

ZRÍNYI MIKLÓS NATIONAL DEFENCE UNIVERSITY

**APPLICATION OF THEMATIC MAPS
BASED ON GEOSPATIAL DATABASE
FOR SUPPORTING HUNGARIAN LAND FORCES
IN THEIR PEACE AND WARTIME TASKS**

Written by Major Attila Kállai

THE S I S B O O K L E T

Consultant:

(Lieutenant Colonel István Gőcze, PhD)
Associate Professor
PhD of Military Science

Budapest

— 2007 —

DEFINITION OF THE SCIENTIFIC PROBLEM

Notional reflection and modelling geographical environment surrounding human has been playing determinant role in geography and cartography throughout centuries. The high-level cultivation of thinking and understanding, as well as development of graphical visualization tools yield more effective imagination of geographical process and occurrence, since 19th century. Since the 20th Century, this process has been changed by leaps and bounds in consequence of success of cognitive psychology and on the other hand owing to free flow of information.

Since the surrounding environment is neither observable nor comprehensible, consequently it is necessary to modelling it via optional consideration, in the abstract. Models created by human abstraction are specific interpretations of physical reality. The process of cartographic generalization and simplification is not only a reduction in the number of elements, but an even high abstraction of modelled processes, and factors via schematization, and thematization.

Taking scientific examination of the geographical or virtual reality as one's starting point it is distinctly visible that they are directed towards solutions of increasingly complex spatial problem. The idea of utilizing GIS tools for analysing complex relationship of geographic environment is not of latest type. Classical cartographic representations are unsuitable for visualizing all results of GIS analysis due to his sophistic character, which affect developing cartography, as well as thematic maps.

The state of supply of thematic maps in HDF is not ideal nowadays. There is significant inequality between support of ground and air thematic map, and between modernity of standard prefabricated and non-series thematic maps. My thesis is concentrated attention on existing reasons and problem-level exploration of mentioned inconsistencies, with reference to actual and probable requests of Land Forces.

The thesis topicality is rising up in consequence of widely spreading information technology. The more information required more efforts to data processing, which is always has a lot of problem in military command and control. Too much information is problematic too. We suggest consider that 80 % of decision-making processes are geographical related, which is emphasize importance of GIS based thematic product making.

GOALS OF THE THESIS RESEARCH

In my thesis I set myself the following scientific goals:

- 1) To analyse characteristic features of the digital cartographic databases and geographical information systems constituting the basis of thematic information as well as principles of new approaches to space modelling; as a result of these analyses to determine the main requirements in order to form the thematic information.
- 2) To specify the general and specific demands concerning the thematic spatial information of the Land Forces and to reveal their present thematic map supply analysing the present and probable tasks of the Hungarian Land Forces as well as their capability.
- 3) To prove the need of the geographical information systems for the renovation of the thematic map supply system of the Hungarian Defence Forces, as well as for the successful activity of the Land Forces and for increasing the efficiency of their command.
- 4) To determine those standard thematic map types introduction of which is justified in the map supply system of the HDF; to reveal the reasons for relative being pushed into the background of the thematic maps used by Land Forces; later with analysing these reasons to work out concrete suggestion how to improve the thematic map supply of the HDF, suggestion for the technology of making NATO standardized thematic maps, as well as for the system of non-standard thematic map information service based on the present capability of the Land Forces and on the basis of their would-be defence and mission tasks. To put forward a proposal for implementation of a modern, decentralized network-based system concerning the service of the thematic spatial information, for dividing the geoinformation potential for the Land Forces of the HDF.

APPLIED RESEARCH METHODS

In the interests of realizing the earlier mentioned goals, I applied secondary research methods:

- I studied the national and foreign special literature connected with my project as well as publications and studies.
- I used the summary of my personal consultations carrying out with the representatives of home scientific and professional life.

