ScanMagic

Image Processing Software
Version 1.5

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Application Purpose

ScanMagic is a software application for the visualization, analysis and processing of remote sensing data. In most of the cases, ScanMagic makes it possible to carry out a complete range of activities on preparation of Earth remote sensing output products without application of additional software tools.

ScanMagic is a MDI application for Microsoft Windows 98/2000 environment. It features a modern and intuitive graphical user interface easy to understand and use. ScanMagic provides the following main operations with the images:

- displaying images with an arbitrary colour synthesis, contrasting and scaling;
- geographical location of the images, including gelocation by satellite orbital elements; cartographic location of the images; geocorrection by implementing adjustments for satellite orbital position and attitude; geocorrection with usage of ground control points; "image-to-map" and "image-to-image" georeferencing;
- import and overlay of digital maps on the images;
- image transformation to map projections; mosaicking;
- export of original and mapped images to generic graphical formats and GIS formats;
- image printing.

ScanMagic is built with the use of modern effective techniques of image processing. Along with other provisions, the software is capable to analysis the images up to 4 Gb in real time of viewing, to implement images reprojection "on-the-fly", to repeatedly correct and visually evaluate the quality of images without consumption of considerable time with the actual data processing only at the final stage.

All comments, remarks and evaluation of ScanMagic Application are requested to be forwarded at support@scanex.ru indicating "ScanMagic" in the letter subject field.

Requirements to Hardware

- Windows 98, 2000 operation system or later versions.
- Pentium III processor or higher.
- RAM is not less than 256 Mb. One has to note, that free RAM is important for the Application operation speed. Free RAM size should be more than size of the image converted to cartographic projection. In a case of mosaicking, RAM size should be not less than total size of all source images.
- Disc free space is not of particular importance; but it should be within reasonable limits – not less than a few hundreds of Mb. If possible, it is recommended that more fast hard discs should be used.
- Monitor graphic mode - TrueColor (32 bit/pixel). Screen size should be not less than 1024x768 pixels.

Application Composition

ScanMagic Application consists of the basic module (ScanMagic.exe), selection of dynamic libraries (hd413m.dll, hm413m.dll, gdal11.dll, proj.dll and sophocl.dll) and configuration file (ScanMagic.ini), which contains current settings and may be absent in a general case. The Application also includes Help (ScanMagic.hlp and ScanMagic.cnt files) and the Present User's Manual (ScanMagic.pdf). Besides, the Application may include some additional data, such as digital maps, file formats description, etc.

The Application is supplied as an installation version.

Image Import

ScanMagic presently implements import and processing of the data with radiometric resolution up to 16 bit/pixel received from the following satellites: IRS-1C, IRS-1D, TERRA, RESURS 01-№3, RESURS 01-№4, METEOR-3M and NOAA 12-17:

Satellite	Sensor	Product	Format
IRS-1C/1D	LISS-VNIR, LISS-SWIR, WIFS, PAN	LISSL0, PANL0,	SCANEX IRL/IRP
		LISS1A, PAN1A, LISS1B, PAN1B	HDF
TERRA	MODIS	MOD02/250, MOD02/500, MOD02/1KM	HDF
RESURS O1-№3/№4	MSU-E	Level 0	SCANEX RSR
METEOR-3M	MSU-E	Level 0	SCANEX RSR
NOAA 12-17	HRPT	Level 0	SCANEX HRP

Besides, ScanMagic allows to import and processing of the images of series generic graphic and GIS formats: BMP, TIFF/GeoTIFF, GIF, JPEG, PNG, PGM/PPM, ERDAS IMG, ESRI BIL/BIP/BSQ, ENVI BIL/BIP/BSQ, CEOS SAR, USGS DEM, etc.

An image of one of the formats described above can be opened through the menu command *File -> Open…* or 📂 button of the Application toolbar. In the process a standard dialog box for opening file appears (Figure 1). It is necessary to select one or several files and click the *Open* button.
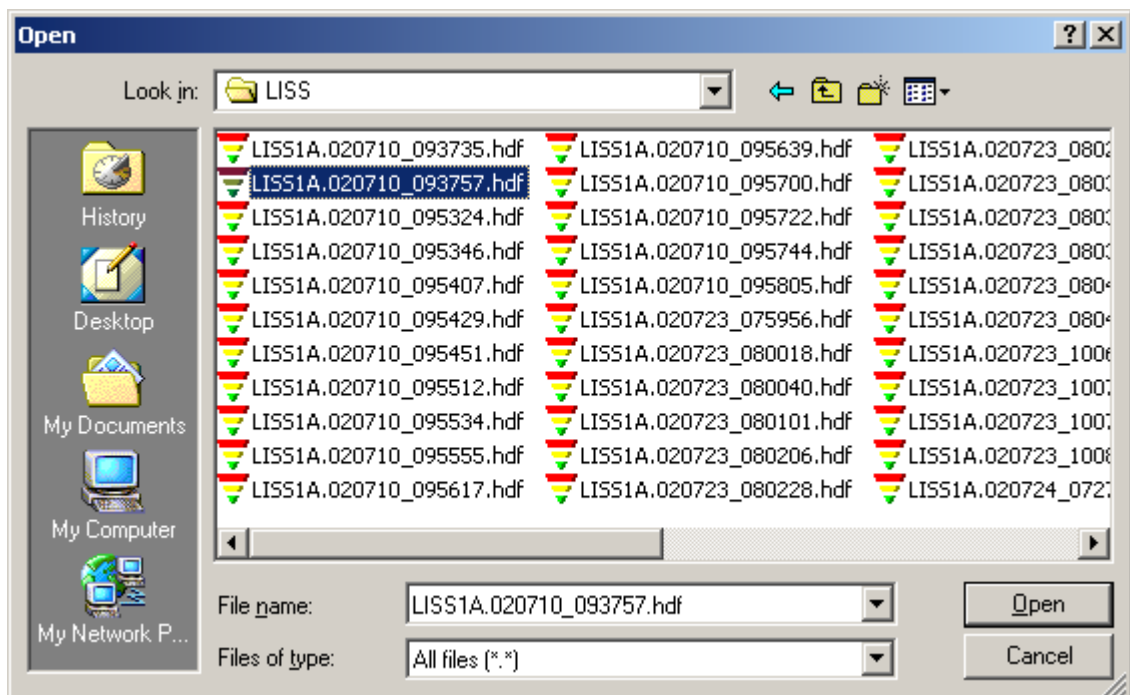

Figure 1.

The *ImageManager* dialog panel (Figure 2) makes it possible to open images. For displaying the *ImageManager* dialog panel, select *View -> Image Manager …* menu command or click [icon] button on the Application toolbar. The panel is created in a docked bar style, it is attached to the top or to the bottom border of the Application main window. To change position of panel, click [icon] button placed in upper left corner of *Image Manager* panel.
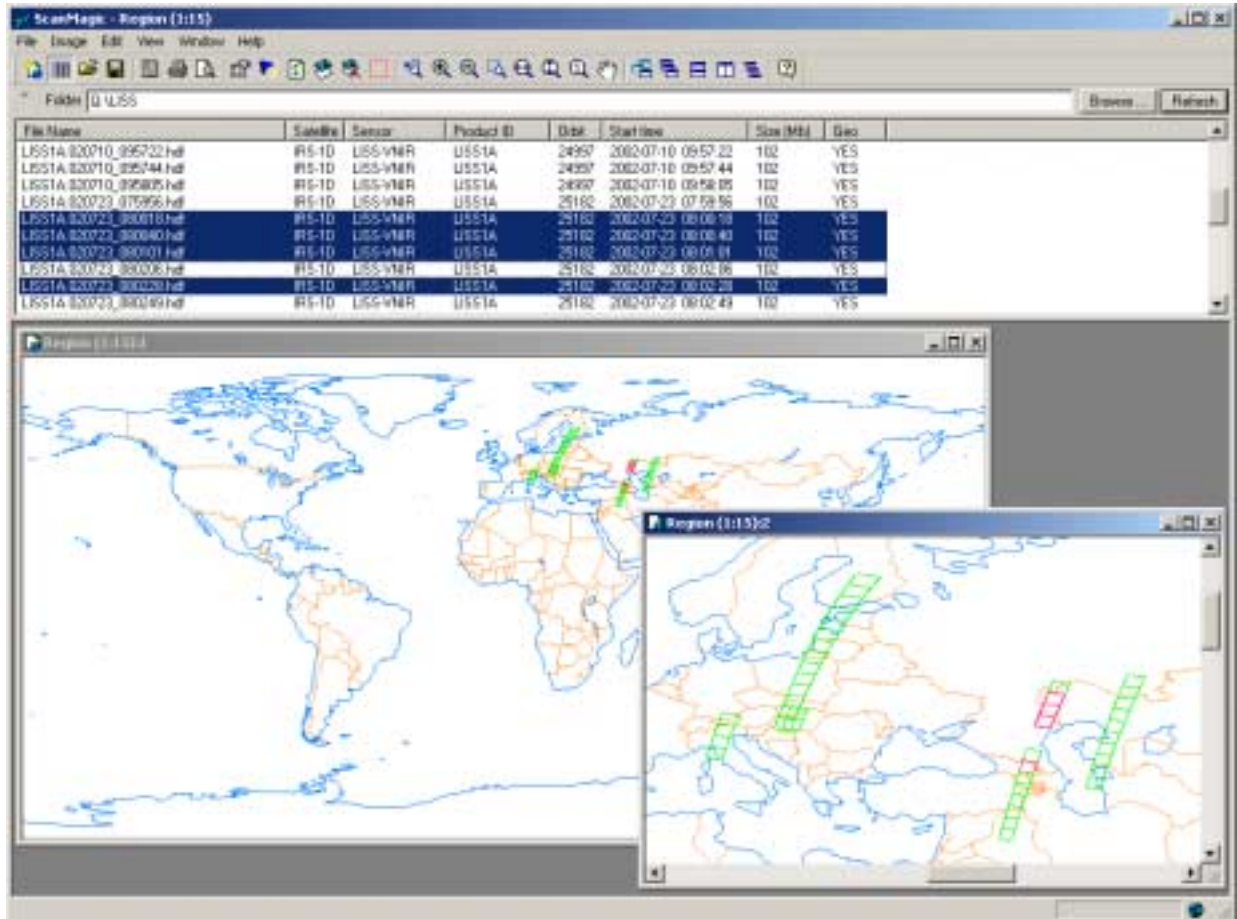

