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Geotechnology – civil engineering impact and environment

MEASURING AND DETERMINING THE DYNAMIC DEFORMATION OF CONSTRUCTIONS USING MODERN TECHNOLOGIES AND TECHNIQUES

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Abstract. It is known that long-term movements of structures and constructions can be monitored using topographical instruments. Measurements are taken over minutes, hours, weeks, months or years to a number of targets to measure settlement, displacement or long-term permanent or specific deformations. At the 'Politehnica' University of Timisoara in Department of Land Measurements and Cadastre one of research area is concentrated on the dynamic deformation of structures. Monitoring equipment includes precise and modern instruments like topographical electronic levels, total stations and GPS system. A recent research about a structural bridge was measured and studied by the authors on the Power Thermal Central (CET South) in Timisoara including the usage of integrated system GPS/TPS Leica 1200, a total robotical station and a RTK GPS system. The total station results are compared with the GPS data. In this paper are outlined the results from the total station measurement and GPS sessions of the structural bridge.

Keywords: displacement, integrate system GPS/TPS, movements, monitoring, dynamic deformations.

AIMS AND BACKGROUND

The development of measuring techniques has permitted and created the possibility to observe and emphasise the behaviour of the studied buildings[1]. There are numerous classification criteria methods of research and observation of buildings and structures movements. Taking this into consideration, there have been developed criteria based on types of deformations, types of equipments and place where the equipments are situated during the observations.

By the place where equipment is located during the observations process there are two possibilities to determine the movements and deformations:

- physical methods: with the equipment located inside the building; in this case the equipment moves at the same time with the building so relative movements and deformations can be evaluated;

[*] For correspondence.

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STUDYING THE MOVEMENT OF BUILDINGS AND DEVELOPING MODELS TO DETERMINE REAL SETTLEMENTS

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Abstract. The development of measuring techniques has allowed and created the possibility of determining and highlighting even the finest movements of a building or industrial structure. Even so, the movements of some building elements are rather difficult to find. While choosing the best method or model to determine the movements and deformations of buildings, the anticipatory knowledge which refers to the type of movement at the most probable moment when it happens is not known and not taken into consideration or, in other cases, even impossible to determine. In this paper, the authors suggest some deformation models and give examples of their measurements and representations.

Keywords: building movements, deformations, statistical representation, topographic methods.

AIMS AND BACKGROUND

The movement and the deformation phenomena of the land surface in areas affected by terrain condition or terrain exploitation, continue to represent a complex problem of great interest regarding the implications for the protection of the environment and of constructions. The latest research leads to the conclusion that the domain of geodetic engineering and also that of surveying engineering can offer important evaluation of the affected areas and accurate monitoring for future development.

The development of measuring techniques has permitted and created the possibility to observe and highlight the behaviour of studied buildings. In time, deformations have a high impact on engineering structures (such as dams, bridges, high buildings, etc.) due to environmental factors such as changes of ground water level, tidal phenomena, tectonic phenomena, etc. or anthropic factors. This is why monitoring the dynamic behaviour of large structures has always been a re-emergent topic to which geodetic engineering brings considerable input[1].

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APPLICATION OF LASER SCAN TECHNOLOGY TO LANDSLIDE MONITORING, VOLUMETRIC CALCULUS AND DEM

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ABSTRACT

A high-resolution and accurate recording of the objects in 3D space is of high importance for many subjects of different domains of interest such as monitoring landslides, archaeology, cultural heritage etc.

Traditional techniques for 3D data acquisition either restrict the size of the scanned objects or impose demands on the stability and structure of the surface.

Topographic surveys or the digital documentation of stratigraphic excavations using total stations, GPS devices or photogrammetrical methods can be a laborious task.

Terrestrial 3D imaging laser scanning forms a method to acquire a large number of precise data points in 3D space representing the surface of the objects under investigation. These scanners are an effective tool for the collection of data to create a digital elevation model of the topography of a site as well as of the surface of a single archaeological deposit.

Laser scanning is a method that is applicable to document historic buildings or standing archaeological features as walls, columns, monumental statues as well as caves, abris, megaliths or carved rock formations. The acquired data can be used for documentation purposes only, but the further processing provides the possibility for virtual reality modeling for public presentation, restoration planning or virtual reconstruction. Laser scanning technology and the final deliverable, materialized as the three dimensional model of the terrain, emphasises the importance and the applicability of geodesy in giving proactive solutions to engineering problems.

Keywords: laser scan, 3D modeling, DEM, landslides, volumetric calculus

INTRODUCTION

Landslide activity is strongly related to environmental changes, such as climate conditions and land cover. Moreover landslides are, among natural hazards, one of the main sources of loss for life and property. These are the reasons why slope instability has been included amongst the 27 Geoindicators in the report by the Cogeoenvironment Working Group on Geoindicators [COGEOENVIRONMENT (IUGS) Working Group on Geoindicators 1995].

