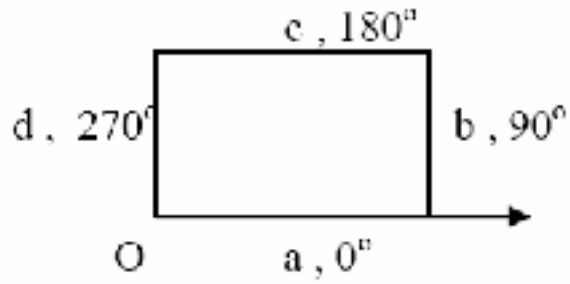
Figure 7. Depth degree values

Depth degree values give an opportunity to calculate third dimension of the modeling for any point
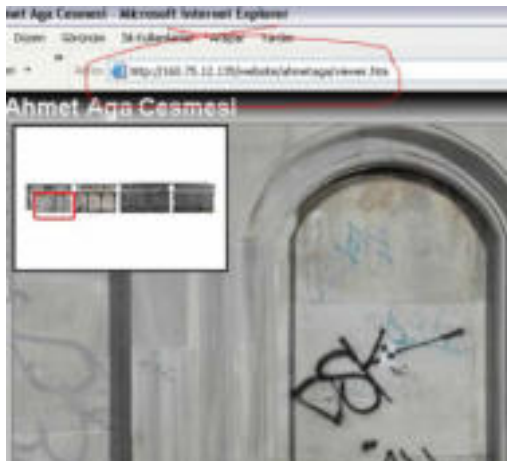.

Figure 8. Historical object on internet

Figure 9. Ahmetaga Cesmesi

4. CONCLUSION

This approach is a simple way to represent historical monuments. It builds a bridge between providers and end user. The design of modeling may be enhanced more. Project owner may add more features to database so as to give away the data effectively.

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