ISSN NO: 2771-8840
Date of Publication: 25-11-2023

Importance of using GIS technologies in soil science

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Abstract. The reason we focus on this concept in this book is because information is an important part of GAT, or without it, GAT would be meaningless. We can call it information in our ordinary language, but if we say it in the language of GAT, then this concept has a slightly wider meaning. We know that in the world of information there are 2 different concepts, one is information and the other is information. Information is the event we see, and information is the image of that event processed in the human mind. In GAT, information is derived from the processing of primary data obtained from the place, unlike the above definition, this information or primary information is not in the human mind, it is processed using special programs of GAT and stored in the database, and in the future, depending on the user's desire, it is presented in the form of electronic or ordinary paper.

Key words: Geodata, model, photogrammetry, modeling, grid.

The reason we focus on this concept in this book is because information is an important part of GAT, or without it, GAT would be meaningless. We can call it information in our ordinary language, but if we say it in the language of GAT, then this concept has a slightly wider meaning. We know that in the world of information there are 2 different concepts, one is information and the other is information. Information is the event we see, and information is the image of that event processed in the human mind. In GAT, information is derived from the processing of primary data obtained from the place, unlike the above definition, this information or primary information is not in the human mind, it is processed using special programs of GAT and stored in the database, and in the future, depending on the user's desire, it is presented in the form of electronic or ordinary paper. It is somewhat correct to call the information in GAT geospatial information. The reason is that in this system, basically, each point and each line has different coordinates depending on its location, and these coordinates are combined to form a general understanding of the place and serve as a basis for spatial analysis and other types of analytical work in the future. Sources of geospatial data can be numbered maps, aerial photographs, space rates, statistical tables, and other GAT-related data. In addition, geospatial data can be obtained directly from the results of surveying (GPS surveying, surveying with the help of geodetic instruments) as attribute information. Another convenient way to get information, as mentioned in previous chapters, is to buy information. After receiving the geographic data, these data should be connected to each other through the database, which in turn provides the opportunity to obtain unified and general information by connecting the data on the map and the database. Geodata is usually linked to maps in a GIS. The map is the only field in the GAT that works with geodata and is also considered the final product of the GAT. Therefore, GAT not only produces the card, but also performs data analysis through special processing and analysis processes. Modern GAT can be seen in three different ways. These are tabular or database view, card view, and model view. View through a table or database. GAT is a system that includes the world database, or we can also call it a geographical database. GAT describes the world through a database with a special geographical structure. Card view. GAT is a complete system of cards with all the details. These cards show all the characters of the earth's surface. Using the cards created in this way, information retrieval, analysis

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and editing are performed. Such a view is called Geoimaging or Geovisualization by another name. Model appearance. GAT is also a system with a set of other types of information and data transformation devices. This means creating a new data set from an existing data set. Such a process is called geoprocessing or Geoprocessing. In this process, the geoprocessor takes the existing data, analyzes it, and stores the results in the database in the form of a new data set. Photogrammetric data analysis Photogrammetry is, in short, the science of making measurements through images, aerial photographs. Using such aerial photographs, a two-dimensional model of the place is created in traditional photogrammetry, and by combining pairs of stereophotographs and images, 2- and 3-dimensional models of the place are created through current GAT and remote sensing systems.