TERRESTRIAL LASER SCANNING USED FOR 3D MODELING

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ABSTRACT

Nowadays, the graphic information needed by the specialists in different engineering fields or in the cultural heritage sector has to be very accurate. Thus can be explained the widespread usage of the three - dimensional data, because, first of all, it offers a better visualization of the studied object and also, facilitates a better understanding of the behaviour of the 3D model under specified loads by means of layouts showing cross sections and elevations.

The aim of this paper is to bring forward the stages that must be followed when using terrestrial scan station in order to obtain the 3D model of a chapel, efficacious in assessment and monitoring of churches, part of cultural heritage, thus contributing to historic conservation.

Moreover, by means of presenting state of the art technology, such as the Leica Scan Station C10 with unprecedented versatility and major productivity for as-built and topographic surveys, the paper shows its high level of topicality.

This paper has as goal, beside its educational purpose, the presentation of methods and materials specific for terrestrial laser scanning technology that are in close connection with surveying engineering and have to be used for 3D – and terrain modeling. These are Leica C 10 Scan Station and its equipments: standard tripod, standard tribrach, laser plummet and instrument height meter and the Leica Cyclone 7.1.1 software. It describes both the fieldwork and the processing of the measured data.

The value of this paper lies in stressing the importance of the terrestrial 3D laser scanners and the practical applications they have in many domains, such as: historic conservation, by means of assessment and monitoring of churches, part of cultural heritage, architecture, land surveying, archaeological studies, bridge structures, assessing the risk of slope instability along transport corridors and highway surveys.

Keywords: 3D modeling, point cloud, laser scanning, historic conservation, terrestrial scan station.

INTRODUCTION

Preserving cultural heritage and historic sites is an important problem. The advent of new digital 3D scanning devices has provided new means to preserve these sites digitally, and to preserve the historic record by building geometric and photorealistic 3D models. [1] The most obvious motives for 3D modeling of heritage sites are documenting historic buildings and monuments for reconstruction or restoration if they

PROCESSING OF ENVIRONMENTAL DATA USING DIGITAL TERRAIN MODELS FOR THE WESTERN PART OF ROMANIA

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ABSTRACT

Gridding and contouring capabilities of Surfer package have placed it among the first cartographic choices when it comes to working with tridimensional data. Over the years, DTM and Surfer users for environmental purposes included engineers, hydrologists, geologists, archaeologists, educators, students, oceanographers, biologists, medical researchers, geophysicists, climatologists etc. Everyone who wants to use the XYZ data with clarity and precision will benefit from features of the Surfer package.

This paper aims to present 3D modeling using Surfer for a very large land area, namely the Banat area – western Romania, to highlight the importance of such an approach for topography, modern engineering and cartography. The authors provide pre-processing and post-processing steps, visualize simulation outputs and manage data exchange.

The contours generated by Surfer can be individualized according to requirements, by changing the ranges, thickness, colours and labelling of the contours. The surfaces can be coloured according to a scale of colours or shaded parts, for the purpose of creating plans prepared for printing and publishing. Labelling of the contours is realized dependent on user specified ranges, or by positioning it along the contour line.

Surfer provides multiple methods of interpolation and the possibility of controlling calculation parameters. Surfer interpolates quickly and accurately regular or irregular positioned values in a network with fixed gap. The software has twelve interpolation methods implemented for generating the interpolation file that best represents the data.

Processing of 3D environmental data for DTM generation is very useful for data management and analysis, allowing a better understanding and a better management of air pollution and environmental quality problems.

Keywords: DTM, cartography, contour lines, Surfer, air pollution.

INTRODUCTION

Environmental protection, as a relationship of mankind with nature, has evolved in time as the awareness on both natural and anthropic activities, their irreversible effects and dramatic consequences to the modified natural environment. [1], [2] Air pollution is a major concern for all nations, with a higher or lower development level. The rapid increase of the industry sector and urban development had generated substantial quantities of substances and poisonous materials, which are, mostly evacuated in the atmosphere, in addition the traffic and mobility necessity determined the developing of infrastructures that allow the different fleet, mostly equipped with internal combustion engines, to act. The human society is not recognizing that the environment has only a limited capacity to process all its waste, without major changes. Each of us is a polluter but also a victim of pollution. [3], [4]

Environmental data modelling can be performed by a number of computer programs that are available as open-source software or as commercial software tools. Recent computer programs require a wide range of input information about pollution sources, meteorological conditions and complex terrain properties. [5] Thus, the authors present a complex project "EnviroBanat – Water and air quality in Banat area and Danube tributaries" developed to manage environmental data, provide pre-processing and post-processing steps, visualize simulation outputs and manage data exchange. In accordance with the new environmental and sustainable development policies imposed by the EU expressed by Air Quality Framework Directive 96/62/EC, public health impact of air pollution exposure which depends on estimates of air pollutant concentrations must be assessed.

Surfer represents one of the best alternatives when it comes to software packages intended for the generation of contours and 3D plans of various types. Surfer turns XYZ data in high quality editable results, with multiple topics, such as: contours, surface, spatial network, terrain model, virtual spatial image, vector plans, layout plans. [6]

In order to generate any kind of plans, Surfer offers extensive and ingenious individualization options as for example: importing basic plan in common graphics formats; overlay plans of various types; combining different types of plans; scaling; change point of observation; applying text, polylines, polygons and symbols; exporting graphics in many formats.

