SPATIAL DATA MULTI-DIMENSIONAL ACQUISITION USING DIGITAL PANORAMIC IMAGES

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***Abstract**: In the past decade, data acquisition possibilities multidimensional were quickly improved method for determining the spatial position, models multi-dimensional objects using panoramic images. The visualization model thus created plays an important role in various applications such as urban planning, documenting cultural heritage and animation, and documenting historic buildings and sites, etc. Multi-dimensional 2D, 3D or 4D models are also a new way of presenting spatial data as a final product for measuring objects in the field. Capturing images and viewing them will soon be a core technology within the geospatial domain. It will not be based on field measurements where individual points are measured and time spent on the ground is lower, increased flexibility but the new results will provide new opportunities and a strong competitive advantage.*
This article describes an approach using panoramic images captured by V10 Trimble technology to enhance the details and realism of the geospatial data set in order to build 2D, 3D or 4D multi-dimensional models and virtual reality applications.

Keywords: *multi-dimensional models, data spatial, panoramic image, geospatial data*

1. Introduction

Recently, with a lot of interest, it was demonstrated the understanding of a real-world object by taking 3D images of it using panoramic images. A realistic impression of 3D geometric data can be generated by imposing real-color textures captured simultaneously by a color-coded camera. 3D modelling of spatial information has a characteristic for observing the entire image area by moving a point of sight or rotating 3D models. [1]

Graphic panoramas are valuable tools for real 3D viewing in an easy-to-understand way. In cartography, panoramic techniques have been used for centuries to represent three-dimensional objects (buildings, mountains, etc.) in a two-dimensional drawing. Figure 1 shows an example of a modern panoramic map used for tourist purposes. Digital adaptation is presented in Figure 2 where the same region is observed by a panoramic camera in which the images are presented over the internet in real time. The example also shows that the "panorama" expression is used for panoramic views at angles up to 360 °.[2]

Figure 1 Mapping panorama (Lenggries, Germania) [2]

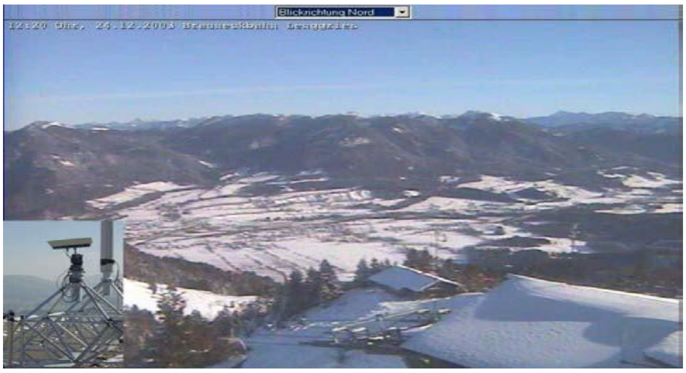

Figure 2 Panoramic camera and images accessible on the Internet in real time [2]

This ability to measure performance is one of the most important results of new geospatial technologies by developing an integrated camera system that captures 360 ° digital panoramic images for visual documentation and environmental measurements. When we talk about geospatial technology as a measuring instrument, most people think it's about measuring positions and sizes in two or three dimensions. But geospatial systems support other, equally tangible types of measurement as well.

Combining the position with other data such as time, driver logs, inventory, vehicle information and customer feedback, an organization can develop a detailed view of the activities and productivity of assets and resources.

Trimble company recently developed technology for capturing panoramic images Trimble Rover Imaging V10 that produces 360 ° panoramic images and geospatial data acquisition captures necessary information in order to make virtual reality applications. This ability to measure performance is one of the most important results of new geospatial technologies. Geospatial information can be used to improve efficiency in designing, 3D urban plans, virtual reality applications and use in transport infrastructure.

In this context, in the paper, we will describes an approach using panoramic images captured by V10 Trimble technology to enhance the details and realism of the geospatial data set in order to build 2D, 3D or 4D multi-dimensional models and virtual reality applications , of a building in the city of Timisoara.

2. Materials and Methods

In order to acquire the geospatial data of a building Mc Donald's located on Arieş Street (figure 3) we will use the panoramic images resulting from the measurements made with the Trimble V10 Imaging Rover.

