

Geoinformatics teaching at Mendel University of Agriculture and Forestry, Brno

Vladimir Zidek

Mendel University of Agriculture and Forestry, Brno, Czech Republic

zidek@mendelu.cz

Abstract

Main part of undergraduate teaching in Geoinformatics and related disciplines at Mendel University Brno is based on GIS IDRISI, non-commercial product of Clark University, USA, and on CAD systems. Postgraduate (doctoral and long-life) study programs cover advanced processing of spatial data, their interpretation and practical use. IDRISI Resource Centre and UniGIS Site located at the University provide further assistance to professionals.

1. Introduction

At Mendel University, Brno, Geoinformatics is considered a discipline covering various aspects of Earth-oriented spatial sciences in combination with fundamentals of information science. New technologies of GIS, GPS, remote sensing and digital photogrammetry complete traditional approaches of land surveying, mapping, image interpretation and aerial photogrammetry. Substantial parts of these disciplines are bind together by methods of spatial data processing and analysis.

Czech forestry has a considerable tradition in producing and in the use of thematic forestry maps that became an integral part of forest management plans. But even in forestry, where a production cycle is rather long, modern technological changes are quickly setting on. Economic transformation initiated in early nineties, together with gradually computerised information processing, have a considerable impact even on forestry.

Necessity of precise land ownership recording emerged along with the need to monitor damaged parts of forest stands and the need to enable alternative management. Possibility to use aerial photographs and satellite data without restrictions makes forest maps updating fully operative. New maps and new management plans for forests are now produced by means of fast digital techniques. Specialised geographic information systems (GIS) not only permit clear visualisation of facts, but also provide effective (albeit not yet widely used) tools for data analysing, data modelling and decision support. Digital methods of spatial data processing are undoubtedly a useful step forward, but they require certain skills of users. In practice, these skills may be hard to attain. Hence the task of educational centres (mainly universities) to prepare their students appropriately for the effective use of digital technologies and spatial data manipulation.

At Mendel University, the spatial data handling has been taught with proper attention since the school's foundation in 1919. In 1921, the Department of Surveying has been established. During the academic year 1923/24 lectures in photogrammetry appeared in a curriculum and the Department pioneered in the field of airborne photogrammetry. In 1927, a unique pilot project of stereo-photogrammetric mapping was realised for the university Masaryk Forest, producing a positional and height plan of the Hády forest range. Germans suspended promisingly developing activities in 1939 by closing Czech universities. After the World War II, according to the new east-oriented policy of the State, aerial photographs became secret documents, and the use of photogrammetry stagnated for many years.

After political and economical changes in 1989, a multitude of existing barriers in Central and Eastern Europe collapsed, providing access to new instrumentation and equipment, to relatively cheap computer systems, sophisticated software, and personal contacts. Facile availability of aerial and satellite images and a broad variety of GIS and image processing packages have opened for the Czech forestry new horizons in working with spatial data. Also student curricula at Mendel University, especially at the Faculty of Forestry, has to undergo necessary changes to reflect better the challenges of time. The Faculty delivers three master study programs - Forest Engineering, Landscape Engineering and Timber Engineering. Undergraduate and PhD courses in disciplines falling within field of Geoinformatics are taught mainly at the Department of Geoinformatics (formerly Department of Surveying).

2. Undergraduate Courses

During introductory course in *Basic Informatics* a thorough attention is paid to practical knowledge of Windows NT operation system and to its main application – MS Office. Issues of relational databases (MS Access) are also discussed. Practical exercises are focused on forestry topics with proper text, tabular, and graphic outputs.

GIS Fundamentals encompass main GIS concepts - data input and output, vector and raster data models, data organisation and management, spatial operation, examples of GIS analyses, GIS designing, etc. Students can demonstrate their knowledge in presenting ecological study, constituting a working basis for a summary exam in the middle of their studies. For practical exercises IDRISI software has been selected because of its comprehensible modular structure and instructive exercise data. Owing to its multiple language support, users can communicate with the system interface using not only English, but also other languages. In 1998, Czech language files have been produced at Mendel, so that the students can now use either English or Czech; it helps them to work with the system more comfortably.