Figure 2.

To view the list of images from a directory, first enter the path to the directory in *Folder* edit box of *Image Manager* dialog panel, then click *Refresh* button. Images directory may be selected by clicking the respective *Browse*… button. Images with some basic parameters from the current directory are displayed as a list.

While *Image Manager* dialog panel and Region window being open, all geolocated images of the list are automatically reflected in the Region in a current cartographic projection as boundaries delineations. Images marked on the list are also marked with another color in the Region.

If the Region is created with *Image Manager* being open (for example, by clicking [icon] button on the Application toolbar), it will automatically occupy the size of the whole world in Equidistant Cylindrical projection. Region is created automatically in first opening *Image Manager* panel. A range of world vector maps, which are overlaid on such a Region by default, is set in *Default world map* edit box on *Paths* tab of *Options*

settings dialog box of the Application. To display the settings dialog box, select *File ->
Options…* menu command or click ▦ button of the Application toolbar.

Image Manager panel can open one or several images. To do so, first mark required
images on the list, then press the right mouse button and select *Open* command in the
appeared contextual menu. For deleting of one or several files from the directory, first
mark respective row of the list, then press the right mouse button and select *Delete*
command in the appeared contextual menu.

Images may be opened or deleted directly from the Region window, if its boundaries are
reflected therein. To do it, click the right mouse button near the boundaries of a required
image in the Region window. The boundaries of a marked image will change the color,
and a respective row in the list of *Image Manager* panel will become active. Use *Open*
command of the contextual menu to open the image. Use *Delete* command to delete
the image.

Obtaining Information about Image

The Application provides for the following:

- obtain general information about the image (file format, satellite name, sensor name, orbit number, beginning and end time for taking images, image size, number of channels, etc.);
- control parameters of the marked fragment (width, height and size);
- measure colour characteristics of image pixels in real-time along with the cursor movement;
- measure planar, geographic and map coordinates of image pixels in real-time along with the cursor movement.

Image characteristics are displayed in *Info* tab of *Image Properties* dialog panel (Figure 3). To display the tab, first open *Image Properties* dialog panel through the *View -> Image Properties…* menu command or by clicking 🖼 button on the Application toolbar. The panel is created in a docked bar style, it is attached to the left or to the right border of the Application main window. To change panel position, click ◀ button placed in upper left corner of *Image Properties* dialog panel.

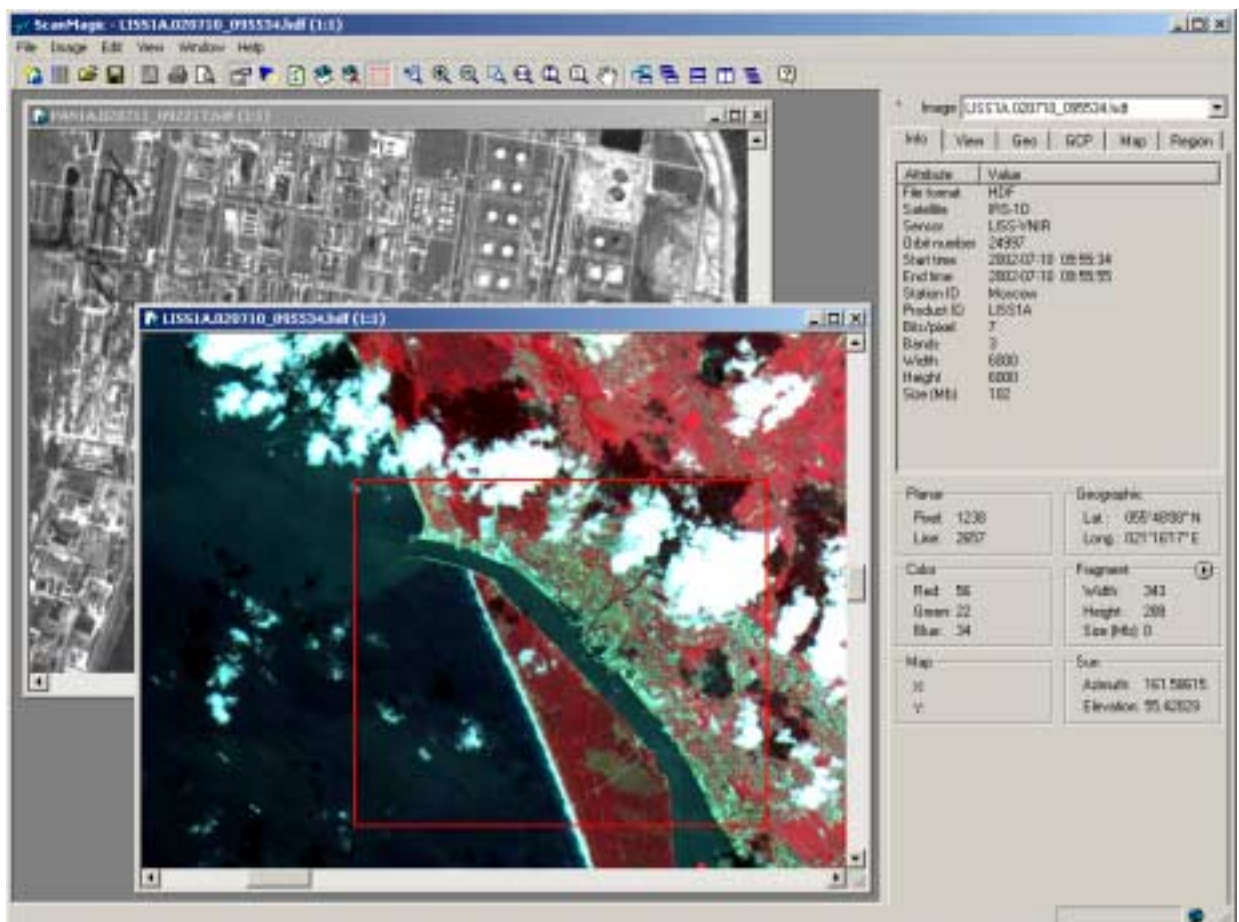Figure 3.

Image View Control

The Application provides for the following:

- displaying images in Grayscale mode with arbitrary selection of a channel and synthesis of colour RGB image with arbitrary set of channels;
- viewing and channel-by-channel histogram processing of the image visible part for ranges 0..255 (8 bit/pixel) and 0..65535 (16 bit/pixel); manual and automatic contrasting of the image histogram, equalizing;
- arbitrary image scroll and zoom in a view window: *Zoom In*, *Zoom Out*, *Zoom To Width*, *Zoom To Height*, *Actual Zoom (1:1)*, *Zoom To Region*, *Drag The Display*, *Previous Zoom*, etc.

A few viewing windows for some image may be created at one time for displaying with specific settings for colour synthesis, zoom and contrasting.

