Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HTT07-P01 Room:Convention Hall Time:May 22 17:15-18:30

Visualization of Geodetic Data in ArcGIS

MAZUROVA, Elena[1*], Svetlana Ogienko[2]

[1]Moscow State University of Geodesy and Cartography (MIIGAiK), Moscow, Russian Federation, [2]Moscow State University of Geodesy and Cartography (MIIGAiK), Moscow, Russian Federation

Almost all processes taking place in nature have analog character (gravitational interaction, atmospheric pressure, air temperature, etc.) and vary continuously with time.

In practice, we, as a rule, have separate measurements performed either at a specific moment of time, or in a certain place of space, i. e., we deal more often with discrete representation of a continuous process. Discretization of continuous processes is one of the fundamental ideas of digital information processing.

In problems of physical geodesy, initial data has discrete representation; therefore, it is effective to implement for their resolution algorithms of linear discrete transforms, such as the Fourier transforms, Hartley transforms, wavelet-transforms. An effective method of calculations is developed for the above discrete transformations - fast algorithms; they allow one to calculate arrays of discrete information that are characteristic of problems of physical geodesy in real time. It is especially important that implementing such algorithms results in obtaining solutions at knots of a regular grid, which helps considerably their further application to visualizing solution results.

Modern development of computer technology and software makes it possible to build 2-D and 3-D digital models of various solution results of physical geodesy problems. The models can be used not only for demonstrations, but also for practical purposes, for example, for modeling a relief, situation, modeling geoidal surface, for doing special scientific calculations, etc.

The paper discusses the issue of computing anomaly height by the fast Fourier transform (FFT), which performs the calculation process by two orders faster than by traditional methods. Calculation of anomaly height has been done by two algorithms: the first one used gravity disturbances and the second one utilized gravity anomalies.

From the results of calculations, there have been generated anomaly height maps for both the water area of the Okhotsk Sea and the area of the Central Alps, as well as a 3-D relief model of this area of the Central Alps.

ArcGIS has been selected as a tool for building the three-dimensional relief model, it being a family of software products of the American company ESRI.

Keywords: Fast Fourier Transform(FFT), anomaly height, digital models, ArcGIS

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Centralized Geodatabase and Mobile Field Data Collection for University Campus Information System

LWIN, Koko[1*], Yuji Murayama[1]

[1]Division of Spatial Information Science, University of Tsukuba

Recently, the use of mobile communication devices, such as smart phones and cellular phones, in field data collection is increasing due to the emergence of embedded Global Position Systems (GPS) and Wi-Fi Internet access. Accurate, timely and handy field data collection is required for disaster management and quick response during emergencies. In this presentation, we introduce a web-based GIS system to collect the field data from personal mobile phones and smart phone through a Post Office Protocol POP3 mail server and Web-GIS. The main objective of this work is to demonstrate a real-time field data collection method to students using their mobile phones to collect field data in a timely and handy manner, either in individual or group surveys at local or global scale research. This Web-based GIS will be used as Tsukuba University campus information system and facility management for students and visitors.

Keywords: Web-Based GIS System, Real-Time Field Data Collection, POP3 Mail Server, Smart Phone, Personal Mobile Phone

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Geomorphological analysis of a limestone cave using a 3D laser scanner

TAKAYAMA, Tomomi[1*], HAYAKAWA, Yuichi S.[2], Kazutaka Iwasaki[3], OGUCHI, Takashi[2]

[1]Grad. Sch. Frontier. Sci., The University of Tokyo, [2]CSIS, The University of Tokyo, [3]Faculty of Information, Shizuoka University

In recent years, 3D technology has been used to analyze landforms. It gives us highly accurate and dense data of topography, from which cross sections, area and volume of an object can be obtained. However, there are few cases of geomorphological analysis of limestone cave using 3D technology. The purpose of this study is to measure a limestone cave using a 3D laser scanner to analyze its form. Ryugashi Cave in Hamamatsu, Shizuoka Prefecture in central Japan is the target of this study, which has a length of 470 m in total. The cave was surveyed from 41 locatios, resulting in 904,5800 measured points that have provided a 3D survey map. GLS-1500 by Topcon was used as a laser scanner to survey the cave, and Topcon ScanMaster software was used to edit the obtained 3D data. Quantitative analyses of the 3D data suggest some correlations between the overall shape of the limestone cave and solution forms, speleothems and sediments.

Keywords: Limestone cave, 3D laser scanner, Topography