Figure 3 Positioning the building Mc Donald's on Google Maps

Trimble V10 Imaging Rover with Trimble VISION ™ technology is an integrated camera system that captures digital panoramas for visual documentation and environmental measurements. The twelve-seven panorama-calibrated cameras and five Trimble V10-integrated landplanes provide full view of the lens and documentation with a 60 MP panorama image that can be used for photogrammetric measurements. [3]

This system allows the use of existing familiar workflows to create both traditional and new results for customers. The Trimble V10 Trimble Business Center allows geospatial professionals to produce better and faster results. Data collected with Trimble V10 is easier and faster to generate 3D models and images than when working with large cloud point files. Trimble V10 is a geospatial solution for any type of work where visual design of the project is required in the field.

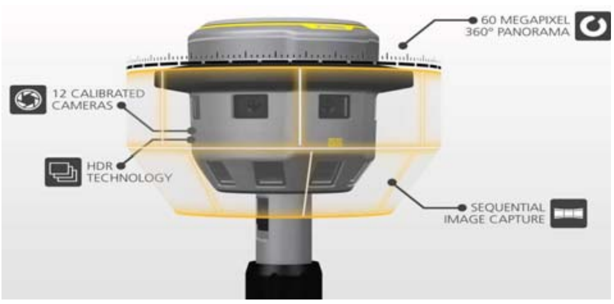

Figure4. Trimble V10 Imaging Rover (3)

Studying the geometry of the construction and comparing with the measurement principle using the Trimble V10 Imaging Rover, for a more accurate measurement, a total of 20 stations were needed, each with panoramic images, X, Y, Z coordinates of the stationary point. Each station was assigned a name from V1 to V20 and a code: ps. The measurement method selected in Trimble Access was Measurement Points. The type of heel with this measured height has been set to the bottom of the Trimble V10 Imaging Rover; Height was automatically selected by software of 1.952 m. The measurements were performed with a fixed solution having a horizontal average error is 0.011 m and 0.023 m drop, and the average of the 11 satellites visible.


Figure 5. Measurement with Trimble V10 Imaging Rover

Figure 6. Panoramic images during the measurements with Trimble V10 Imaging Rover

3. Results and Discussion

At the office, we combined the images into the Trimble Business Center software and used common photogrammetry tools to develop 3D positions for the points and objects in the photos.

To ensure the highest level of accuracy, it is important that we compensate the photo station and tilt values before using reference pictures to perform photogrammetric measurements. An automatic compensation of the connection points is the most common for the adaptation of terrestrial photo stations, which typically gives us excellent compensation results. For this compensation, you will change the configuration type for terrestrial stations from Raw Sensor Values to Full Orientation.

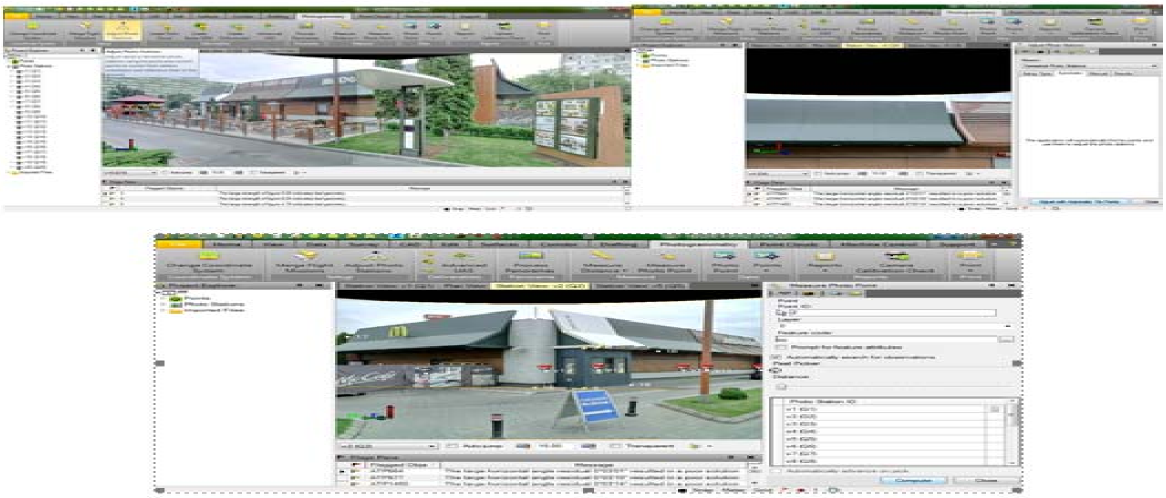

Figure 7. Compensation of photogrammetric stations

In order to create and visualize the 3D model, we will export panoramic images together with dwg or .skp or csv format (figure 8).