Control of view mode, synthesis, histogram and processing algorithm is performed in *View* tab of *Image Properties* dialog panel (Figure 4).
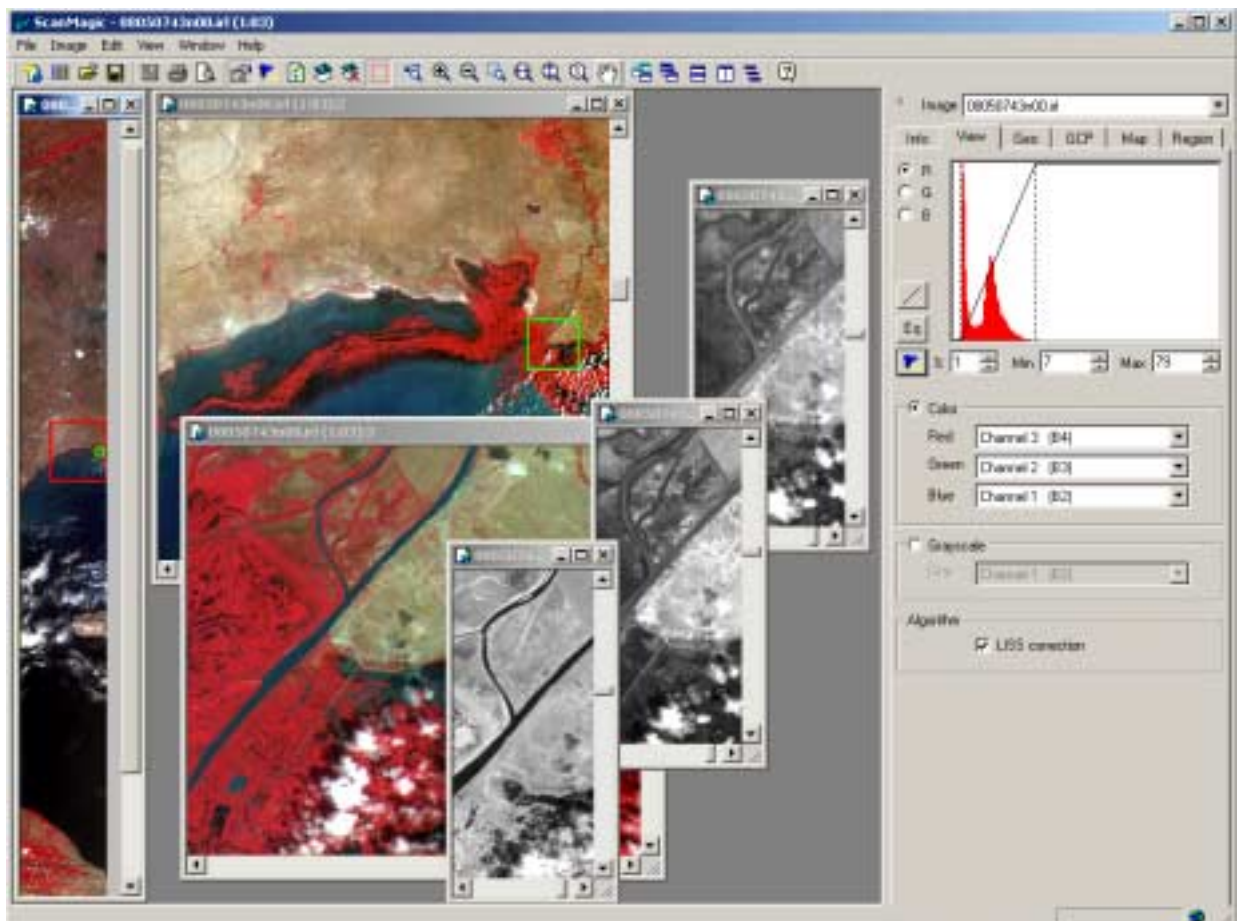

Figure 4.

The *Grayscale* group of elements in *View* tab of *Image Properties* dialog panel makes it possible to select an arbitrary image band for viewing in the Grayscale mode.

The *Colour* group of elements in *View* tab of *Image Properties* dialog panel makes it possible to select three arbitrary image bands for synthesis of the RGB image.

Controls ⊙ R, ○ G, ○ B indicate, for which channel of synthesised RGB image the histogram is displayed in *View* tab of *Image Properties* dialog panel.

One has to note, that the histogram is created for only that part of the image, which is currently being viewed in the view window. A histogram is built up at the moment of drawing the image in the viewing window. Signalling element of the status bar looks like ⌛, at the moment of the image drawing, and it looks like 🌐 upon drawing completion.

The boundaries of the linear contrasting range are established with the help of [Min] [Max] controls. Minimum and maximum boundaries of the linear contrasting range may also be set by clicking left or right mouth button with the cursor being on the histogram.

Button ╱ of *View* tab of *Image Properties* dialog panel is intended for setting the linear contrasting function for the whole range of the current channel of RGB image.

Button Eq of *View* tab of *Image Properties* dialog panel makes it possible to perform the equalizing of the current histogram in the current range.

Button 🖌 of *View* tab of *Image Properties* dialog panel makes it possible to perform quick contrasting of the image visible part. In the process the boundaries of the contrasting range are automatically determined with cutting some percentage of the histogram area along the edges. This percentage is set in [1] % control.

Fast contrast option is accessible through *Image -> Easy Contrast* menu command and 🖌 button of the Application toolbar.

Image zoom control can be exercised via *Image* menu item (commands: *Previous Zoom, Zoom In, Zoom Out, Zoom To Region, Zoom To Width, Zoom To Height, Actual Zoom*) or by using elements 🔍🔍🔍🔍🔍🔍🔍 of the Application toolbar.

To move a displayed part of the image in the window it is possible via scrollbars or through ✋ button of the Application toolbar (*Image -> Drag The Display* menu command).

Location of windows can be controlled via *Window* menu item (commands: *Cascade, Tile Horizontally, Tile Vertically, Arrange Icons*) or by using elements 🗗🗗🗗🗗 of the Application toolbar.

A new window can be added to the opened image by *Window -> New Window* menu command or by clicking 🗗 button on the Application toolbar.

The *Algorithm* elements group in *View* tab of *Image Properties* dialog panel allows us to display the image with account of some processing algorithm. For example, it is possible to eliminate the distortion on the left and right edges of MOD02/250,

MOD02/500 and MOD02/1KM products, which are the outcome of MODIS sensor design peculiar features, to compensate the shift of CCD2 respective CCD1 and CCD3 for Level-0 data of IRS-1C and IRS-1D satellites PAN sensor, etc.

Image Geographical Location

- The Application provides for automatic geographical and map location of imported images, as well as manual location as per "image to map" and "image to image" techniques

- Among other methods, one may use trajectory data from NORAD TLE format messages for images geolocation; and geocorrection may be done by selecting adjustments for satellite orbital position and attitude angles thereof.

- For more precise geolocation of the image in converting it into cartographic projections ground control points are used. They are determined by the User manually, in particular, with the help of vector maps as a geographical basis.

It is possible to determine, whether the image is geolocated, by the icon of the image window. If it looks like 🖼, the image is geolocated, if the window icon looks like ⬜, the image is not geolocated.

Precision of geolocation can be visually controlled by overlaying the vector map on the image.

It is necessary to renew image geolocation after the change of adjustments in the process of geolocation correction (location of the vector maps overlaid on the image will be changed as well). It can be done by *File -> Refresh Geolocation* menu command or with the help of 🔃 button of the Application toolbar. A similar button is also available in *Geo* tab of the *Image Properties* dialog panel.

In general, imported images can have three modes of location:
1. *Simple Image* – general raster.
2. *Mapped Image* – cartographically located image, whose each pixel's map coordinates X, Y can be changed based on *WORLD* location from the file heading (*ULX*, *ULY*, *XDIM*, *YDIM*). If the image heading contains parameters of map projection, geographical coordinates can be measured for each pixel.
3. *Geolocated Image* – geolocated image, whose each pixel's geographical latitude and altitude can be changed. Geolocation is made based on the orbital elements from the file heading, latitude and altitude grid from the file heading, trajectory data from outside NORAD messages, etc.

During conversion to the Region, the image in *Simple Image* mode does not contain geo or map location, and it is initially placed "as it is" with left – top levelling position. Such image location can be done by "image to map" and "image to image" techniques.

During conversion to the Region, the image in *Mapped Image* mode is immediately placed taking into account its own map location. If image map parameters differ from Region map parameters, the image is automatically reprojected. If the image only contains *WORLD* location (map projection is not clearly determined), one has to established a required map projection for the Region. If necessary, location correction is made based on ground control points.

During conversion to the Region, the image in *Geolocated Image* mode is placed therein taking into account its own geolocation. If necessary, fine correction of location is made based on ground control points.