Surveying and cartography course provides students with a knowledge of basic concepts in cartography and surveying, e.g. cartographic projections, control points, co-ordinate systems, land cadastre, surveying instruments and auxiliary devices, and methods of co-ordinate measuring and computation. Most important operations used in surveying are practised in the field. Classical methods of co-ordinate computation are compared with digital methods using a Czech geodetic software package KOKES.

In *Earth Remote Sensing* course students familiarise fundamentals of remote sensing and the most important interpretation techniques. Methods of visual interpretation are based on aerial photography. A special emphasis is put on satellite data and various approaches to digital image processing. During the exercises students work partially with aerial photographs, interpreting them with the use of analogue methods and partially with satellite images, using image processing operations in IDRISI and TOPOL packages.

Course on *Digital Cartography* has the form of seminar aimed at thematic maps creation (mainly forest and environmental ones), using TOPOL software. (TOPOL is original Czech GIS, predominantly used in practical forestry.) Students learn how to employ elementary cartographic principles in developing map output from spatial data. They gradually master vector data acquisition and data editing techniques, employment of raster data, conversion to vector formats, geometric transformations into local co-ordinate systems, and attribute data processing. Every student prepares his seminar assignment – a thematic map of a territory closely related to his master thesis.

Course in *Digital Photogrammetry* is ready to start; a barrier of lack of necessary equipment was not yet overcome.

When working on their theses, students specialised in Geoinformatics can use a variety of GIS and image processing systems, including SPANS, ERDAS, EASI/PACE, ARCVIEW, ARC/INFO, and MAGIS. Their studies are mainly focused on tree species classification, tree damage assessment, landscape interpretation, forest maps updating, the use of GPS, analysis in GIS, etc.

3. Postgraduate Study

3.1 Doctoral Program in Geoinformatics

This program meets the demand for skilled people trained to efficiently analyse information and to support spatial decision-making. Candidates acquire thorough knowledge (focused mainly on topics of their theses) of spatial processes and models. Modern methods used in analysis of spatial data are discussed, including area data, patterns, spatial interaction data and geostatistical data. Further information and training in the use of aerial photography for estimation of forest parameters is provided, as well as advanced training in digital image processing of remotely sensed data. Graduates should master how to integrate remotely sensed and location data in GIS, and how to use their knowledge of geographic information processing in practical natural resources management.

3.2 Long-life Education - Program UniGIS

UniGIS is an international diploma program aimed at working professionals who want to attain the latest knowledge in the field of GIS. It is offered on distance learning basis. The program came to existence in 1992 in United Kingdom and its success has attracted international attention. A partnership network of UniGIS was established later, consisting now of nearly 20 universities in Europe and in the world. Graduates acquire knowledge and experience of GIS spatial and technical aspects, organisational contexts, and also achieve practical skills in a particular work with selected software packages. Having finished their studies, they have a valuable knowledge concerning structure and organisation of GISes in their home country and in the world, and they are able to solve various issues in their own fields on professional level, using their knowledge creatively.

4. Support Activities - IDRISI Resource Centre

In 1977, the regional IDRISI Resource Centre have been established in the Czech Republic and in Slovak Republic, within the framework of the IDRISI Project based at the Clark University, Worcester, Massachusetts, USA. The centre is jointly administered by Mendel University Brno (Czech Republic) and Technical University Zvolen (Slovak Republic). It is run on non-profit basis, making use of volunteer work of its staff. The main goal is to provide Czech and Slovak IDRISI users with a support, to contribute to development of GIS and remote sensing techniques, and to organise exchange of knowledge and experience. Since 1998, meetings of IDRISI users take place alternatively in Brno and in Zvolen. The users training courses are scheduled according to users needs.

5. Conclusion

University management believes that with the above tuition the graduates, once in practice, will be able to find their bearings in the domain of digital spatial data as professionals. Despite the accelerated development in the field of spatial data processing, the graduates will leave the University with a substantial knowledge. They will be able to apply integrating holistic approach enabled by spatial digital data to their responsible decision-making routines concerning the landscape, and forest in particular. This can help to approach a sustainable management of renewable resources that is to bring benefit not only to this, but also to future generations. UniGIS Site and IDRISI Resource Centre at the Department of Geoinformatics make necessary contacts with practice easier and support a desirable feedback to University.