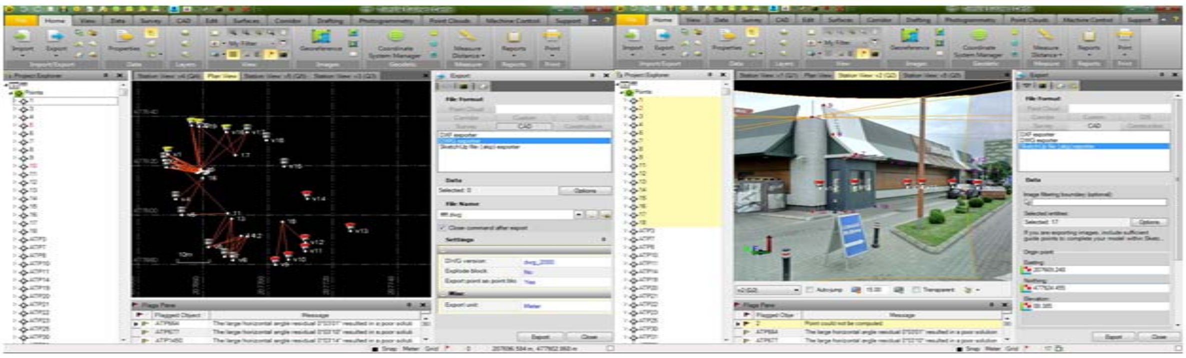

Figure 8. Exporting panoramic images and stations to formats: dwg, .skp, or .csv

The 2D and 3D texture of the construction will be done using the Trimble SketchUp software. Each minute spent for validating details and creating clear 3D drawings to explain the texture of objects will save time spent in data reprocessing. Every SketchUp model is made of just two things: edges and faces. Edges are straight lines, and faces are the 2D shapes that are created when several edges form a flat loop. Each SketchUp model consists of only two things: edges and facades. The edges are straight lines, and the facades are 2D forms that are created when multiple edges form a flat loop.