Geolocation control is performed in *Geo* tab of *Image Properties* dialog panel (Figure 5).
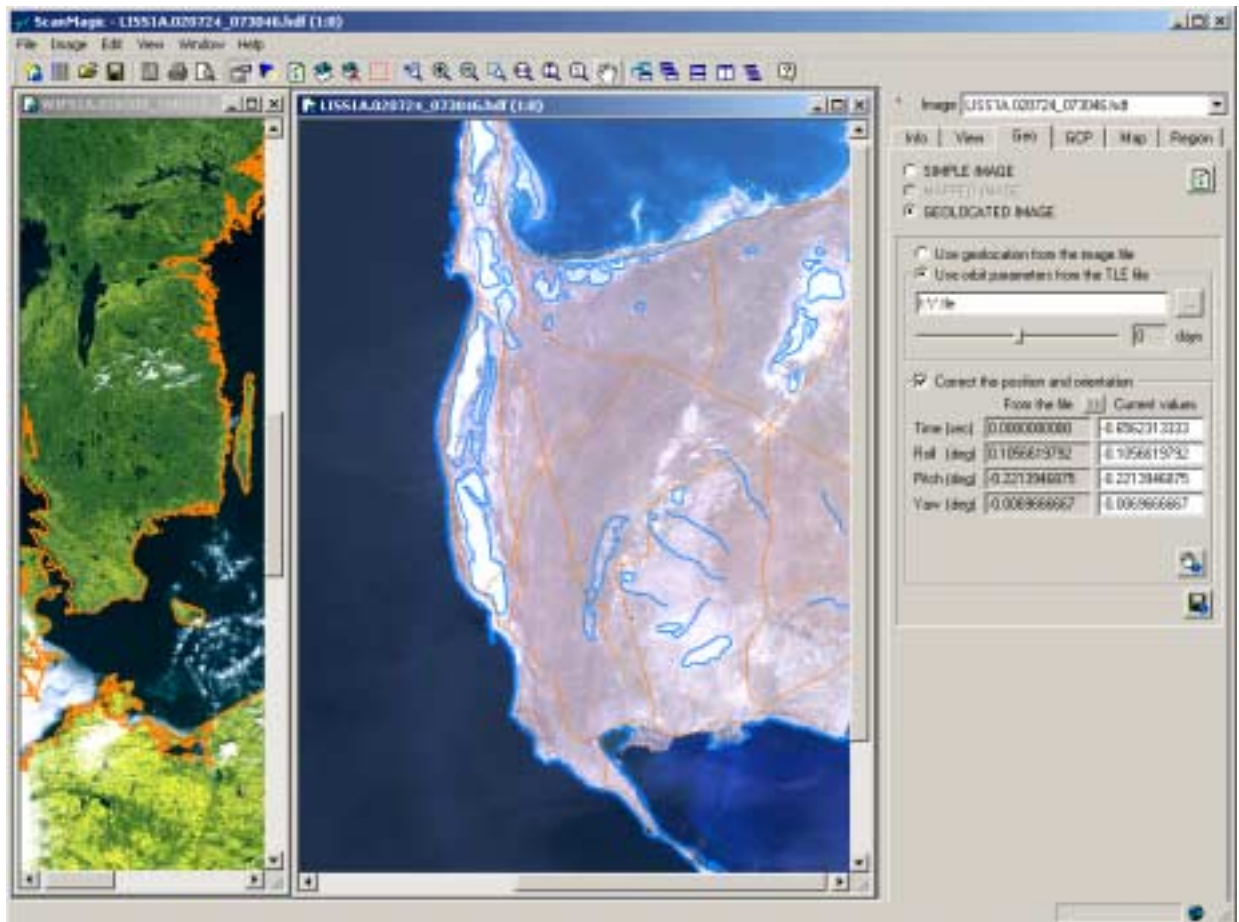

Figure 5.

The current mode of image location is established with the help of "*SIMPLE IMAGE*", "*MAPPED IMAGE*" and "*GEOLOCATED IMAGE*" control elements.

The appearance of control elements in *Geo* tab is changed while changing a location mode. Given below is a description of operation with *Geo* tab control elements in selecting *Geolocated Image* mode (this mode is not available for all imported formats).

If "*Use orbit parameters from the image file*" option is selected, image geolocation will be calculated based on satellite orbital elements and attitude parameters from the file header. This option is not available, if orbital elements are missing in the image file.

If "*Use orbit parameters from the TLE file*" option is selected, image geolocation will be calculated based on orbital elements from the outside file (attitude parameters from the file header are not used, but they are available for viewing). The full path to the file containing NORAD TLE messages is selected in a corresponding field of the group. It is permissible to select files mask, for example, "D:\NORAD*.tle". In this case, that message will be automatically selected, which exactly fits the time of receiving the image. It is possible to establish the shift of the required message in days since the

moment of taking the picture with the help of control element.

Controls *Time adding*, *Roll adding*, *Pitch adding* and *Yaw adding* helps to set adjustments of the satellite orbital position and angles of its orientation. One has to remember, that after setting new options and geolocation parameters, button should be clicked.

To save current geolocation parameters into image file, click button.

The Application supports the selection of ground control points for each image, makes it possible to edit ground control points, to perform their on-line determination by the image.

Ground control points control is performed in *GCP* tab of *Image Properties* dialog panel (Figure 6).
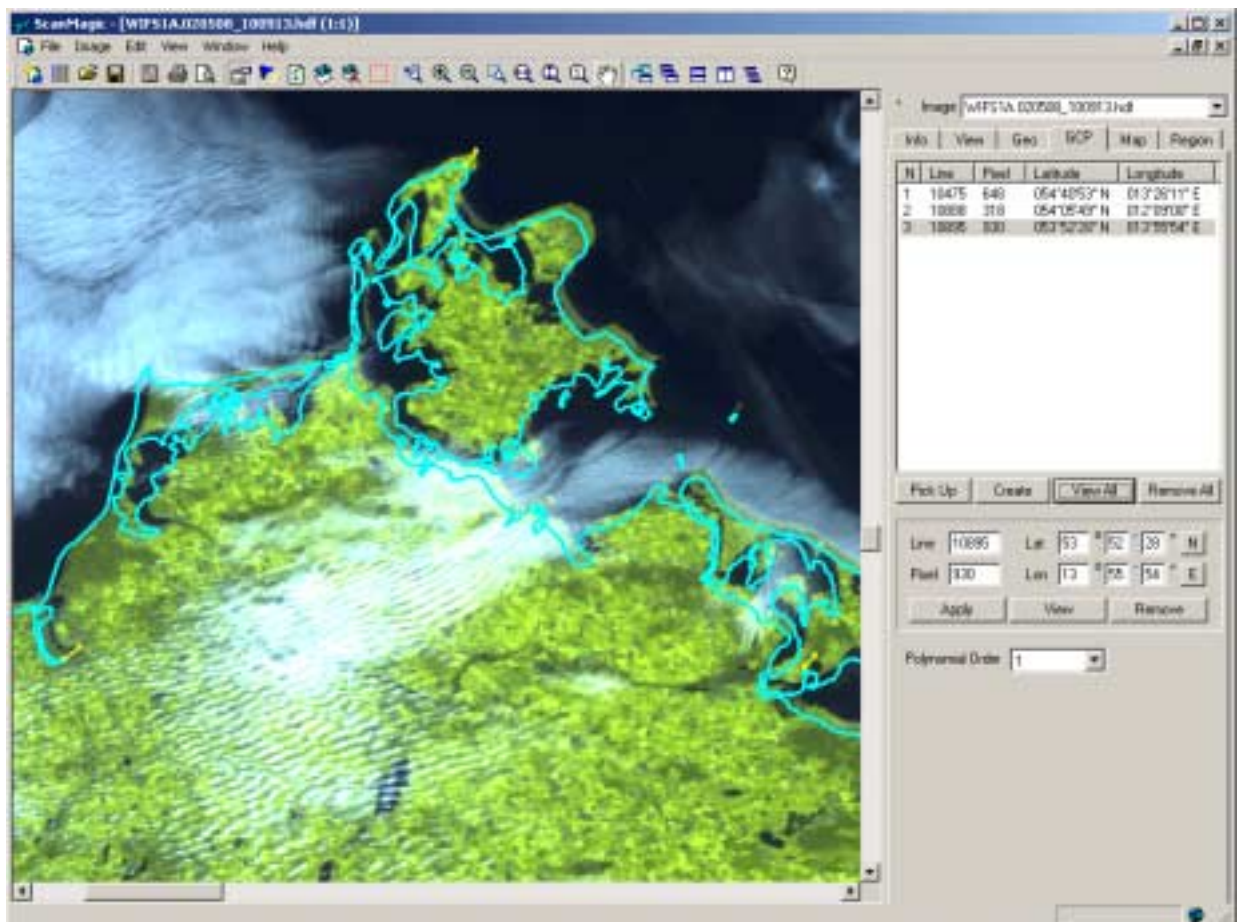
Figure 6.

The editor of ground control points consists of the ground control points list and a group of elements, where parameters of the selected ground control point are displayed.

For on-line picking up a ground control point by the image and the map overlaid on it, select the mode of ground control points picking-up by clicking *Pick Up* button. Then move the mouse cursor to the image object and click left button, afterwards similarly

click the element identical to the image object on the vector map (the map should be overlaid on the image).

For input of the ground control point coordinates manually, click *Create* button. A new ground control point shall be added to the list. Select this ground control point from the list and change its coordinates in respective fields, then click *Apply* button.

For viewing the ground control point position, select it from the list and click *View* button, or simply double-click the ground control point on the list. The ground control point position is drawn in yellow in the image window. Click the empty recording in the list of ground control points to cancel the drawing of the ground control point position. Click *View All* button to view all ground control points positions.