By opening the program, it displays a window of the classic menu with the worksheet (Fig. 1) in the centre. The main menu contains options specific to programs running under Windows, i.e.: File, Edit, View, Tools, Window, and Help and specific program features namely: Draw, Arrange, Grid, Map. Surfer comprises three types of document Windows: the plot, the work window (worksheet) and node editing window of gridding. The maps are prepared and created in the plot. The worksheet window displays, edits, converts and saves the data in a tabular format. The editor for the node gridding displays and edits the Z values for the selected grid. The user interface of the program includes title bar, menu bar, tabbed window, toolbars, the object manager and the status bar.

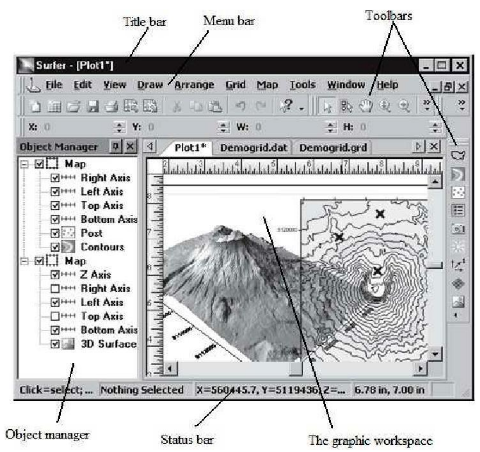


Figure 1. Surfer worksheet

3D modeling of the Banat area using the above described software solution was a complex process that started with the use of 19 sheets of map, scale 1:100.000 (Fig. 2), that have been introduced in AutoCad, georeferenced and vectorised with the view of obtaining the contours (Fig. 3). For the case study, the processing followed two directions: generating the grid with a gap of 1000 and a gap of 5000.

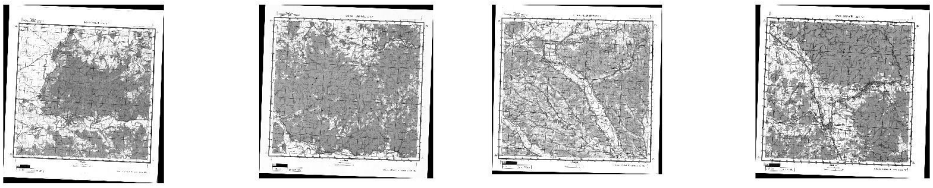
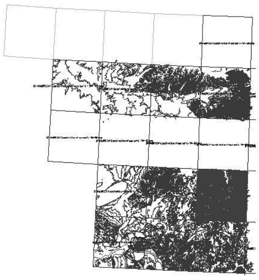


Figure 2. Maps that have been georeferenced and vectorized

Using the program Dxf2xyz the points' coordinates of the polyline forming the contours have been extracted, saved in a csv type file and imported into Surfer to obtain the digital terrain model.



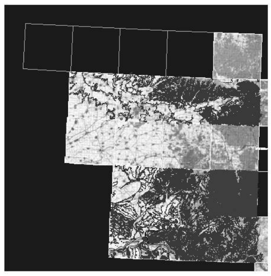


Figure 3. Georeferencing the maps Vectorizing the contours on maps

GRIDDING METHODS

Most applications create (*. grd) files based on X, Y, Z (Fig. 4). These files are used later for realizing plans.

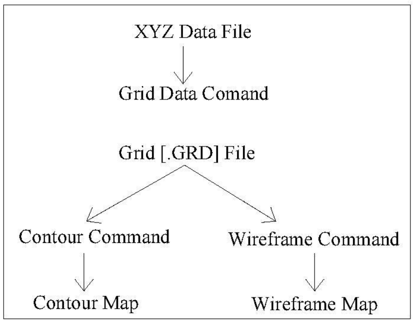


Figure 4. Scheme of the workflow

The digital terrain model is based on grid files that are necessary for the production of grid-based maps. These include maps with contours, maps with imagery, shaded relief maps, vector maps, 3D surfaces and wireframe 3D maps.

If specific information regarding the data set does not exist, it is recommended to use the gridding method of the software by interpolating with a linear variogram. This method has been chosen as custom as it is appropriate for gridding a variety of data sets. However, the method does not always lead to the desired results with each set of data, therefore it is sometimes recommended to consider other gridding methods.

Faults are defined during data gridding. The data on one side of the fault are not directly used to gridding the other side of the fault. When the gridding algorithm encounters a breakline, any data point situated directly on the line will take precedence given by an interpolated value. Breaklines are used to define beds of rivers, ridges, or other interruption of gradient. Unlike faults, breaklines do not represent barriers to the flow of information, and the gridding algorithm goes over the line to use the data of a point on the other side of the line.

The gridding methods which accept faults are: Inverse Distance to a Power, Minimum Curvature, Nearest Neighbour and Data Metrics. Breaklines are accepted by the following gridding methods: Inverse Distance to a Power, Kriging, Minimum Curvature, Nearest Neighbour, Radial Basis Function, Moving Average, Data Metrics and Local Polynomial.

