

DESKTOP MAPPING AND GIS SYSTEM -- DIGIMAP-GeoSET

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ABSTRACT

In my paper I present DIGIMAP-GeoSET system designed and developed by myself. This is software for computer assisted digital mapping with use of analog stereo-plotters.

I fix my attention on the latest version of the program, which has been used in production since 1995.

GeoSET is an application for Windows environment. The System is considered the industry standard and guidelines of Common User Access. It uses the Dynamic Data Exchange protocol to accomplish dynamic linkage to relational database management system -- Microsoft Access.

The version of the software gives possibility to produce vector numerical maps, where geometrical data may come from photogrammetry as well as from various sources, that is field surveys, raster images, digitizing, etc.

Presented conception provides possibilities of presenting the vector and raster images together. Therefore GeoSET may be used for presentation of the vector information on background of digital orthophoto-maps or for map-compiling applying digital photogrammetry.

As the linkage to relational database is implemented, GeoSET may be also used as a LIS or GIS management system.

GeoSET is easy to learn and use. It is also a low-cost desktop mapping system. It may be a proposal for small photogrammetric and geodetic companies. It also can be used in mapping and LIS education.

1. HISTORY OF DIGIMAP

1.1 Beginnings

As a young engineer, immediately after graduating from the Department of Geodesy and Cartography of Warsaw University of Technology in 1985, I started my professional career in Military Center of Geodesy and Remote Sensing. At first I worked as an analog stereo-plotter operator. Next I had luck to work as an operator and system manager of the first in Poland analytical stereo-plotter Wild AC1. At that time I completed the Postgraduate Computer Science Course in Polish Academy of Science and the University of Warsaw.

Experience in photogrammetry and skills in area of computer science was the reason why I started to think about modernization of photogrammetric technology in my firm. I made up my mind to use analog stereo-plotters to make digital maps, similarly as analytical stereo-plotters.

I was promoted fast and I was given a free hand in materialization of my ideas. The result was a few systems. DIGIMAP was the best and well known.

1.2 Conception

DIGIMAP was conceived as software for computer assisted digital mapping with use of analog stereo-plotters. The stereo-plotter and PC are connected via special interface.

The software gives possibility to interactive control of mapping, making drawing on screen in real time. The

result can be hardcopy made on vector plotters or ASCII files with coded geometrical information that can be transferred to other CAD or GIS software.

In the late 1980-ties it was in Poland very modern conception and it brought success for DIGIMAP.

1.3 Achievements

The software developed in my private innovating company GeoSOFT, at the beginning of 1990-ties, hit in request. About 80% of photogrammetric digital maps were produced in Poland by DIGIMAP. The reason of that situation was insufficient number of used in my country analytical stereo-plotters. Only 2 analytical stereo-plotters had worked till 1994 in Poland. And about 30 Digital Photogrammetric Workstations based on DIGIMAP is still engaged.

This software was awarded several times. The most important was first-grade Prize of Ministry of Spatial Planning and Construction.

DIGIMAP is known and used not only in Poland. It was used in works for abroad: Arab Emirates, Germany, Denmark, Belgium.

In 1989 Carl Zeiss Jena Works had an interest in use of DIGIMAP. It was tested in connection with constructed analytical stereo-plotter DICOMAT.

In 1993 DIGIMAP was installed on connection with 3 stereo-plotters in Survey and Mapping Department in Entebbe-Uganda for First Urban Project - Greater Kampala Mapping, financed by World Bank. I find that my greatest personal success.

2. GeoSET – NEW GENERATION SOFTWARE

2.1 New Conception

Since 1993 my company GeoSOFT has been working on designing and developing new generation software. GeoSET is projected to be competitive with other present-day commercial CAD and GIS software. It is compatible with DIGIMAP but this is in fact a completely new elaboration.

GeoSET is an application for Windows environment. The System is considered the industry standard and guidelines of Common User Access. As all good developed Windows-based software it is easy to learn and use. Particularly important is device-independence in area of graphics, printers and plotters. As GeoSET is the system dedicated especially for photogrammetry and geodesy, it provides tools to produce digital maps emphatically faster, better and cheaper than CAD software (even the most famous).