Click *Remove All* button to remove all ground control points from the list. To remove one ground control point select it from the list and click *Remove* button.

Operation with Vector Maps

The Application provides for the following:

- overlaying of up to one hundred layers of the vector digital maps in ShapeFile GIS ArcInfo format (support of polygonal, polylinear and point objects);
- overlaying of vector maps both on the source image and on the image converted into the cartographic projection;
- change of vector layers draw parameters during displaying.

Map control is performed in *Map* tab of *Image Properties* dialog panel (Figure 7).
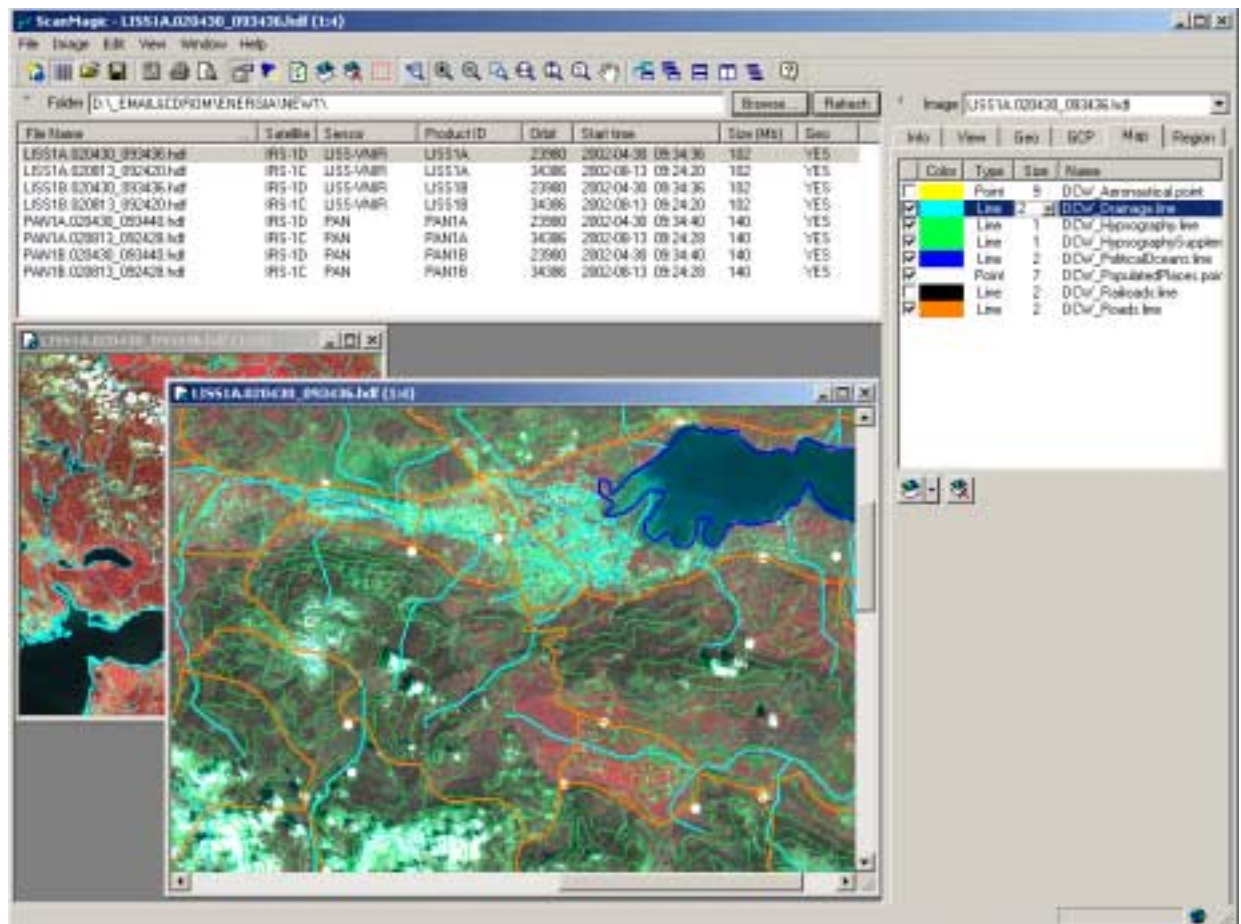
Figure 7.

To add vector maps, click [icon] button of *Map* tab of *Image Properties* dialog panel. Select imported files of ShapeFile GIS ArcInfo format in the appeared dialog box and click *Open* button. One may also use *Image -> Add Vector Layers…* menu command or [icon] button of the Application toolbar.

To delete all vector maps from the image, click [icon] button of *Map* tab of *Image Properties* dialog panel. This command is also available through *Image -> Remove All Vector Layers* menu command or [icon] button.

To delete one or several maps from the list of current image vector layers, mark respective entries of the list, click right mouse button thereon and select *Remove* command on the appeared contextual menu.

To enable or disable the displaying of some layer, establish or remove a flag on the list of layers. The same actions may be performed by marking required entries of the list by clicking right mouse button thereon and selecting *Visible* or *Invisible* commands on the appeared menu.

To change the size of vector objects of some layer, select a required value in *Size* column for a respective entry of maps list in *Map* tab of *Image Properties* dialog panel.

To change the color of a vector layer drawing, double-click left mouse button in *Color* column for a respective entry of maps list and select a required color in the appeared dialog box. One may establish a display color simultaneously for some set of layers by marking required entries of the list by clicking the right mouse button thereon and selecting *Color* command in the appeared contextual menu.

If parameters of the image geolocation are changed with the help of button, the position of the vector maps shall be recalculated automatically.

If a fragment is marked on the image, the vector maps shall only be overlaid within the limits of the fragment. To overlay the maps on the whole image, temporarily switch off the mode of fragment marking .

Conversion to Cartographic Projections

ScanMagic makes it possible to transform single images or their fragments to cartographic projections "on-the-fly", as well as to create photometricly levelled mosaics of images from different sensors for a certain geographical region with an arbitrary integration of different channels data and spatial resolutions.

Current software version supports more than 70 cartographic projections:

- Albers Equal Area
- Azimuthal Equidistant
- Behrmann
- Bonne
- Cassini
- Central Cylindrical
- Collignon
- Craster Parabolic (Putnins P4)
- Eckert I
- Eckert II
- Eckert III
- Eckert IV
- Eckert V
- Eckert VI
- Equal Area Cylindrical
- Equidistant Conic
- Equidistant Cylindrical
- Fahey
- Foucaut
- Foucaut Sinusoidal
- Gall (Gall Stereographic)
- Gall's Orthographic (Peters)
- Gauss-Kruger
- Gauss-Kruger (6 deg. zone)
- Gnomonic
- Hatano Asymmetrical Equal Area
- Kavraisky V
- Kavraisky VII
- Lambert Azimuthal Equal Area
- Lambert Conformal Conic
- Lambert Equal Area Conic
- McBride-Thomas Flat-Polar Parabolic
- McBryde-Thomas Flat-Polar Quartic
- McBryde-Thomas Flat-Polar Sine (No. 1)
- McBryde-Thomas Flat-Polar Sinusoidal
- McBryde-Thomas Flat-Pole Sine (No. 2)
- Mercator
- Miller Cylindrical
- Mollweide
- Nell-Hammer
- Orthographic
- Perspective Conic
- Plate Caree
- Polar Stereographic
- Polyconic (American)
- Putnins P1
- Putnins P2
- Putnins P3
- Putnins P3'
- Putnins P4'
- Putnins P5
- Putnins P5'
- Putnins P6
- Putnins P6'
- Quartic Authalic
- Robinson
- Sinusoidal (Sanson-Flamsteed)
- Stereographic
- Transverse Cylindrical Equal Area
- Transverse Mercator
- Universal Transverse Mercator (UTM)
- van der Grinten (I)
- Wagner I (Kavraisky VI)
- Wagner II
- Wagner III
- Wagner IV (Putnins P2')
- Wagner V
- Wagner VI (Putnins P1')
- Werenskiold I
- Werner
- Winkel I

ScanMagic supports user-defined ellipsoids and more than 40 standard ellipsoids:

- MERIT 1983
- Soviet Geodetic System 85
- GRS 1980 (IUGG,1980)
- IAU 1976
- Airy 1830
- Appl. Physics. 1965
- Naval Weapons Lab.,1965
- Modified Airy
- Andrae 1876 (Den.,Iclnd.)
- Australian Natl & S. Amer. 1969
- GRS 67 (IUGG 1967)
- Bessel 1841
- Bessel 1841 (Namibia)
- Clarke 1866
- Clarke 1880 mod.
- Comm. des Poids et Mesures 1799
- Delambre 1810 (Belgium)
- Engelis 1985
- Everest 1830
- Everest 1948
- Everest 1956
- Everest 1969
- Everest (Sabah & Sarawak)
- Fischer (Mercury Datum) 1960
- Modified Fischer 1960
- Fischer 1968
- Helmert 1906
- Hough
- International 1909 (Hayford)
- Krassovsky,1942
- Kaula 1961
- Lerch 1979
- Maupertius 1738
- New International 1967
- Plessis 1817 (France)
- Southeast Asia
- Walbeck
- WGS 60
- WGS 66
- WGS 72
- WGS 84
- Normal Sphere (r=6370997)

ScanMagic Application makes it possible to import, display and analyse images of a large size (no limitations are imposed on the image input file). Image conversion into cartographic projections is performed "on-the-fly" along with viewing. All source images (or their fragments) in the process of conversion to map projection boot into the RAM.