- I systematized and adapted experience of those research and professional projects in which I participated earlier.
- I took part in national and international conferences, in lectures of scientific sections whose topics are in connection with my research.
- I studied law, doctrines and regulations connecting with the research subject.
- I analysed the complex principles connecting the research subjects in order to eliminate anomalies appearing in the course of changing approach, then I synthesized their reductions.

THE STRUCTURE OF MY THESIS

According to the research goals and hypotheses my thesis consist of four main chapters.

In the first chapter, I survey the present task system of the Hungarian Land Forces taking into consideration the 21st century defence policy situation in order to define which are those operations that are needed spatial information and tasks where the improve so far of the introduced military geographic information and documentation can be advantageous in the course of the thematic display representation.

In the second chapter, I call the attention to the physical and logical characteristic features of the spatial information, which is essential for the change of the view arising from the geographical space modelling. The aim of all these is to define the basis of modern, task oriented, situation and environment dependent thematic representations.

In the third chapter, I write about changes happened in methods of thematic representation of the geographical environment and changes which have taken place in the last decade of cartography, and after all that from the synthesis of the previous two chapters I put forward a proposal for working out such military topics which mainly supports the peacetime and qualified temporary tasks of the Land Forces.

In the fourth chapter, I put forward proposals for short- and long-term program forming the map system, which supports the peacetime and qualified temporary activities of the Hungarian Land Forces, In conclusion I summarize the results of my research work.

SUMMARIZED CONCLUSIONS

The research goal was to scholarly define general and specific requirements of Hungarian Land Forces, all topic related theoretical and practical questions of modelling geographical environment, and in conclusion put forward proposals to develop a GIS based thematic map-

support system. I intended to contribute to enhancement thematic state of supply by thematic maps of Hungarian Land Forces through scientific research work.

I achieved the fixed goals I set for myself. I justified that my formulated hypotheses were valid, and useful for achieved research results related to the new, GIS based thematic map information support of HDF.

I proved that the NATO integration process of Hungary was the cause of changes in map supporting system of HDF, which took effect in application of thematic maps by Land Forces.

I pointed out importance of spatial databases for production thematic maps, and benefits of digital spatial modelling.

I proved that the differentiation of tasks of Hungarian Land Forces in environment of changed defence policy situation of Hungary and other NATO country required a new, decentralized, and GIS based modelling and visualization technologies.

My research works turned attention to deficiency of geoinformation support system of HDF related to thematic map supply.

Scientific Results

Summarizing the results of my research work following things are regarded as **new, scientific results:**

- 1) I analyzed the principles of geospatial modelling which are of new approach, general characteristics of the digital cartographical databases and geographical information systems; I determined the main requirements concerning them from the point of view of forming the thematic information.
- 2) I specified those field of activity of the Hungarian Land Forces which primarily claim thematic spatial information as well as the application of the GIS based thematic maps — at the same time I revealed the shortage of thematic map supply of the Hungarian Land Forces, the reasons for inequality experienced in the air and ground thematic map supply and the need for improving ground thematic maps.
- 3) I proved that the application of the GIS is necessary for the renovation of the thematic map supply system of the HDF as well as it is needed for increasing the efficiency of the activity of the Land Forces, and for increasing the effectiveness of the command.
- 4) I determined those standard thematic map types whose introduction into the map supply system of the HDF is justified. I elaborated some proposals how to form, develop and operate this GIS based thematic map supply system.

Thesis Research Findings Utilization – Suggestions

The results of my thesis research call attention to the frequent role of thematic maps for visualization of complex military geographical correlation, for exploring latent geographical processes, and for filtering out of redundant information.

The new approaches of my research contribute to progress of implementation geospatial modelling on base GIS as well as call attention to importance of GIS databases for production of thematic maps; to relevance of attribute data, and to developing data-infrastructure for representation of thematic overlays.

Results of my research can be used for further scientific research of thesis.

25th August 2007, Budapest

Major Attila Kállai
assistant professor