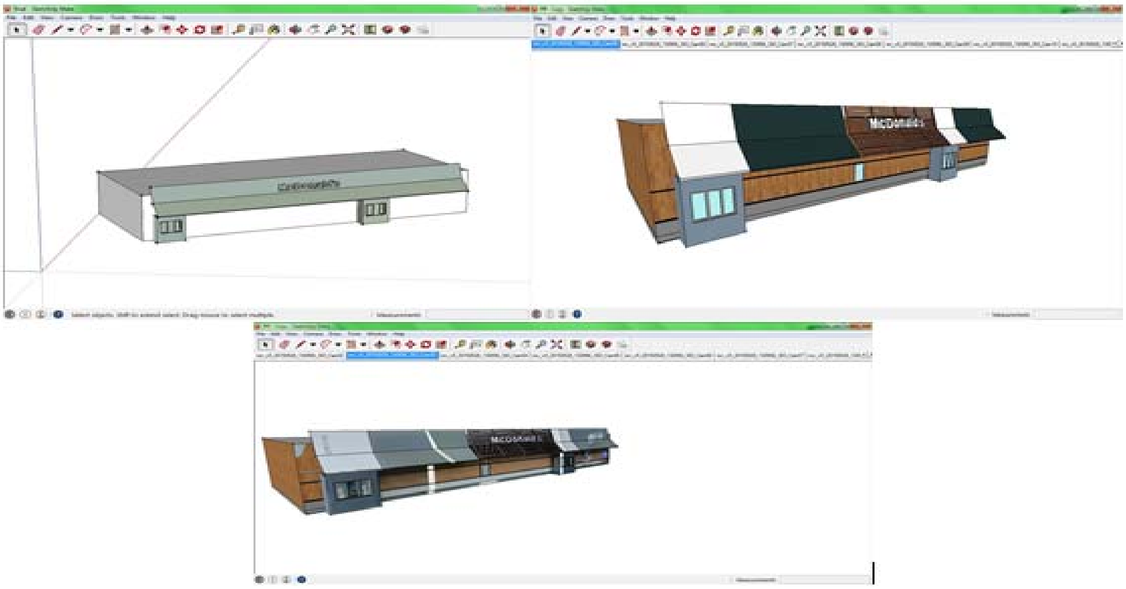

Figure 9. Overlay panoramic images over the 3D construction model

4. Conclusions

In this paper, the results show that this method of acquiring geospatial data using panoramic images establishes topological relationships between surface patches and also obtains the reasonable structure of the studied objects.

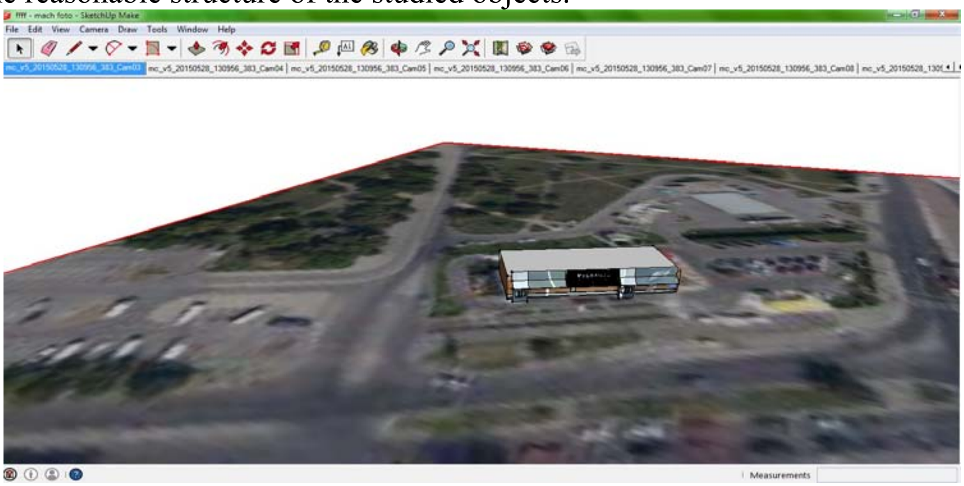

Figure 10. Geo-referenced building 3D model using Google Earth

This section include o short summary of the main achievements of the research. The reader should have a good idea of what you have investigated and discovered even though the specific details of how the work was done. The potential for future work in image-based urban models in general and in 3D image spaces, in particular, is enormous.[4]

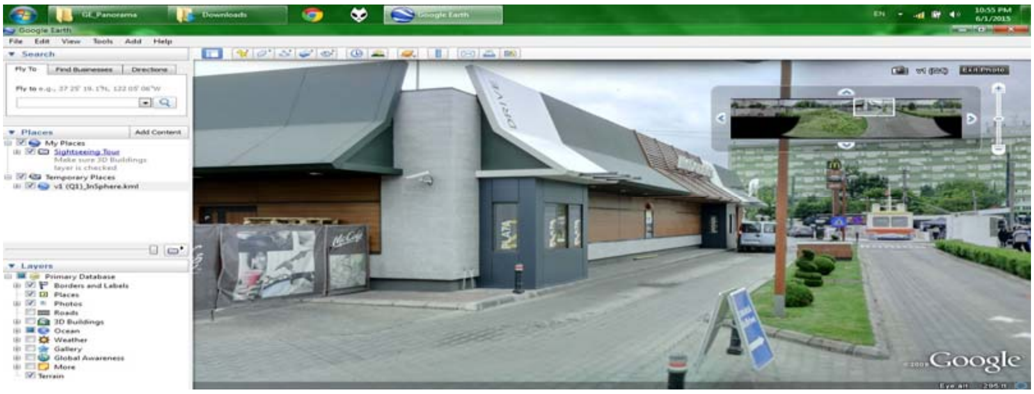

Figure 10. Panorama V1 in .Kml format inserted in Google Earth

However, this technology can quickly and accurately provide geospatial data, which can then be modeled in appropriate formats for effective decision making, plotting and digital growth, Virtual Real (VR) development models for public participation and community support based on reconstruction projects. [5]

5. References

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