

Globe Based 3D GIS solutions for Virtual Heritage



Recent development of **Virtual Reality (VR)** applications allowed to explore environments that, otherwise, would be inaccessible.

the application and development of VR technologies for the creation of 3D **Cultural Heritage** (CH) representations and virtual reconstructions is a fundamental research field.

From the merger of VR and CH comes the term Virtual Heritage (VH) (Roussou, 2002).



Globe Based 3D GIS solutions for Virtual Heritage



WebGL libraries

In recent times, advances in **Information and Communication Technology (ICT)**, in particular on VR, allowed the creation of 3D CH environments for interactive navigation **on Web** (Guarnieri et al., 2010).

The development of **WebGL** (Web-based opensource graphics library for Web-browsers) allows users to navigate on Web, inside 3D environments, in an interactive way, without the requirement of any additional app or plugin.





Globe Based 3D GIS solutions for Virtual Heritage



WebGIS Globe applications

Recent advances in ICT technologies allowed the development of new **Globe applications**, which are real human-centred **WebGIS solutions**.



Globe application examples on web.

in recent times these Globe models can be integrated with the insertion of 3D city models (with buildings, roads, bridges etc..) and layers, accessible through **WMS services**, draped over the **DTM** surface.

Globe Based 3D GIS solutions for Virtual Heritage







Globe Based 3D GIS solutions for Virtual Heritage



The case study

The case study of the virtual navigation model of the **Manfredonic Castle of Mussomeli.** This monumental complex was built in 1374 in Sicily on a massive rock that dominates the surrounding territory for many kilometres.





Globe Based 3D GIS solutions for Virtual Heritage



The reconstruction of the model

Preliminary operations: UAV and GNSS **survey**, **photogrammetric restitution** and **3D modelling** of the external and internal environments of the castle.





Globe Based 3D GIS solutions for Virtual Heritage

GEOINFO CONFERENCE October 1 & 2 DELFT2018

Experimented solutions

Commercial proprietary application (Terra explorer)

Free and opensource solution (Cesium)



Globe Based 3D GIS solutions for Virtual Heritage



Tested solutions – The free and open-source solution





WebGL visualization with Cesium.js library

WebGL visualization with Three.js library



Tested solutions – The free and open-source solution



Globe Based 3D GIS solutions for Virtual Heritage



Tested solutions – The commercial proprietary solution





Globe Based 3D GIS solutions for Virtual Heritage



The experimentation- Comparison between the two solutions

FEATURES (Highlights and Issues)	OPEN SOURCE (WebGL)	COMMERCIAL PROPRIETARY (TERRA EXPLORER)
Free navigation around the model	\blacklozenge	\blacklozenge
System of popup Information windows	\blacklozenge	\blacklozenge
Indoor and outdoor environments in the same visualization		\blacklozenge
Possible WMS data implementation	•	\bullet
Possibilities of crashes or partial loadings	•	
Difficoulties of loading oversized textures		\blacklozenge
Software installation required		\blacklozenge
Rigid limitations on 3D model format files		\blacklozenge



Globe Based 3D GIS solutions for Virtual Heritage



Conclusions

- The construction of the 3D GIS virtual environment is simpler using the commercial software because it uses a graphic interface for structuring the system;
- considering the user needs, probably the open-source solution is more direct because no installation of any app is required;
- Both of the solutions represent some **limitations about the dimensions** of 3D models because the possibilities of visualization crashes or loading issues are strongly linked to the increment of the number of polygons.
- These experimentations represent different solutions in the perspective of the creation of a **standard model** for the virtual fruition of CH

The studied solutions of this work are available and navigable online connecting to **GISLab Website** at the address: http://gislab.dirap.unipa.it/mussomeli/





Globe Based 3D GIS solutions for Virtual Heritage



Thank you for your attention!!!





Globe Based 3D GIS solutions for Virtual Heritage