The present version of the Application realizes the technology of creation of so called Region with a possibility to change its characteristics on-line. In a general case, Region is an image of some area of the earth surface in one of the cartographic projections. Region's raster is synthesised as a result of spatial and spectral mounting of several images obtained at different time from different sensors.

To convert one or several images into a cartographic projection, one has to select *File - > Create Region…* menu command or to click 🔧 button of the toolbar. As a result a new empty "*Region*" window will appear in the Application. Then it is necessary to select characteristics of the created raster and parameters of the cartographic projection in *Region* tab of *Image Properties* dialog panel and to click *Apply* button (Figures 8,9).

Control of Region characteristics is exercised by the elements of *Region* tab of *Image Properties* dialog panel. After changing Region's main characteristics, it is necessary to click *Apply* button to redraw Region's raster in the view window. For example, the following refer to these characteristics: number of raster's channels, list of images to be converted, geographic borders of the Region and cartographic projection parameters. However, in case of changing some properties, redrawing of the Region takes place in the View window at once. For example, it is not necessary to click *Apply* button of *Region* tab of *Image Properties* dialog panel in case of changing background color, order of arrangement and type of pictures interpolation, parameters of some pictures contrasting, etc.

Below is a description of parameters, whose application for the Region requires clicking *Apply* button.

Channel NN element of *Region* tab of *Image Properties* dialog panel is used for setting the number of Region's channels.

Bits per pixel of the image is set automatically taking into account maximal radiometric resolution of the pictures used for creating the Region.

Width, *Height* и *Size (Mb)* elements show calculated dimensions of synthesised raster at the current Region's parameters.

Image sub-tab provides selection of the list of images converted into the Region and parameters of their conversions (Figure 8).
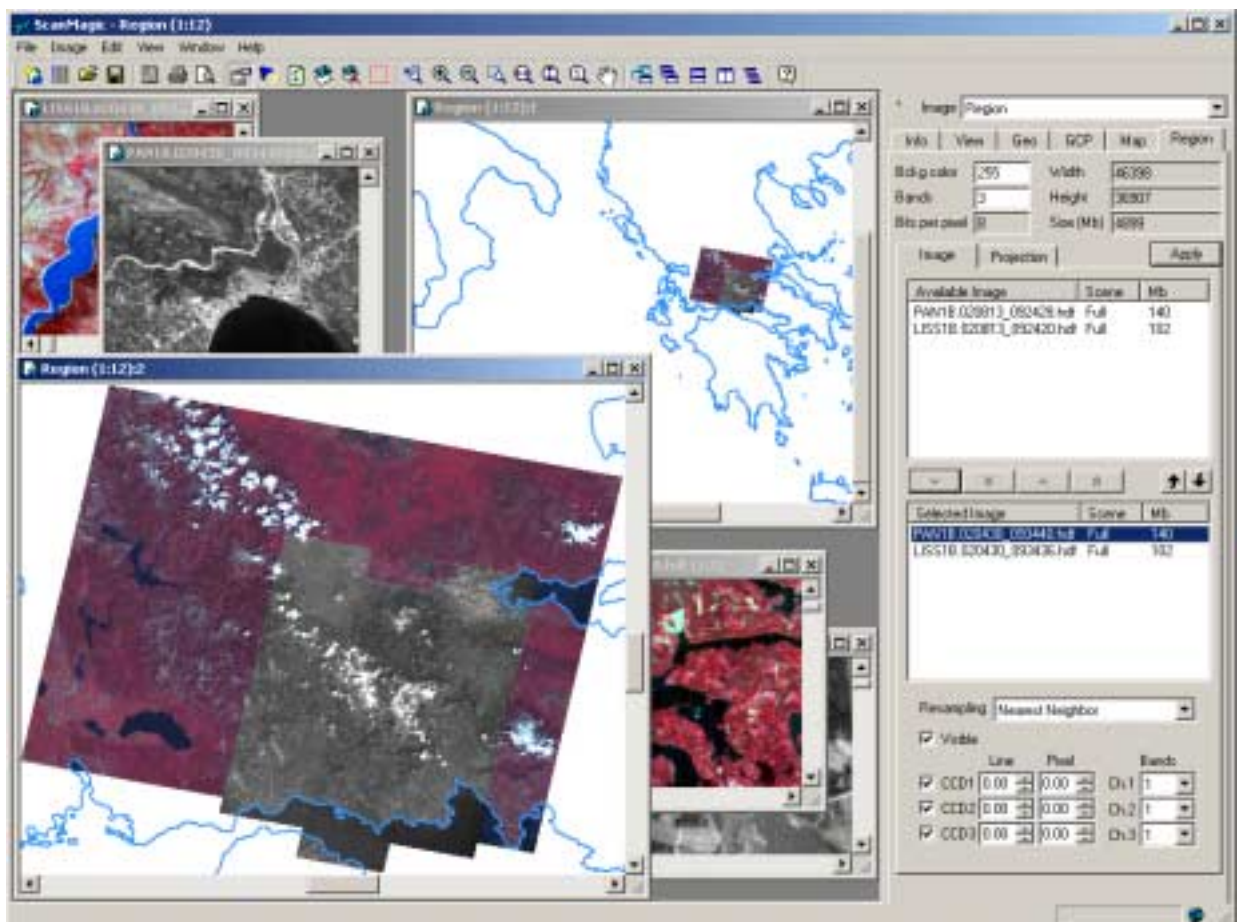

Figure 8.

List of *Available Images* of *Image* sub-tab contains images available for conversion into cartographic projection. It includes all images geographically located and opened by ScanMagic Application.

List of *Selected Images* of *Image* sub-tab contains images selected by the user for conversion into Region's cartographic projection. Images of the list may be added and deleted by [⌄ | ⌄⌄ | ⌃ | ⌃⌃] buttons.

Output channels elements are used for establishing the order of arrangement of spectral channels in the Region for the image selected in *Selected Images* list. *None* indicates that no spectral channels of the current image will be placed in the present channel of the Region.

Projection sub-tab provides setting parameters of the Region cartographic projection (Figure 9).
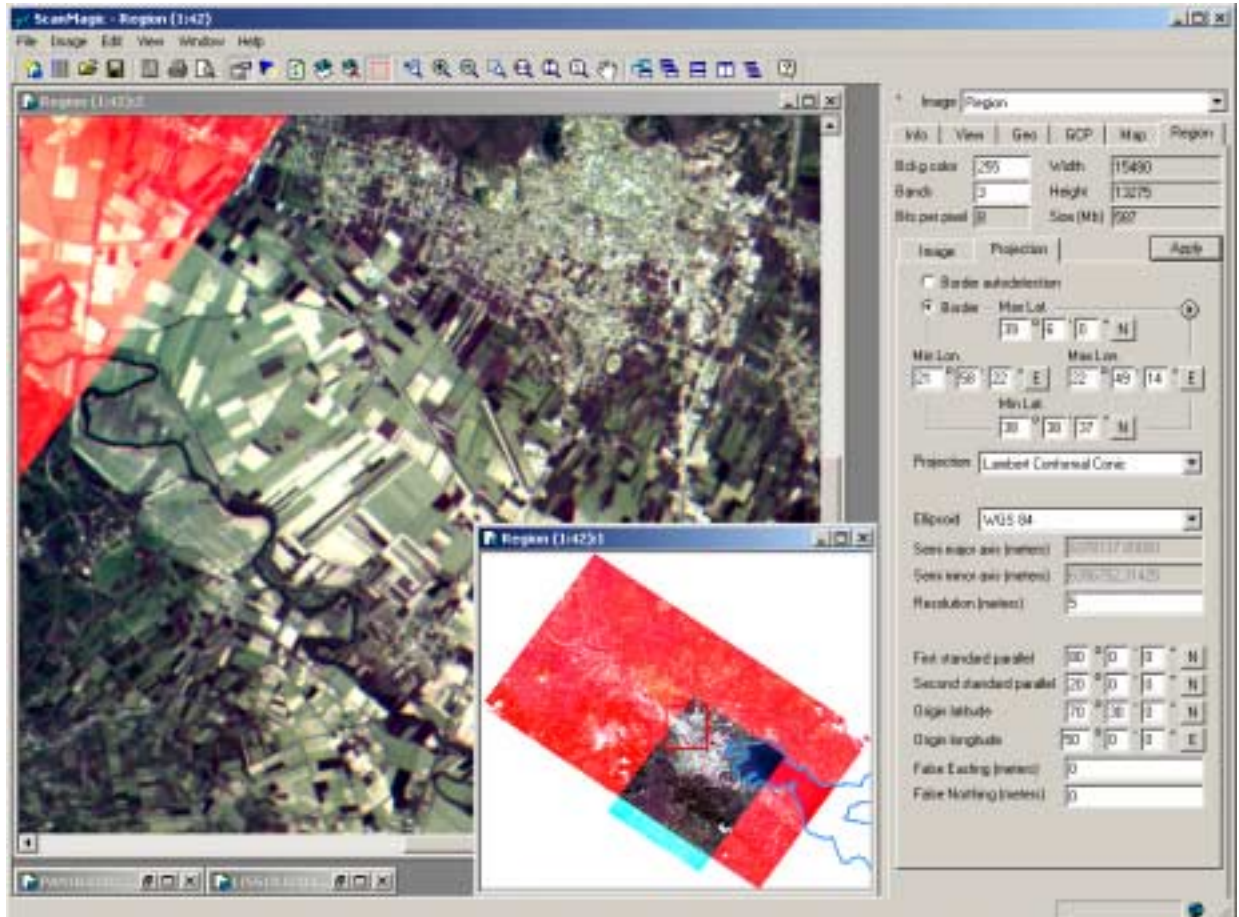