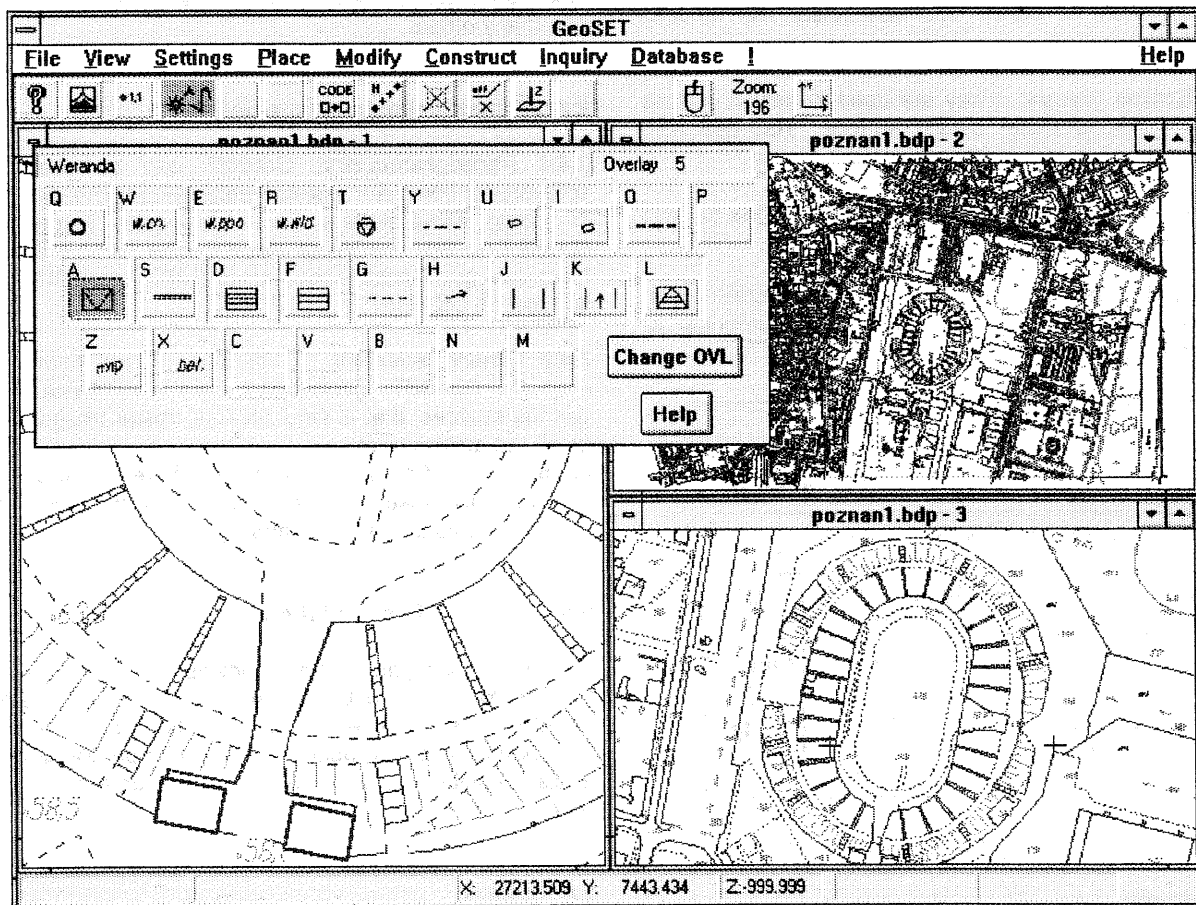


Figure 1: GeoSET for Windows

2.2 Operator's tools

GeoSET provides a range set of tools to make maps fast and conveniently.

2.2.1 Menu bar and pull-down menus: This is a typical tool for all applications that are considered the industry standard. You can call any function from menu.

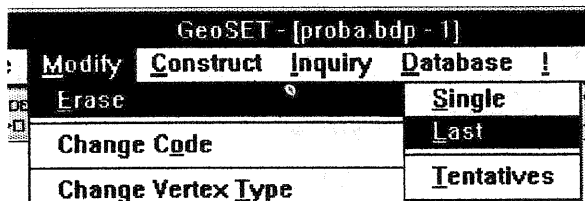


Figure 2: Pull-down menu

2.2.2 Toolbar: With the toolbar and a mouse, you can quickly choose menu commands and other actions. You just have to click a proper button with pictogram.

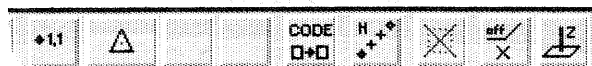


Figure 3: Toolbar

2.2.3 Palettes: Most often with one button on the toolbar are linked a few related thematically functions. To choose a proper function you can open a palette with other buttons. To do so just double-click a proper button on the toolbar.

The palette is also a very convenient tool to choose symbols from the library (Figure 1).

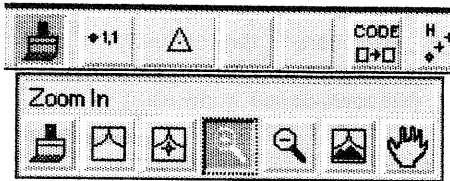


Figure 4: Palette

2.2.4 Matrix menus: They are used in conjunction with a digitizing table or tablet. You can select any function using tablet cursor.

