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3D MODELING OF URBAN AREA USING SketchUp SOFTWERE

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Abstract

The most powerful method of representing relief is to construct a mathematical model of the earth's surface: a digital terrain model (DTM) or digital ellevation model (DEM). 3D modeling of urban areas objects is an expanding application. This paper aims to present haw to create a 3D model for a digital terrain model (DTM) or digital ellevation model (DEM) using low cost programs and technologies. 3D modeling of urban area using SketchUp softwere it is a reliable solution. The choice of data sources, terrain sampling techniques and interpolation method used in model construction are critical for the quality of the resulting DTM.
***Key words**: GIS, digital terrain model, 3D Modeling, SketchUp*

INTRODUCTION

A system may be defined as a set of elements that are in a structural relationship of mutual interdependence and interaction, forming an organized all working together to fulfill a purpose.
A geographic information system is basically software that links geographic information (where things are) with descriptive information (what things are). Unlike analogue maps, where information is limited to what is displayed on the piece of paper, a geographic information system can display multiple "layers" with different types of information.

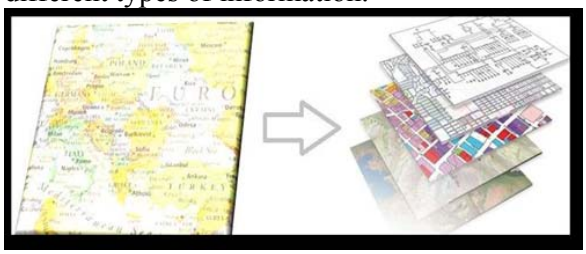

Figure 1.

A geographic information system is mainly composed of five components:

- Hardware (this component is represented by computer and peripheral equipment)
- Software (represented by the particular design and management programs)
- Data (is the most important component of GIS)
- Personal (component is made up of users, designers and those who are dealing with maintenance)
- Methods or procedures (specific operating models and practical application)

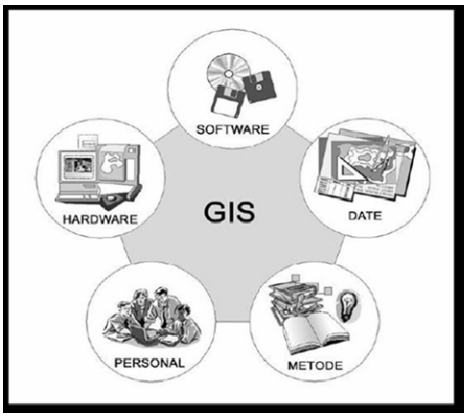

Figure 2.The components of GIS

Data models usually use a networked structures points called raster or vector called coordinate system. What is the model generates a geographical database (Geodatabase).

A geographic database is a collection of real-world data and relationships between them.

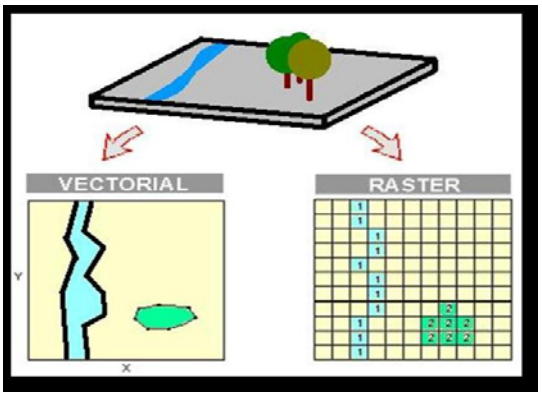

Figure 3. Raster vs Vector

URBAN AREA AND GIS

Today, more people lives in cities then rural areas.Europe is one of the most urbanized continents.About 75% of this population lives in urban areas. Starting with 2020 the proportion will be 80%. Consequently, the demand for land in and around cities is becoming acute. The extension o urban areas is reshapeing landscapes and affect the quality of people's lives and the environment more than ever.

