12th International Conference
of Environmental Engineering

INNOVATIVE METHODS OF USING LASER SCANNING AND GEOINFORMATION SYSTEMS FOR DESIGN OF COMMUNICATION ROUTES

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Introduction

Laser scanning, which appeared on the Ukrainian market of Geodetic services about 10 years ago, is gradually finding application in solving an increasing range of tasks. This is the operational control of the construction of engineering structures and monitoring of their condition during operation, design of connection roads, 3D-modeling of complex architectural objects. All this can be used to create a three-dimensional information content of geoinformation systems.

Geoinformation coding system

A Geoinformation coding system is a set of commands, parameters, and attributes designed to enter and accumulate information about topographic objects, using which:

- establishes the relationship between the object and its description in the classifier;
- objects are linked to the definition of land plots on the ground;
- a description of the geometry of complex linear and area objects is formed;
- sets the semantic description of objects.

The composition of the encoded information allows you to:

- determine the parameters of infrastructure objects (coordinate type and attitude to terrain),
- create structural lines and terrain contours.

In order for the Geoinformation system to recognize elements of an existing highway (roadway, roadside, etc.) and correctly identify repair measures, it is necessary to encode the above-mentioned elements, i.e. create appropriate area-based thematic objects based on them (Figure 1).

Digital model of the surface

In the CREDO system-dialogue it is possible to create layer-by-layer digital models of railway repair projects for transmitting 3D leveling of road construction equipment to systems (Figure 2).

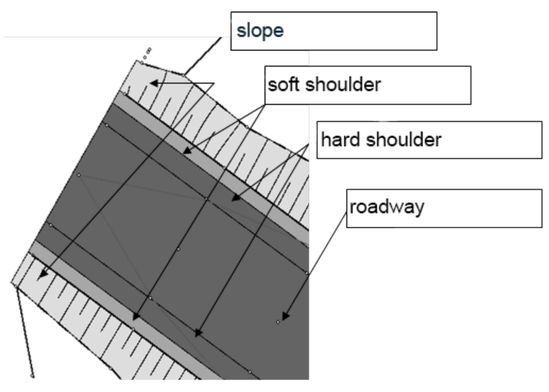

Figure 1. Area-based thematic objects of connection roads

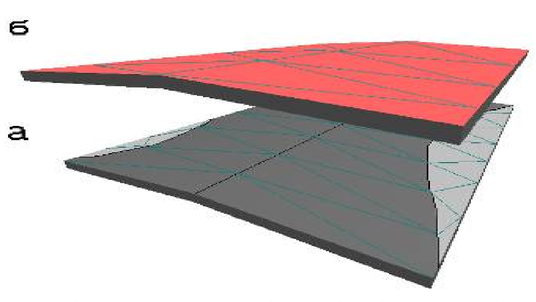

Figure 2. Fragments of layer-by-layer: a) digital surface models digital model of the milling surface, b) digital model of the design coating surface

To do this, you need to get a layer-by-layer digital model of the entire structure and export it to the format *dxf. Export parameters are configurable and can be saved as a schema, which can be used in the future and not waste time on re-executing settings.

The layer-by-layer digital model formed in this way can be used for road construction with 3D leveling systems (Figure 3).

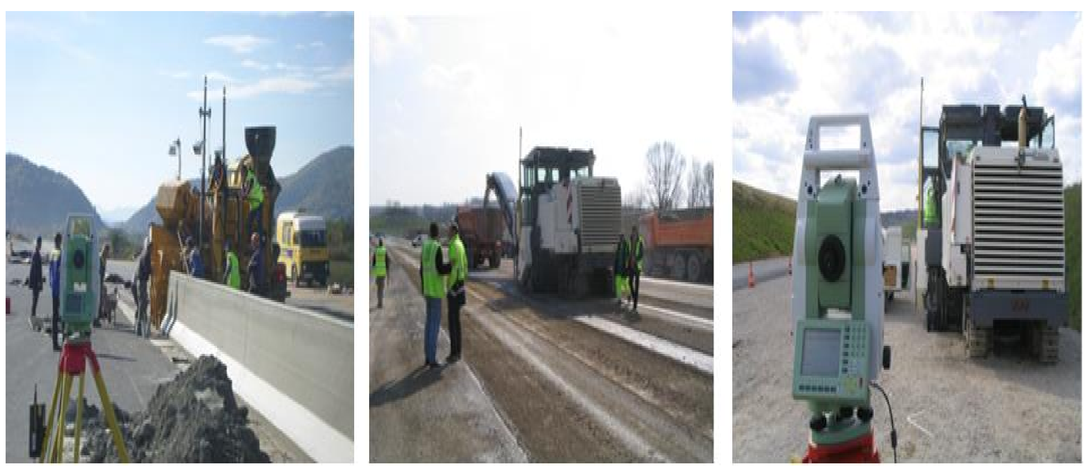

Figure 3. Example of construction of connection roads with 3D-leveling systems

**Thanks to Vilnius Gediminas Technical University for your support!
Special thanks to Chairman of the conference - Prof. Dr. Donatas Čygas, Chairman of Technologies of geodesy, cadastre and geographic information system section – Prof. Dr. Eimuntas Kazimieras Paršeliūnas and Secretary – Prof. Dr. Jūratė Sužedelytė-Visockienė, Environmental Protection and Water Engineering department - Prof. Dr. Rasa Ušpalytė-Vitkūnienė**

Conclusions

The object-oriented data model treats real-time geographical objects as database objects. Objects are represented by spatial linear objects, such as connection roads, infrastructure objects, and land plots.

The geodata database model defines a general model for geographical information. Advantages of the geodata database in providing opportunities:

- centrally store and manage geographic data in a single relational database management System (DBMS);
- model the behavior of spatial objects;
- apply complex rules and attitudes to data;
- maintain spatial data integrity in a consistent, accurate database;
- function within a multi-user access and editing environment;
- scaling of created design solutions;
- integration of spatial data with other databases;
- support for custom functions and behaviors.

IMPORTANT - WORK WITH LARGE VOLUMES OF DATA OR WITH ACCURATE DATA ON LARGE AREAS AND THE CONVENIENCE OF EDITING AND UPDATING DATA, AS WELL AS SPECIFIC SOFTWARE

The following tasks of system data organization:

1. converting information as descriptive information into models;
2. reducing a set of spatial data to a single integrated information model;
3. classification of source data and models when converting them to an integrated model;
4. identification of data in the process of converting data into an integrated model, which preserves their individuality;
5. establishing additional links between geodata based on their integration;
6. unification of source data and creation of the ability to process and analyze data measured in different scales and with different dimensions in a single system;
7. creating a base for solving the main problem of Geoinformatics - establishing spatial relations between spatial processes, objects, phenomena and their characteristics.

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