TYPE OF MAPS OBTAINED THROUGH PROCESSING

a) Contour maps

Surfer enables complete control of parameters of contour maps. Using smart templates contour map is automatically realized, or by double-clicking on an existing map its characteristics may be adopted. The maps can be presented at any contour gap or the user can specify the values of the gap that he/she wants to appear on the map. Spaces between gaps can be filled with colours to achieve a map with high visual impact or they can be filled using grayscale for black-and-white prints.

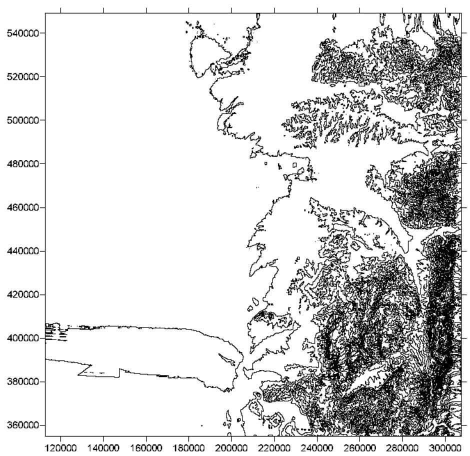
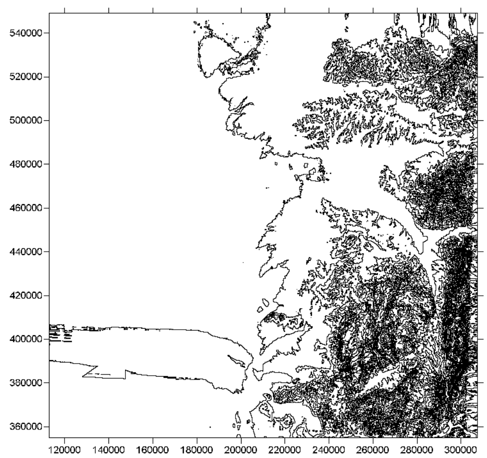


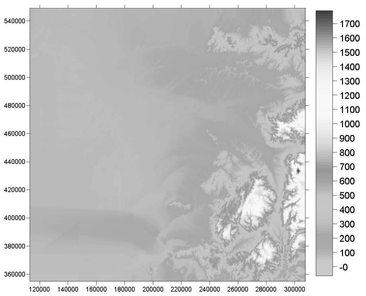
Figure 5. Contours based on the grid for Banat area with a gap of 1000



Contours based on the grid for Banat area with a gap of 5000

b) Image Maps

Surfer image maps use different colours to represent the values of the height of a grid file. Surfer combines colours automatically between the percentage values, which will lead to a smooth gradation of colours on the map. You can add colour anchors to any percentage value between 0 and 100%. To each anchor point a single colour can be attached, and the colours are automatically mixed between the adjacent anchor points. This allows the creation of colourful maps by using combinations of colours. Any colour choice for filling a map image can be used at any other map image even if associated grid files cover distinct Z intervals. Image maps can be made independently of other maps, or can be combined with other maps. They can be scaled, resized, resized and moved around.



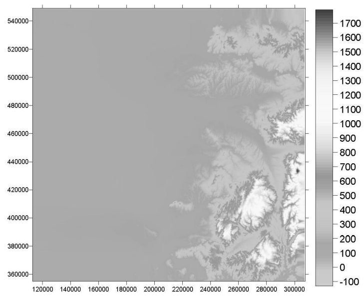
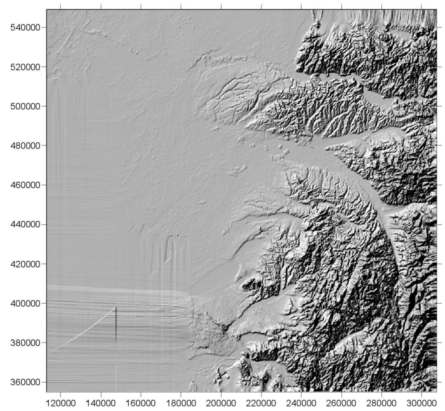


Figure 6. Image map of Banat area with a gap of 1000 and colour scale bar

Image map of Banat area with a gap of 5000 and colour scale bar

c) Shaded Relief Maps

Based on grid files shaded relief maps can be obtained. These maps, reported at a light source specified by the user, highlight using colours the value and direction of the slopes. The program determines the orientation on the surface of each grid cell and assigns unique colours for each cell. The colours of shaded relief maps are associated with an incident light on the surface, the effect is similar to sun rays reflection by a topographic surface. Shaded relief maps can be created independently of other maps or can be combined (using overlay maps command). Shaded relief maps can be scaled, resized, delimitated and moved around same as the above described maps.