Figure 9.

Border autodetection option indicates, that all geographic borders will be selected automatically so, that all converted images could be accommodated in the Region (i.e. images on the list of *Selected Images* of *Image* sub-tab).

Geographic borders may be set manually with the help of *Border* group of elements after activating the option of the same name.

After clicking ⊙ button and selecting *Autodetect* item in the appeared contextual menu one may fill the fields of *Border* group of elements with values of geographic borders calculated automatically. After selecting *World* item in the contextual menu one may fill the fields of *Border* group of elements with values describing geographic borders of the whole world. If the image of the Region has already been created, and it is necessary to reduce its geographic borders, it may be easily done by marking its fragment and establishing new borders with the help of *Fragment* item of contextual menu.

Resolution (meters) element establishes spatial resolution of the Region in meters. One has to remember, that this value is nominal, i.e. it refers, for example, to pixels of the image at the latitude of standard parallel of cartographic projection.

Projection control element is intended for selection of cartographic projection. Other elements of *Projection* sub-tab, which are not described, are intended for setting parameters of selected cartographic projection.

Region's parameters, which do not require clicking *Apply* button, are described below.

Bckg color element of *Region* tab may be used for changing the brightness of the background of all Region's channels.

↑ ↓ buttons may be used for changing the order of displaying pictures of the Region. Upon clicking the buttons, the current image in *Selected Images* list moves up or down and respective redrawing of the Region takes place.

Interpolation element of *Image* sub-tab may be used for changing the type (nearest neighbor, bilinear or bicubic) of photometric interpolation, for the image selected in *Selected Images* list.

Visible element of *Image* sub-tab may be used for switching on and switching off the displaying of the image selected in *Selected Images* list.

CCD1, CCD2, CCD3 elements provide switching on and switching off the displaying of separate parts of the image (for example, for PAN), and respective editing fields make it possible to correct a relative shift of these parts in terms of row/column of the source raster.

This version of the Application features a possibility to control photometric and geometric characteristics of displayed pictures directly through the Region window, while working with the Region. For example, it is possible to perform photometric alignment of the mosaic images by selecting individual parameters of contrasting or to perform a precision geometric matching of the mosaic's pictures.

Access to the characteristics of the images converted into the Region is made by the *Image* control element of *Image Properties* dialog panel. This element makes it possible to select the name of analysed image from the list when working with the Region. In case of selecting "*Region*" line, the work through *Image Properties* panel is performed with all images of the Region, and if the name of one of the images used for mosaicking is selected, activities are only carried out with its image.

For example, to perform photometric alignment of converting image, one has (with selected "*Region*" item in *Image* control element) to set the linear contrasting for the whole range for the whole Region using elements of *View* tab. And then it is necessary to perform in turn the contrasting of individual images used for mosaicking. For this it is necessary to select the name of image in *Image* control element and to contrast its with help of *View* tab elements. Afterwards, the same should be done for the other images.

Similar actions may be taken in performing precision overlapping of the images in mosaic, directly working with the Region window. After selection of the name of the image with the help of *Image* control element of *Image Properties* dialog panel, one can

pick up ground control points in *Geo* tab correcting the geolocation using technique "image to map" or "image to image". One has to remember, that after changing parameters of images geolocation (in particular, after picking up ground control points), it is necessary to click ⟳ button of the Application toolbar.

During geolocation process while using "image to image" technique, it is possible to change the order of images arrangment quickly by using "*Page Up*", "*Page Down*" buttons. In the process the image in the Region window selected as a current image with the help of *Image* control element, will move up or down in accordance with *Selected Images* list of *Image* sub-tab of *Region* tab. A representation in the Region of the current image can be switched on and switched off by pressing "*Ins*" button of the keyboard (similar actions are taken with the help of *Visible* element of *Image* sub-tab of *Region* tab).

Operation with Image Fragments

The Application makes it possible to perform the following:

- mark the fragment on-line on input or converted image;
- overlay vector maps on the image within the limits of marked fragment;
- convert the fragment marked on the input image fragment;
- export the marked fragment.

Any fragment may be marked by using a mouse left button, if the mode of the fragment marking is activated (⬚ button of the toolbar should be pressed). The mode of the fragment marking can be enabled or disabled in *Image -> Select Fragment* menu command or with the help of ⬚ button of the Application toolbar.

Parameters of the marked fragment are displayed in *Info* tab of *Image Properties* dialog panel.

It is possible to change the size of the marked fragment by clicking the mouse left button on one of its boundaries and moving the fragment boundary to a new position while holding the button. One may automatically expand the fragment boundary as far as to the edge of the picture by double-clicking on one of the fragment boundaries.

The boundaries of the marked fragment can be exactly established manually by clicking ⊙ button in *Fragment* elements group of *Info* tab. It is necessary to set the position of the fragment boundaries in image pixels in the appeared *Fragment* window (Figure 10) and press *OK* button.
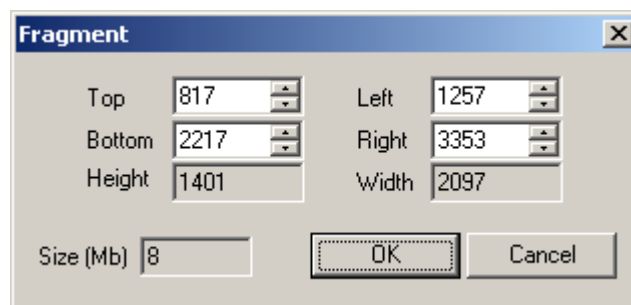

Figure 10.

If the image is converted into a cartographic projection, and the mode of the fragment making is turned off or another fragment is marked, the boundaries of a converted part of the image are marked in green.

Image Export

The Application supports two modes of image export:

- In "Save Image As" mode the image is exported "as it is", i.e. with the initial selection and order of bands, initial radiometric resolution and initial contrasting. Supported export formats are as follows: TIFF/GeoTIFF, BIL ArcInfo, ERDAS IMG, EUROMAP Fast Format.
- In "Save View As" mode the image is exported with the current view window parameters, i.e. with the current color synthesis (RGB) or channel selection (Grayscale), current contrasting and radiometric resolution of 8 bit/pixel. Supported export formats are as follows: TIFF/GeoTIFF, ERDAS IMG, BMP, PGM/PPM.

In both above mentioned modes the image is exported completely, if the mode of fragment marking is disable; and the current fragment is exported, if the mode of fragment marking is enabled.

In both above mentioned modes, while exporting mapped image additional files are created in an exported format, besides the image itself: ESRI WORLD file and SCANEX PROJ file with parameters of a map projection. They further make it possible to open up images by many GIS software (ArcInfo, ENVI, ERMapper, ERDAS IMAGINE etc.).

