

SUMMARY

This habilitation thesis is a synthesis of the scientific activity carried out after public presentation in February 1999 of the doctoral dissertation entitled "*The orientation of the underground surveying works under the conditions imposed by the factors of mining projects design and their importance in the technological process*" under the coordination of professor dr. Nicolae DIMA.

Chapter 1 summarizes the results of the didactic activity.

The didactic activity started in 1994 as a teacher assistant, and after supporting the doctoral dissertation, the didactic activity continued as the basic function at the Mining Faculty at University of Petroșani, since 2000. The didactic activity took place at disciplines in the fields of and geodesy, including specific mining disciplines such as Mining Surveying, Geometrization of Mineral Deposits or Geostatistic.

In the support of the didactic activity, were developed several books, courses or laboratory guides, addressed not only to students but also to specialists. The materials were developed as author or coauthor and their content is related to the surveying and mining activity. Some of the titles of these materials include: "*General Topography and Elements of Mining Surveying*", "*Theory of Errors and The Method of the Smallest Squares*", "*Automation of Geodetic Works*", "*Modern Techniques and Technologies in Mining and Cadastral Surveying Works*" "*Instruments, Apparatus and Forms used for Topographical Measurements*", "*Engineering surveying*", etc.

The didactic activity took place at all levels of education, including the PhD, by teaching the course "*Using the Information Technology in Research*". Also, since 2008, I have been teaching at the University of Agricultural Sciences and Veterinary Medicine – Cluj Napoca, in the specialization of "*Land Measurements and Cadaster*".

Chapter 2 includes a review of contract-based research.

The activity of some contracts is presented in a brief synthesis, and the information has been grouped by categories according to the specifics of the topic studied. The research, although essentially utilized the knowledge of surveying or mining engineering, has been diversified and responded to requirements in various fields: infrastructure's development, cadaster - GIS, protection and safety of persons, geotechnics, environmental protection, stability tracking.

Among the works conducted as a director, is included "*Research Study on the Location of Natural Gas Pipelines in Areas with Possible Subsidence Phenomena*" having as beneficiary the National Natural Gas Transmission Company TRANSGAZ SA and which serves for the location of a section of the BRUA natural gas transmission network in mining-related areas.

Likewise, another coordinated research project is "*Competitive Technique for Supporting Underground Mining Excavations aligned to High Performance Conditions in the Exploitation and Use of Coal for Production of Energy*" and was funded by UEFISCDI under the PN II Program – partnerships in priority areas.

In most of the works (papers), the research had as its object the instability of the land and the buildings/constructions caused mainly by the underground exploitations. Research has been carried out at Cacica, Târgu Ocna, Ocna Dej, Ocnele Mari, Slănic Prahova, Ocna Mureş and Jiu Valley.

Chapter 3 includes contributions to analyzing and improving precision.

Practical work has in many cases led to the need to evaluate the precision in topographical work and the need to increase the precision by improving data acquisition or processing methods. The chapter contains precision evaluation models in different types of surveying/topographic measurements. As a result of researching the way in which the accuracy of the supportive elements influences the determinations in a topographic network, a model of measurement compensation has been developed and presented taking into account the precision of the supportive elements. Also, compensation models for mining polygons are presented, characterized by lack of end-to-end support guidelines.

In the last part of the chapter there is presented an approach meant to improve the quality of cartographic projections. The essence of the presented approach is the idea that the transposition of the points from a curved surface to a plane is done not by a straight beam of design but by curve beams, so that the representation remains consistent but with minimal areolar deformations.

Chapter 4 includes contributions from research to develop surveying determination methods.

There is a way to solve an applicable back intersection in cases where the determined point is near the non-determination circle of other methods. In the second part of the chapter is presented the model developed for solving a polygon supported on points located outside the route.

A significant part of this chapter is devoted to presenting the results of research that led to important conclusions on the use of complex numbers in topography. Under the current conditions in which the measurements are made with total stations and are taken simultaneously not just directions but also distances, it is desirable that all these measured quantities be included in the measured sizes. Writing triangulation-trilateration specific equation systems is rather difficult, but the use of complex numbers leads to a much-simplified solution of topographic networks. The developed model of compensation of measurements in topographic works can be used successfully and easily to solve junctions required to send the surface reference system to the underground on vertical works.

The last part of the chapter presents research results on the optimization of underground track geometry. Since any meter of underground work is very expensive to dig and support, it is desirable that each route be as short as possible. However, most of the time, the route cannot be in a straight line, but must observe certain conditions of settlement, curvature, slope, etc. The chapter presents an elaborate model for finding the optimal route for mining work that has a minimum length but still respects the restrictions or conditions imposed by technical factors.

Chapter 5 includes the university career development plan.

I have presented brief considerations which are at the base of the career development, general objectives, perspectives and directions related to career and scientific research development.

The thesis ends with bibliography.