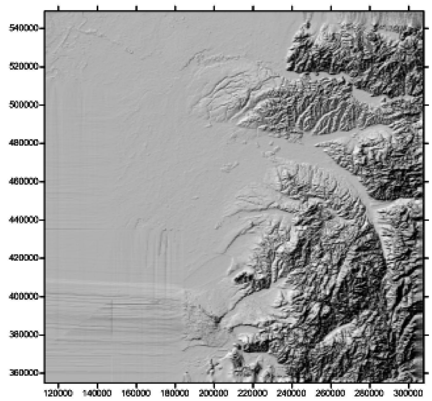


Figure 7. Shaded relief map for Banat area with a gap of 1000

Shaded relief map for Banat area with a gap of 5000

d) Vector Maps

Surfer can instantly create vector maps, showing the direction and size of data in chosen points on maps. Vector maps can be obtained on the basis of a single grid or two grids. Two components (direction and magnitude) of the vector map are automatically realized from a single grid by calculating the gradient of the represented area. In any node of the grid the direction of the arrow indicates the direction of steepest descent. Arrow size varies depending on the inclination of the slope. Vector maps with double grid use two separate grid files to determine the direction and size of vectors. Grid files contain Cartesian data and polar data. In case of Cartesian data, the grid contains data associated with the X component, and the other grid, data associated with the Y component. In case of polar data, one of the grids contains information on the angles, and the other one, information related to lengths. Vector maps, contour or wireframe maps may be overlapped to accentuate the effect of representation.

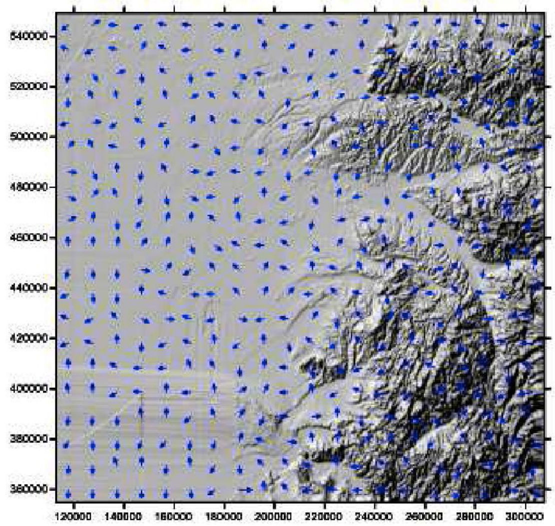


Figure 8. Vector map for Banat area with a gap of 1000

e) 3D Wireframe Maps

Wireframe Surfer maps make possible an impressive tridimensional presentation of the data. Colour zones are used, orthogonal projections or perspective with any angle of tilt and rotation and different combinations of X, Y, Z axis to produce exactly the desired surface. One can also create a contour map with coloured filling over a wireframe map, and the representation of data will have the most impact. The possibilities are endless.

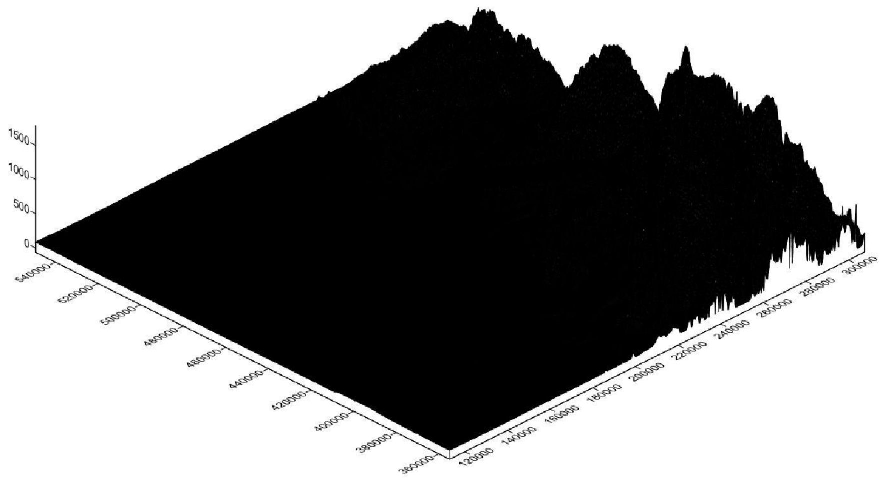


Figure 9. 3D Wireframe of Banat area with a gap of 1000

f) 3D Surface Maps

3D surface maps are tridimensional renderings of a grid file, which provides a visual interpretation of data. They can be layered with other maps with surfaces, so that the surfaces intersect each other. The surfaces can also have layers of other kinds of maps with the exception of wireframe maps. The colour, the brightness of a surface can be controlled.

3D surface map uses shading and colours for highlighting the characteristics of the data represented. By mouse clicking one can change the brightness, angle of inclination and presentation. For realizing an informative block-diagram, overlapping of several 3D surface maps can be used.