It is known from the photogrammetry courses that when the aerial speed is taken by the aircraft, in order to merge the aerial photos together, the next speed along the frame should cover at least 60% of the previous speed, and the speed between those lines should cover at least 30% of the speed after it. The same process is carried out in remote sensing. The coverage (overlapping of rates) value indicates the area where the dimensional model will be generated. Photogrammetry is the science of making measurements through motions and images. In order to obtain true georeferenced Earth coordinates from the resulting model, motions must be referenced using control points (same as the manual digitization process). Control points are determined using land surveying or GPS. Measurements are taken from a pair of superimposed frames using a device called a stereoplotter. With this device, a model is created and 3D measurements are taken, edited, assembled, and data and graphics are output to a card. development stages of stereoplotters 3 types: analog (optical); divided into analytical and digital. Nowadays, mechanical analog streoplotters are rarely used. The most commonly used types of devices are analytical (which is a cross between analog and digital stereoplotters) and digital (fully computerized) stereoplotters. Today, with the development of computer technology, it is safe to say that mechanical devices will be completely replaced by digital steroplotters. There are many ways to view stereo models, the most common of which is a simple stereoscope with a flat screen and special glasses that can see red/green images on a computer screen or polarized light. Computers in the photogrammetry system are equipped with mouse, hand-held devices with a 3-dimensional cursor to control the images in the 3-dimensional plane. This, in turn, allows the cursor to move along 3 dimensions, i.e. X, Y, Z. The types of extraction of vector objects from 3D models are divided into automatic, semi-automatic and manual types, such as manual digitization (). The only difference is that in this type, the calculated height value Z must also be taken into account. Figure 30 below shows the traditional workflow in digital photogrammetry. As seen here (ie in 3 different colors) digital photogrammetry has 3 important parts. These parts are data entry, data processing, and card and other data processing. Targeting (orientation) and triangulation is one of the main tasks of data processing in photogrammetry.

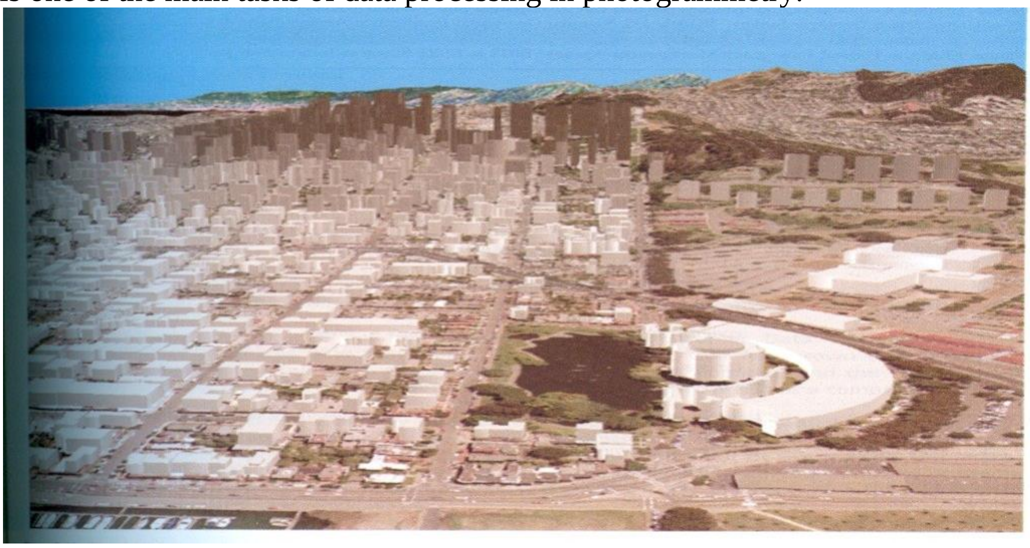

Figure 31: A 3D image created using a photogrammetric process. (Source: Longley 2005)

By targeting we mean the process of creating stereo models for accurate viewing and then obtaining 3D vector coordinates to represent geographic objects from these models. Triangulation is the process of combining several images into a single model to obtain accurate and consistent information about large areas.

As a product of the digital photogrammetry workflow, we can get several types of data, and they include a digital relief model (DEM-Digital elevation model), contours, orthoimages, vector units, and of course 3D scenes (3D Scenes). A Digital Terrain Model (DEM) is a straight line of elevation values. A DEM is created by joining a pair of stereo images using mutual control points. After the DEM is generated, it becomes clear to extract the contours using special algorithms. Orthoimages are elevation-corrected images using DEM. These images are widely used nowadays due to their low cost. We can also use these types of images as a source of accurate information in the process of manual rendering. The vector feature extraction section is still under development, as this section has not yet been fully automated. The most commonly used method is feature extraction by combining spectral analysis and spatial rules. The last part, that is, the 3-dimensional (3D) view is created by combining the generated vector features and the DEM with orthoimages (Fig. 31). In conclusion, photogrammetry is an effective data acquisition technique. Sometimes it can be the only practical way to get topographical information of a certain object. One of the disadvantages is the difficulty of the operation and the high cost of the equipment, which limits the signal acquisition of large-scale areas.

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