The image or its marked fragment can be exported in "Save Image As" mode by *File -> Save Image As…* menu command or by clicking 🖫 button on the Application toolbar. It is necessary to select file name and select a recording format in the appeared dialog box for file saving (Figure 11). Image export in "Save View As" mode is made similarly through *File -> Save View As…* menu command.
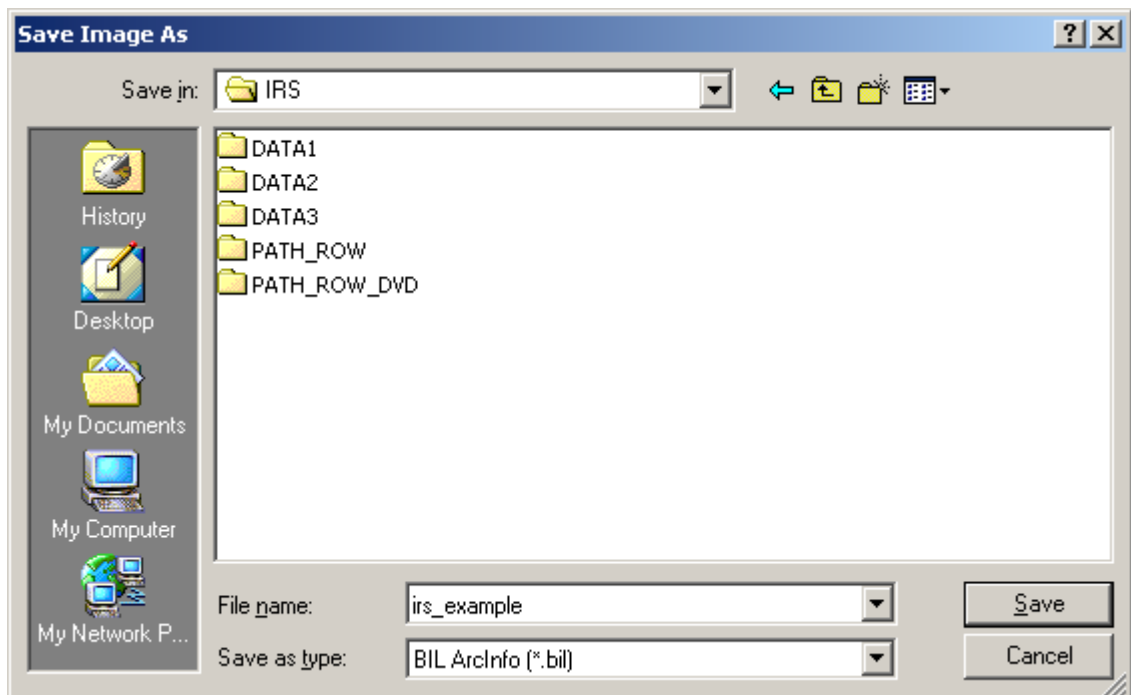

Figure 11.

The Application provides for the export of geographic grid in HDF file. For this it is necessary to select "GEOGRID (*.gg.hdf)" format in the *Save As* dialog box and to press *Save* button. Further it is necessary to set step of grid in pixels and to press the *OK* button in the appeared *Geographical grid parameters* dialog box (Figure 12).
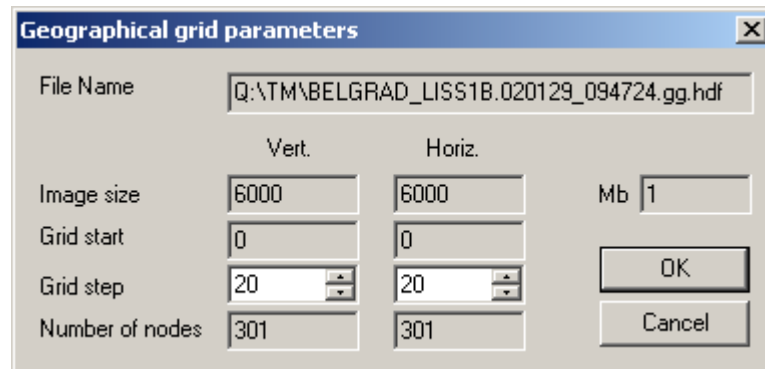

Figure 12.

Printing

The Application provides for the following:

- printer parameters setting;
- page parameters setting;
- page header and footer setting;
- preview of the printed page;
- printing the whole image or a marked fragment.

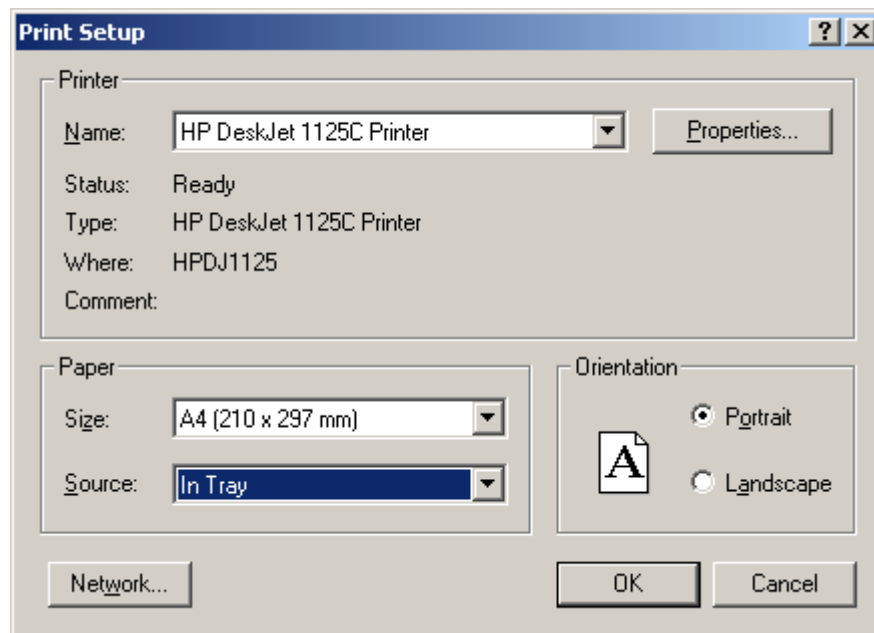Use *File -> Print Setup…* menu command to call a dialog box of printing parameters setting (Figure 13).

Figure 13.

Use *File -> Page Setup…* menu command to call a dialog box of page parameters setting (Figure 14).

To set page header and footer it is necessary to use *File -> Header & Footer…* menu command and to enter the text lines in the appeared dialog box (Figure 15).

Use *File -> Print Preview* menu command or button of the Application toolbar for preview of a page being printed. It is important to remember, that during preview the image itself is displayed in a compressed form for fast redrawing (coarsened view of a bigger image in no way have an impact on the further printing quality).

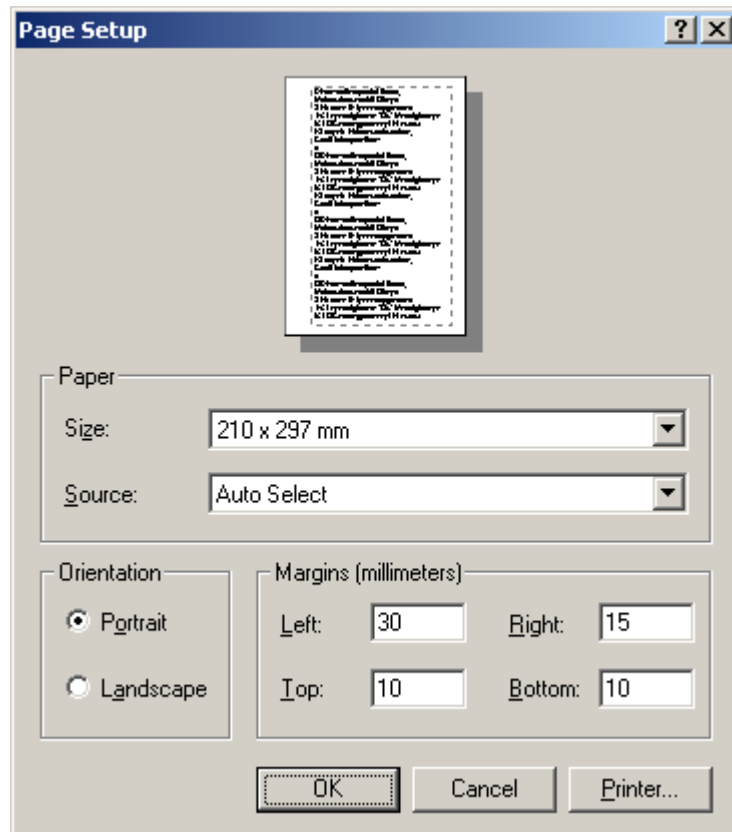Use *File -> Print…* menu command or button of the Application toolbar to open a standard printing dialog box.
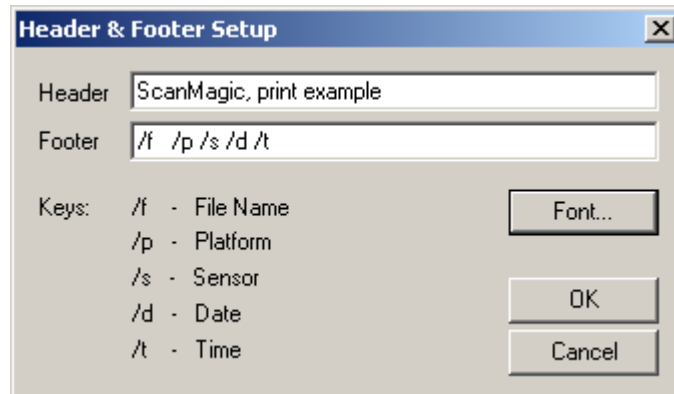
Figure 14.

Figure 15.