3D MODELING OF THE U.S.A.M.V. CLUJ-NAPOCA CAMPUS USING INTEGRATED SYSTEM GOOGLE EARTH – SKETCHUP AND 3D WAREHOUSE

Sălăgean T., M. Dîrja, M. Ortelecan, N. Pop, Jutka Deak
Faculty of Horticulture, University of Agricultural Sciences and Veterinary Medicine, 3-5 Mănăştur Street, 400372, Cluj-Napoca, Romania; salagean_tudor@hotmail.com

Abstract. *The paper treats study on "Virtual globe" systems that focuses on the benefits and risks that may occur from their use, possible solutions to protect users. For a concrete example of using a "Virtual globe" system, were chosen Google Earth and Google SketchUp software, including a case study treating 3D modeling of University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca campus. During the achievement of this objective will treat the stages that lead to the 3D model: data imports from Google Earth and topographical plans in DWG format, how to rebuild the areas and buildings, texturing, shading studies using geographical location, using styles offered by SketchUp to visualize the final model.*

Keywords: Virtual, SketchUp, geographic information**,** 3D modelling

INTRODUCTION

'Virtual globe' software systems such as Google Earth are growing rapidly in popularity as a way to visualize and share 3D environmental data. Scientists and environmental professionals, many of whom are new to 3D modelling and visual communications, are beginning routinely to use such techniques in their work.

The virtual globe type of visualization crosses several key thresholds in communicating scientific information, using conventional spatial data and geographic information science.

For members of the public, the attraction of virtual globes lies in the realism offered by them, the sensation of flying to or above the earth, the ability to see their homes or other significant locations and the sense of control over their own data medium: the navigation, visible data manipulation, adding their own data so they can be viewed by others.

Besides the advantages offered by these software systems and the enthusiasm created among users, must be also specified some disadvantages:

- Reliability issues - different views and answers on the data of the same project obtained by different users;
- Possible reduction in the validity of views;
- High risk that very realistic views include a large dose of subjectivity;
- If the 3D data are available for buildings in cities, there may be discrepancies between 3D shapes and satellite images or draped ortophotographic images.

MATERIAL AND METHOD

Research methods used are:

- Describe the current situation of UASVM Cluj-Napoca campus – data on the location, history;
- Updating the topographic study - which does not include the new buildings constructed on campus in recent years - the updating was made using data taken from Google Earth;
- Shading study based on geographical location (Geo-location);
- Landscape reconstruction of the campus terrain using two methods: (1) import of the topographic plan in DWG format, raising the level curves to the corresponding altitude, making surfaces using From Contours tool, texture, etc.; (2) import data from Google Earth using Add Location tool and the Slicer plug-in for terrain reconstruction.

RESULTS AND DISCUSSION

To obtain an accurate and realistic 3D model, besides the data provided by Google Earth, were also used the topographic plan and photo surveys of UASVM Cluj-Napoca campus.

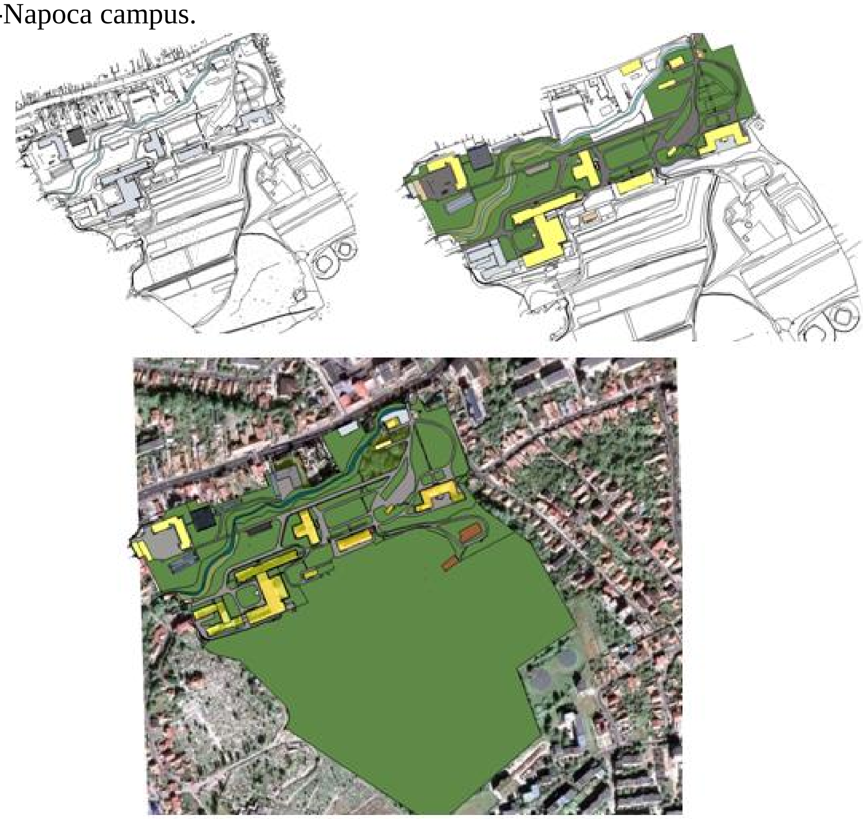

Fig. 1. Progressive evolution of surface reconstruction based on the DWG file

3D modeling stages of UASVM Cluj-Napoca campus using the Google Earth - SketchUp - 3D Warehouse are:

1. Import of the topographic plan (DWG format) in SketchUp.
2. Cleaning the additional elements from the plan that are not necessarily needed in the 3D modeling.
3. Surface reconstruction by joining lines, applying textures and import of additional data from Google Earth (Fig. 1). One of the disadvantages of using SketchUp software is the fact that by importing DWG files are recognized only lines, often this requires a laborious work to obtain surfaces that allow 3D modeling.
4. Filling the missing data on the topographic plan using data taken from Google Earth (eg. new buildings constructed recently that do not appear on the topographic plan, so they were located and restored by overlaying the plan on the geo-location imported from Google Earth (Fig. 2).