2.2.5 Button menus: They are used to assign actions to the digitizing tablet cursor buttons. You can also assign actions to foot-switches in stereo-plotter.

2.2.6 Keyboard menu: You can assign actions to keys on the keyboard.

2.2.7 Dialog boxes: They are used in GeoSET most often to adjust settings and input alphanumeric or numerical values.

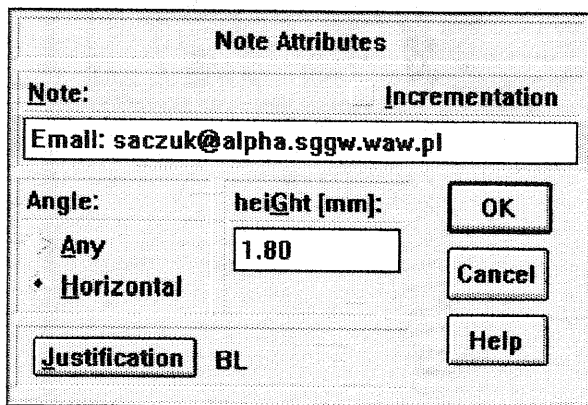


Figure 5: Dialog box -- adjusting settings

2.2.8 Status bar: The status bar at the bottom of GeoSET application window displays GeoSET prompts, status and informative messages like the name of selected function or view control, coordinates.

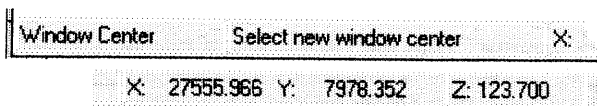


Figure 6: Status bar

2.2.9 Movable, resizable views: As in GeoSET the Multiple Document Interface standard is implemented, elaborated map can be displayed in several views. View attributes can be adjusted to vary the appearance of the digital map. I.e. you can see or not raster background in view or you can rotate image.

2.3 Digital map elaboration

The results of mapping in GeoSET are ASCII files with coded geometrical information. The vector drawing on the screen or plotter is only interpretation of geometrical

data base. You can produce various vector maps based on the same geometrical data by linking various symbol libraries.

To illustrate coded cartographic objects on the map you have to avail a set of drawing tools. They are polygons composed of lines, curves and arcs, signatures, spot heights, annotations, area symbols.

Objects of particular types, their codes and graphical illustration are to be taken from palettes with symbols.

There are also functions for correction of elaborated map, functions for inquiring about geometrical relations and many others.

2.4 Geometrical data acquisition

2.4.1 Photogrammetry: GeoSET can be used as software for computer assisted digital mapping with use of analog stereo-plotters. It will be possible to connect GeoSET to any analytical stereo-plotter. In this area I have had good experience since 1989, when I tested connection DIGIMAP to DICOMAT.

2.4.2 Others sources: To produce vector numerical maps in GeoSET, geometrical data may come from various sources, that is field surveys, raster images, old maps via digitizing, etc.

In plans of future development there is provided possibility to make stereo-digitalization from images on the screen (digital photogrammetry).

2.5 Mediums of presentation

Presented conception provides possibilities of presenting the vector and raster images together. Therefore GeoSET may be used for presentation of the vector information on background of digital orthophoto-maps. It is also possible to place images and photographs on the map.

2.6 Plotting

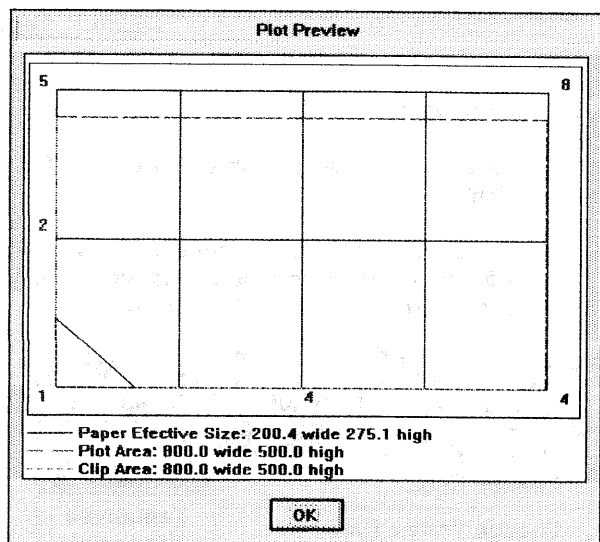


Figure 7: Plot - Preview Partial function

To produce hard-copies of digital maps you can use any vector or raster plotters, color or black laser or ink jet printers or even matrix printers. Software does pagination of drawing if plotted area cannot fit on plotter page. Before plotting operator can see expected effects be use of "preview" function.