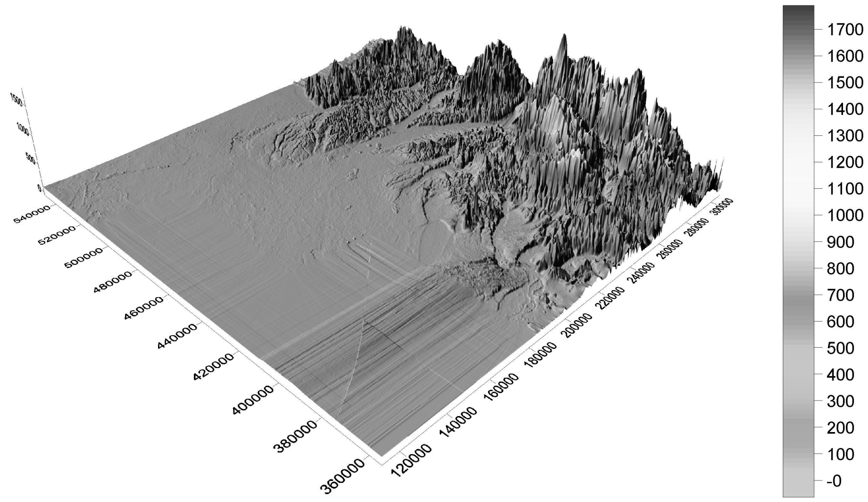


Figure 10. 3D model for Banat area with a gap of 1000 and colour scale bar for heights

ENVIRONMENTAL DATA USING DIGITAL TERRAIN MODELS FOR THE WESTERN PART OF ROMANIA

Once the DTM was created, it was further processed in a cooperation programme that had the following objectives:

- o strengthening the cross-border cooperation between Banat Universities for the benefit of the quality of life;
- o evaluating the environmental quality (air & water) in the Banat and Danube flow area;
- o protection of regional environment by means of a novel scientific tools consisting of identification of the pollution risk;
- o developing a research network for environmental evaluation;
- o creation of 2D and 3D area pollutants dispersion maps for the BANAT region;
- o identification of the high polluted hot-spots in the Banat region and potential threats on Danube water quality;
- o dissemination of know-how to specialists, young researchers, population and authorities. [7]

As regards the air pollutants considered in the project, the CO (carbon monoxide), NO (Nitrogen Oxides), NO2, O3, SO2 (Sulfur oxides), PM10 (Particulate matter), Benzene, Toluene, Xylene (O-xylene, M-xylene, P-xylene), Etilbenzene concentrations in ambient air have been measured and available at 1 hour mean concentration. All the data is available for any interested parties by means of project webpage. [8]

CONCLUSION

The 3D model presented has scientific and practical value and can be used firstly, for an overall analysis of the area, as well as for subsequent processing of specialists from related domains, for example adding air currents, air pollution, snow depth, geologic layers, environmental quality problems etc.

The advantages of using Surfer software for processing of environmental data:

- user-friendly interface, no need for advanced knowledge of 3D modelling;
- realizing suggestive 3D models that have a powerful visual impact given by the colour scale bars for heights;
- possibility of editing, creating and eliminating individual elements of the base map;
- calculating surfaces and lengths for polylines and polygons;
- exporting the maps using different formats, such as: bln, bmp, bna, bw, cgm, 3d dxf, dxf, emf, eps, gif, gsb, jpeg, jpg, mif, pcx, pdf raster, pdf vector, png, pnm/ppm/pgm/pbm, ras, rgb, rgba, 3d shp, shp, sun, tga, tif, tiff, wmf şi ximg;
- automatically saving digitized coordinates into bln or ascii files;
- printing using any plotter or printer supported by Windows.

There are also some disadvantages of processing the environmental data using Surfer:

- processing the digital terrain model using a gap of 5000 involves all computer's resources even though the laptop used was performant: processor Intel Core 7 and 8Gb RAM;
- long time for processing the grid using a gap of 5000.

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Experimental and numerical evaluation of an RBS coupling beam for moment-resisting steel frames in seismic areas

Beams with a span-to-depth ratio < 4 are not very common in the design of moment-resisting frames. For such beams, the shear stresses may become a controlling factor in the design, as the moment capacity is influenced by the presence of the shear. This is an important matter when such a beam is part of a seismic resisting system that is designed according to the dissipative concept. In this case the contribution from the shear force affects the dissipation capacity and plastic mechanism. This paper presents the test-based evaluation of moment frames with short beams and reduced beam section (RBS) connections, for the purpose of exploring the application of the plastic hinge model. Full-scale specimens, taken from an 18-storey building, have been tested. The test results and their interpretation are summarized here.

1 Introduction

Owing to their inherent ductility, moment-resisting frames are often used in systems resisting seismic forces. Inelastic behaviour is intended to be accommodated through plastic hinges in beams near the beam-to-column connections, and also at column bases. Although considered as deemed-to-comply connections, welded beam-to-column connections have experienced serious damage and even failures during strong seismic events. These failures have included fractures of the beam flange-to-column flange groove welds, cracks in column flanges and cracks through the column section [1]. To reduce the risk of the brittle failure of such connections, either connection strengthening or beam weakening can be applied. The first approach consists of providing sufficient connection overstrength, e.g. by means of haunches or cover plates. The second approach can benefit from the "reduced beam section" (RBS) or "dog-bone" concept, initially proposed by *Plumier* [9] and then developed and patented by ARBED, Luxembourg. (In 1995 ARBED waived all patent and claim rights associated with RBS for the benefit of the structural design community.)