In Romania, urbanization has not yet reached so high a share, but the Roman population living in urban areas is large and growing than in rural areas. Today in Romania urbanization has reached 54%.

The new software solution facilitates the implementation of these models. Of these remark software promoted by Google and the company recently purchased Trimble “"SketchUp" whose models are compatible with the software "ArcSIG" and can be inserted into Google Earth.

3D MODELING

3D models represent a 3D object by a collection of points in 3D space, connected by various entities geometry, such as triangles, lines, curved surfaces, etc. Being a database (points and other information), 3D models can be created manual, algorithmically (procedural modeling), or scanned.

Figure 4.

Besides the issue of achieving a system capable of delivering 3D modeling possibilities the problem arises type of 3D model chosen as the basis for the representation of a 3D GIS. The model consists of information about the real world so you have to take into account the type of object that we want to represent.

Two entities of different type such as a building and a tree will be different fundamentally 3D representations when it comes to shape and form as a building location and boundaries delineated officials may be more accurate than the crown of a tree.From the need to shape the environment in the same two types of entities were born following 3D modeling solutions: *The 3D Grid; The Shape; The Facet; The Boundary Representation (B-rep); Matrix 3D model; The Octree; Constructive Solid Geometry model (CSG); 3D TIN (tetrahedral network, TEN);*

MDE –digital model of elevation

MDE models are used to represent the topographical surface of the Earth. Surface models as they are called, are frequently used to create maps of topography, watercourses modeling, correction and analysis of aerial photographs of land geomorphology.MDE are usually constructed from data from remote sensing (LIDAR or SAR) or traditional topographic and can be divided into two categories account if the target data source used to create them. Raster data derived models are built in areas known points of allowances distributed symmetrically spaced constant. The second category is based on vector data and most often they are provided by a TIN. In this case the surface is formed by irregularly distributed on the known points.

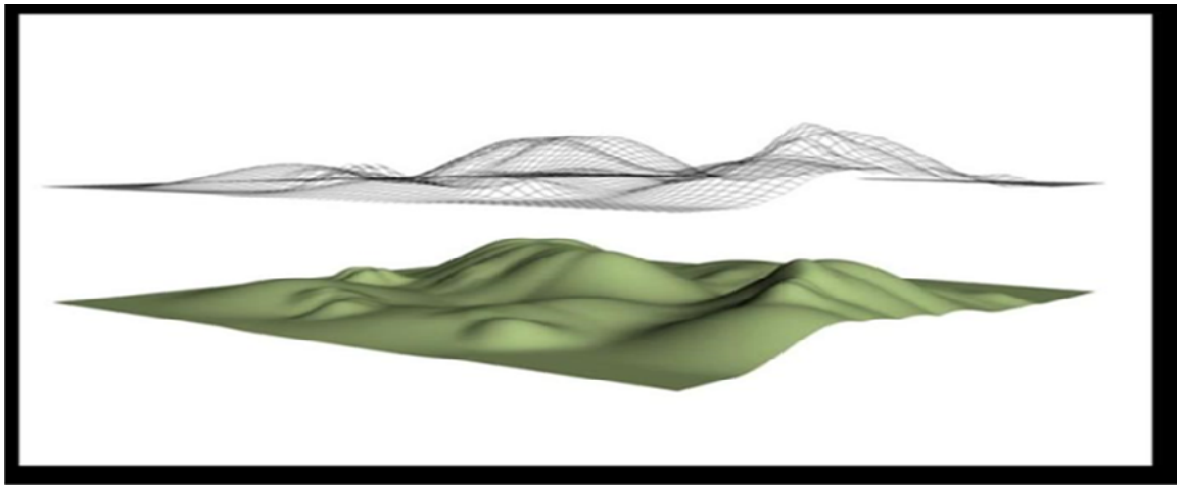

Figure 5. Digital model of elevation

DATA SOURCES

Data acquisition is the process by which data is obtained from an external source Geographic Information System and convert them into a digital format specific SIG. Data acquisition should be viewed carefully because the quality depends on the accuracy of collected data.
These data sources are acquired from many fields such as surveying; Remote sensing and airphotogrammetric; Topographic maps; GPS.