Fig. 2. Reconstruction of new buildings with data taken from Google Earth

5. Importing data from Google Earth in SKP file using Add Location tool. SketchUp Pro 8 allows direct import of these data in SKP file, a restrictive condition in this process is that the user must be connected to the Internet.
6. Restoring the landscape of UASVM Cluj-Napoca campus using data provided by Google Earth and SketchUp tools, because the terrain reconstruction using a topographic plan requires a laborious work and can be inaccurate when the level lines are not represented. The only drawback is that data taken from Google Earth do not allow terrain reconstruction in the smallest details: slopes with small tilt, etc..

To substantiate the model and to obtain the level lines were used two methods:

- Intersecting the model taken from Google Earth with a cube built using the SketchUp tool Group and Intersect Faces With Model (Fig. 3)

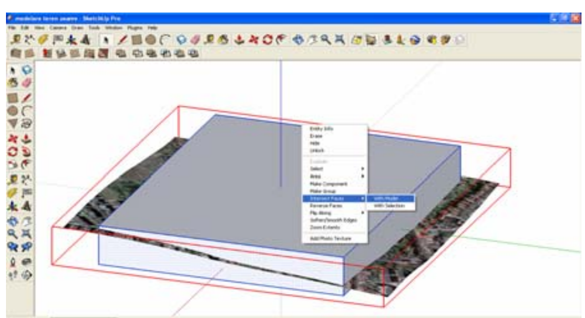

Fig. 3. Terrain reconstruction using data taken from Google Earth and SketchUp tools

- Obtaining the level lines using Slicer plugin. The level lines are obtained following a few essential steps: the previously obtained model is grouped, select the Plugins Slicer and settings are related to the distance between level lines, their thickness, orientation, texture, rendering mode (Fig. 4).

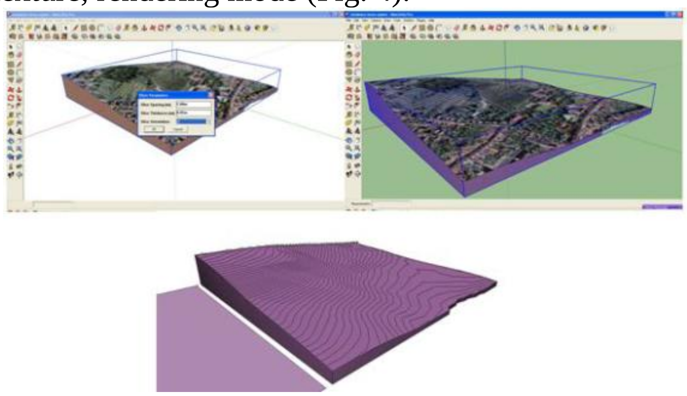

Fig. 4. Terrain and level lines obtained using Slicer plugin

7. 3D lifting of buildings using Push / Pull: the areas are selected, the heights values are introduced and the buildings are lifted. The process is extremely simple, accurate and efficient (Fig. 5).

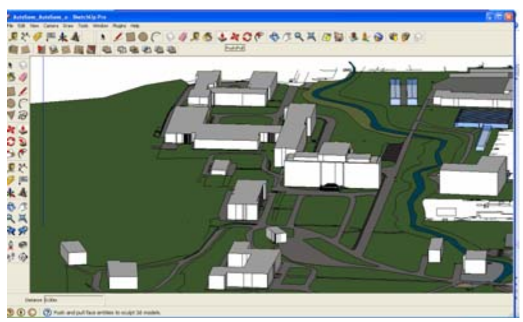

Fig. 5. Lifting the building using the Push/Pull tool

8. Grouping buildings and their position on the terrain previously modeled. Grouping each building provides a better and precise location on the modeled terrain. Drop at Intersection option allows positioning the buildings depending on the existing bumps (Fig. 6).

Fig. 6. Building location using the option Drop at Intersection

9. Shading study. There are two ways of saving the study of shading: JPG, after saving images after each setting of date and time; as a film, with Add Scene - to create different scenes for each setting individually. The necessary geographical coordinates are taken directly from Google Earth by SketchUp once a location has been established (Fig. 7).

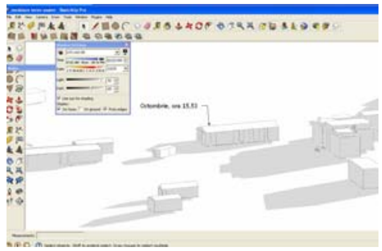

Fig. 7. Shading study for the UASVM Cluj-Napoca campus

10. Detailing the buildings by applying textures using images of the existing situation (Fig. 8).

Fig. 8. Obtaining a building that plays 3D reality in a faithful way using import file as JPG and their application as texture

CONCLUSIONS

Virtual GlobeS offers benefits of accessibility, interactivity and involvement in the viewing environment, the promise of greater importance on the views provided to users, better precision 3D images and accelerated learning skills. Technology has the potential to democratize the planning process to an unprecedented measure, in accordance with the basic principles of the GIS participatory process to allow multiple reviews and interpretations.

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