Proper detailing of the RBS, including flange cut-outs and beam-to-column welds, is needed to ensure the formation of plastic hinges in the reduced zones.

It is economical to keep the width of bays within certain limits because long bays make the structure flexible and therefore increase the drift, which may control the design. On the other hand, short bays can reduce the dissipation capacity due to the presence of large shear forces. As a result, the connection qualification specifies minimum span-to-depth ratios to be used for moment frame connections. When prequalified connections are utilized outside the parametric limitations, project-specific qualification must be performed to permit the prediction of behaviour and acceptance criteria [1].

This paper presents part of a research project that was carried out to check the validity of the moment frame connections of an 18-storey structure. The paper describes the calibration of

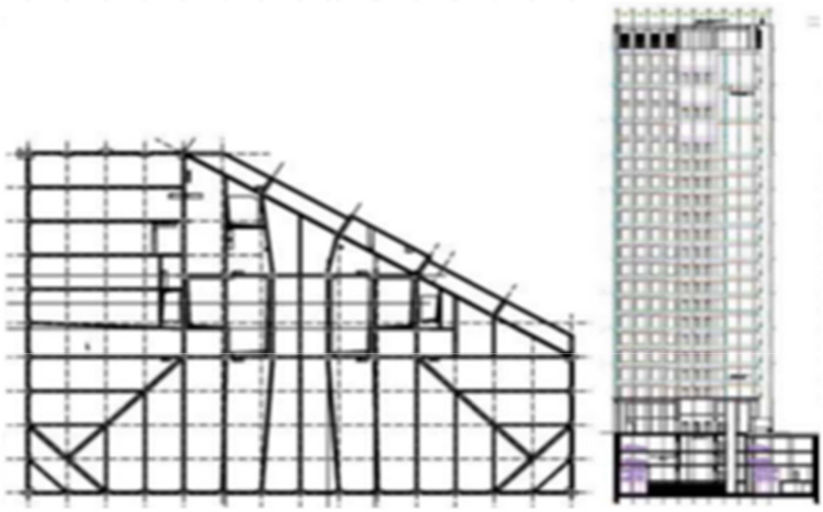

Fig. 1. Plan and elevation of building

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THE CONCEPT OF SUSTAINABLE DEVELOPMENT APPLIED TO RETECHNOLOGY A HYDROELECTRIC POWER PLANT

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Abstract: *The world where we live is in constant changing. The concept of sustainable development, through the fact that it refers to the optimal resources management that can be efficiently and on long term utilized, is about limiting the effects of human activity towards the environment. Considering that domestic and industrial activities are based in a very large proportion on electricity, the way of its production represents an important concern. This is an important issue because Romania is a country which has renewable energy sources, which are not exploited at the optimal utilization capacity.*
To unlock the potential of renewable sources is needed an energy strategy that leverages these renewable energy sources and that our country to align with the current European trends. Besides of implementing the electric energy generating solutions through alternative solutions, an element of high importance represents the optimization of the potential use of energy.
The monitoring systems provide the right solution for surveying the structure of a long bridge, an hydraulic layout, the movement of a slope, or tracking the settlement of a dam or a building. 3D geometries play a special role in the modernization projects developed within the existing ones.
This paper present the research stages in order to optimal water energy utilization and the identification of the turbines production capacity increasing possibilities. For achieving this porpoise a complex topographical survey was necessary to highlight the real situation. The topographical measurements were performed using Leica 1205 TCRA total station.
The topographical measurements were performed in the following areas: the penstock area, near the butterfly valve and in the spiral case area. The data, obtained from the topographical measurements, were compared with the reconstructed 3D geometry, based on the documentation made available by the beneficiary. Based on the differences between the two geometries the modernization conclusions were presented.

Key words: *sustainable development, monitoring,3D reconstruction, polar coordinates, hydraulic layout.*

INTRODUCTION

Engineering companies and contractors are facing challenges never experienced before. They are being charged with - and being held liable for - the health of the structures they create and maintain. To surmount these challenges, engineers need to be able to measure structural movements to millimeter level accuracy. Accurate and timely information on the status of a structure is highly valuable to engineers. It enables them to compare the real-world behavior of a structure against the design and theoretical models. When empowered by such data, engineers can effectively and cost efficiently measure and maintain the health of vital infrastructure.

The main purpose of our measurements represents the evaluation of the real conditions from the Bradisor hydro power plant. The data from the technical drawings were

3-DIMENSIONAL MODELING FOR ASSESSMENT OF THE TOURISTIC POTENTIAL

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ABSTRACT

An effective infrastructure for civil engineering purposes requires more and more detailed background information. To create a model using the traditional approach, such as 3D topographical contour models, involved a long process of cutting layers of material. These were stacked on top of each other to form the model. Creating a model in a modern way involves computer modeling, rendering, scenarios, panting, illustrating etc. Developing and building a ski resort implies a huge responsibility, also a strategy and a scenario that should take into consideration the economic and social impact, tourists' services and all the possible negative consequences resulted from the transformation of the fragile alpine environment. Using any of the GIS standard formats, both 2D and 3D data can be visualized as a 3D perspective. Thus, for engineering purposes the necessity of using measured data in order to create Digital Elevation Models (DEM) and integrate them with high resolution images is a requirement in our days. Cartographers might prepare digital elevation models in a number of ways, but they frequently use remote sensing or direct survey data. The methods of generating DEMs often involve interpolating digital contour maps that may have been produced by direct survey of the land surface; especially for mountain areas. Note that the contour line data or any other sampled elevation datasets (by GPS or ground survey) are not DEMs, but may be considered digital terrain models. The present paper describes the technology and methods used to obtain complex data regarding a ski resort that will be useful for local authorities and developers.