SketchUp- CASE STUDY

SketchUp, Trimble officially named SketchUp is a 3D modeling program that can be used for a wide range of applications such as architecture, civil engineering, mechanical design video.It is available in two versions, that is a variation Make SketchUp Free and Pro SketchUp, a variant of payment.Google SketchUp was detained although it was created in this company and in 2012 was acquired by Trimble Navigation. The program is focused on ease of use and building models that can be published online. A key elements of this program is "3D Warehouse" version of the "3D Warehouse" which is an online database of 3D models part of which can be downloaded for free. SketchUp is also often integrated with Google Earth allowing geolocation models in this program and viewing in Google Earth 3D environment.

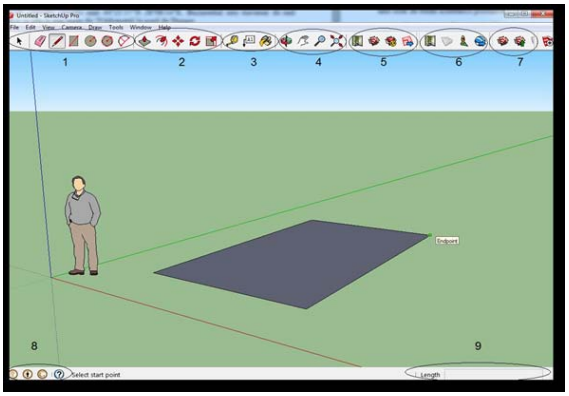

Figure 6. The interface of SketchUp program

Making a 3D modeling works of a building following steps be taken:
The first step was the actual measurement of body geometry and construction details that define facades. For this was used a total station which observations were made using laser Reflectorless how to define the points that we considered to be characteristic of the construction.
The second stage involved the 3D model of the building. For this operation on the data obtained from measurements and scale of topographic plan 1:500 I took photos that you have worked to obtain textures for finishing the model.
The third step was the creation of the geographical database (GBD) using the program
ArcCatalog ArcGIS suite of software from ESRI. This database was populated with data from the following sources at their disposal (3D model of the building created in SketchUp and other templates downloaded from the "3D Warehouse" (online database of 3D modeling

tools offered by Trimble in partnership Google), vectorization over maps provided by ESRI as "Basemap" within ArcMap program).
In the next step the database previously created was imported in procedural 3D modeling program called CityEngine offered by ESRI. Following procedural generation of 3D models base.

CONCLUSIONS

Modeling is executed directly by the user where each model is built in part through the intervention of this which commands a modeling program. The interface of such a program is populated with geometry editing commands such as those presented in SketchUp.
Procedural modeling is based on sets of rules. These rules are essentially sets of instructions or software algorithms then performed models and can be used to create more content at once.
The main advantages and disadvantages in modeling and direct modeling Procedure.

Direct method

Advantages:

- High detail
- High accuracy
- Easy texturing
- Ease of bringing further changes

Disadvantages:

- Laborious process of realization
- Working for long time

Method procedure:

Advantages:

- Process modeling for fast multiple models
- Modelling rules written serve to a several projects
- Rules can return different models depending on the attributes you read.

Disadvantages:

- Application difficult texture
- Require workstation performance for large projects
- Require special programming knowledge for editing
- Modest precision of models

of road network, vegetation and remaining construction, the database has been supplemented with these models.
In the final stage of this case study, it has imported ArcScene database program that allows viewing and running analysis 3D models contained in the data

In conclusion such a system presents both advantages and disadvantages, if it is cost effective or not depends strictly user and the problems it seeks to solve one thing is certain, the future geographical information systems 3D will surely escalate and the classic two-dimensional analogue representations or even digital will only be a tab in history.

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