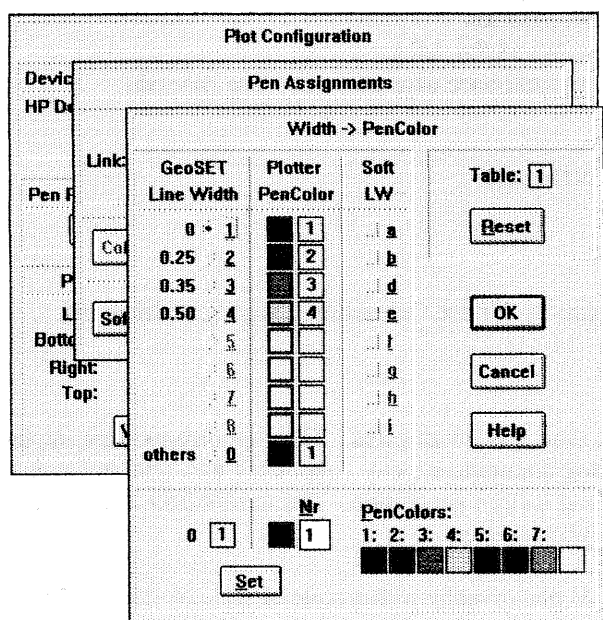


Figure 8: Plot - Pen Assignment function

GeoSET gives full flexibility in assignment plotted lines' width and colors to objects of digital map to produce high-quality maps.

If raster device is used, mix of raster and vector data is possible.

2.7 GeoSET and GIS

Data elaborated in GeoSET can be transferred to other CAD or GIS software via DXF format or in other ways. It is also possible to import data to GeoSET.

GeoSET uses the Dynamic Data Exchange protocol to accomplish dynamic linkage to relational database management system – Microsoft Access. As the linkage to relational database is implemented, GeoSET may also be used as a LIS or GIS management system.

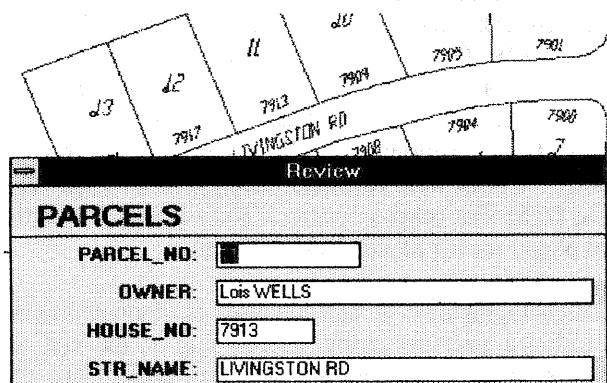


Figure 9: Review database attributes of element

2.8 Areas of employment

GeoSET is the low-cost, up-to-date, versatile desktop mapping system. It can be employed in various spheres of activity.

2.8.1 Photogrammetry: GeoSET can be used as Digital Photogrammetric Workstation in connection with analog stereo-plotter for computer assisted digital mapping

This is the way to upgrade photogrammetric old fashioned instruments (analog stereo-plotters) to requirements of numerical technology.

It is possible to connect GeoSET to any analytical stereo-plotter too.

2.8.2 Orthophotos: GeoSET may be used for presentation of the vector information on background of color or half-tone digital orthophoto-maps.

Mixed raster and vector hard-copies can be produced on raster plotters and laser or ink jet printers by GeoSET.

2.8.3 Digital mapping: GeoSET is the tool for production of digital maps. It gives possibility to produce vector numerical maps, where geometrical data may come from various sources that is field surveys, photogrammetry, raster images, old maps digitizing, etc. Digital maps produced in GeoSET can be the geometrical support for spatial information systems.

2.8.4 LIS / GIS management: As the linkage to relational database is implemented, GeoSET may be also used as a LIS or GIS management system. It can be applied in spatial planning, resource inventory, ecology, environmental monitoring, etc.

2.8.5 Education: As an ease in learning and using and a low-cost desktop mapping system, GeoSET may be a proposal for mapping and LIS education. It can be used for computer assisted learning of surveyors, photogrameters and any users of digital maps and spatial information systems.

3. PLANS FOR FUTURE

The developing of software is the "never ending story". In the foreseeable future I plan to supplement the system with DEM module. In area of my interest are problems of spatial, stereoscopic presentation of digital map. I am working on "digital photogrammetry". I want to offer software for stereo-digitalization from digital pictures on screen as soon as possible.

At the moment I try to interest as many as possible potential users from various spheres of activity in the use of GeoSET.

I also ask for possibility of any cooperation in the field of international marketing organization, software application, any kind of financial support in professional promotion, software development, etc.