Keywords: 3-dimensional, ski resort, modeling, GPS survey, DEM

INTRODUCTION

Setting up a touristic area is a work of a very high extent intended to realize an entire ski resort capable to satisfy the most demanding desires of a large number of users, having been realized as a result of complex studies. The choice of the resort is made by considering many conditions, among the most various, such as the region, that it is going to serve, different economic criteria or the positioning at an appropiate altitude.

Reliable global warming tendencies reported more conspicuously over the past decade, the requirement of the ski resort to be located at high altitudes, around 1800-2000 m to take advantage of the extended maintenance of snow. [1], [2]

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USING THE LASER SCANNING FOR RESEARCH AND CONSERVATION OF CULTURAL HERITAGE SITES. CASE STUDY: ULMETUM CITADEL

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Abstract. Various society fields demand realistic 3D city models. For urban planning or historical buildings even ancient fortresses, analysing in a 3D virtual reality world is much more efficient than imaging the 2D information on maps. For public security, accurate 3D building models are indispensable to make strategies during emergency situations. Navigation systems and virtual tourism also benefit from realistic city models. Manual creation of city models is undoubtedly a rather slow and expensive procedure, because of the enormous number of buildings and complexity of building shapes. In this paper the authors present a complex project developed for Ulmetum castle aimed at creating its 3D model using ground-based laser surveys and vectorisation.

Keywords: building models, digital reconstruction, laser scanning, digital data.

AIMS AND BACKGROUND

Three-dimensional data capture of objects on the Earth surface is an important aspect of surveying and mapping, geospatial database construction, and 3D digital visualisation. Currently, digital data acquisition is largely applied to 2D spatial databases[1]. In this study, we complete the scientific literature with the study that implies ground-based laser scan survey and 3D digital building model construction. Previously, ground survey of spatial objects was mainly accomplished by surveys realised with the total stations[2]. The method is relatively labour intensive and requires data conversions from analogue to digital to incorporate the results into a geospatial database.

The rapid development of cities also adds to the cost of manual city model updating. Nowadays, a lot of research has been done to automate the procedure

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E-LEARNING IN ENGINEERING – IMPACT UPON THE STUDENT'S MENTALITY AND DEVELOPMENT

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***Abstract**: The purpose of this paper is to support and promote the techniques and technologies based on e-learning system. Current trends in the university network require implementation of the policy for restructuring the higher education system, by focusing on the student's educational activities. The new methods involve experimentation learning based on scenarios, alternative solutions and direct interaction between the student, the subject of learning and the learning environment. In this context, when the institutional support is provided, improvement and diversification of educational offers for geodetic engineering and their correlation with the labour market are defined on two main directions. As regards the bachelor cycle, an online network was implemented for university collaboration to develop the capacity of providing superior competences in Geodesy, mainly for harmonization and standardization of a training program at multi-regional level. For the master cycle, emphasis is put on the use of the Virtual Campus of the Politehnica University Timisoara, system based on Moodle, an open-source platform which is an online educational environment of academic support for all faculties belonging to Politehnica University Timisoara. In the present paper, the authors aim to put forward issues such as: where the academic system is heading to (Quo Vadis Academia?) at the beginning of the 3rd millennium in a Europe that is supposed to be Globally Competitive; what are the requirements of the higher education system and of research seen as key positions in the EU strategy; what does quality in higher education mean, as well as presenting their own experiences regarding the implementation of e-Learning technologies in geodetic engineering, its impact on the development and mentality of students and proposals for enhancing the system by offering Open Educational Resources.*

***Keywords:** e-Learning; Open Educational Resources; geodetic engineering; higher education system; labour market.*

I. GENERAL AND SPECIFIC OBJECTIVES OF E-LEARNING PLATFORMS FOR GEODETIC ENGINEERING

1.1 General context

The opportunities provided by the use of Open Educational Resources (OER) spread beyond classroom collaboration. In the past years, Romanian universities have had several OER initiatives for higher education system in the technical sciences and engineering field. [1]

As regards the Romanian geodetic higher education, like any other education system in the world, it cannot evolve as a closed system, inflexible to increasing demands of beneficiaries, to today's challenges, but also to specific developments of the European area, in the field of education.

As a result, the notified bodies considered necessary the implementation of improvement processes based on models, mechanisms, concepts, and stable rules, validated and accepted, taking into account, at the same time, real and specific conditions characteristic to Romanian education, having as general goal upgrading the curriculum, including the Geodesy domain.