

MODULES and BASIC FUNCTIONS AT a GLANCE

Photomod Core	– project creation and management, initial data input, block-wise operations.
Photomod AT	– interior orientation, GCPs input, relative orientation.
Photomod Solver A Photomod Solver S	– adjustment of central projection blocks – adjustment of Pushbroom scanner Imagery blocks.
Photomod DTM Photomod dDSM	– creation & editing of DTM & contour – Pixel wise DSM creation
Photomod Mosaic	– orthorectification and mosaicing.
Photomod StereoDraw	– stereo feature extraction
Photomod UAV	– complete UAV data processing.

Photomod RADAR Modules

Geoprocessor	: Georeferencing , geocode , orthorectification
Stereo Processor	: DEM generation using stereo processing
Interferometric Processor	: interferometric SAR data processing
Image Improvement Tools	: Edge detection, filtering
Image Analysis Tools	: SAR data classification
Oil Spill Detection Processor	: detecting oil spill
Sea-Waves Analysis Module Ship Detection Module	
Polarimetric Processor Image Quality Evaluation tools	

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The digital way

Hardware Required

Workstation:

- Central processor: Intel Core i7 or similar
- System memory (RAM): 32 GB
- Graphics card: Based on NVIDIA Quadro 2000
- Display: Samsung Syncmaster 2233RZ, Planar or similar supporting vertical refresh rate not less than 120 Hz.
- HDD: IDE/SATA 4000GB
- Operating system: Microsoft Windows XP, Windows Vista, Windows 7, 8.1 x64 bit

USB port should be available for hard lock key (for local PHOTOMOD version).

Graphics adapter, monitor and stereo glasses

Since different shutter glasses models can be connected to computer in different ways, and some graphics adapters cannot be used with some models of glasses, you should pay attention to the compatibility of the graphic card and the glasses. The table below contains information on some compatible combinations. In case of any doubts, please consult with our Technical Support Service.

Stereomodes	Graphics adapter	Glasses/Monitor
Anaglyph	Any	Any anaglyph glasses red-blue/any monitor
Page-flipping	Any from the list Nvidia Quadro 6000 Nvidia Quadro 5000 Nvidia Quadro 4000 Nvidia Quadro 2000 Nvidia Quadro 600 Nvidia Quadro K6000 Nvidia Quadro K5000 Nvidia Quadro K4000 Nvidia Quadro K2000 Nvidia Quadro K600	Polarization glasses/stereomonitor Planar or StereoPixel Shutter glasses/GeForce 3D vision compatible LCD Monitor

Short description

Name of Module	Short Description
<i>PHOTOMOD – digital photogrammetry for aerial, space and terrestrial imagery.</i>	
Core	<ul style="list-style-type: none"> • <i>PHOTOMOD Core</i> is the main program shell. <p>Main features of <i>PHOTOMOD Core</i> are</p> <ul style="list-style-type: none"> • creating and managing of project, image block forming, managing of project cameras. • It allows to start the distributed processing control center, to choose an active profile, to setup mouse configuration and • to obtain information about system version, serial number, build date and contains of the system (list of used modules)
AT	<ul style="list-style-type: none"> • Aerial triangulation includes interior orientation of block images, measurement of tie points coordinates on images, • relative orientation of block images, as well as input of ground control points (GCP) coordinates to catalogue and measurement of these points coordinates images or their import and using exterior orientation data. • The ultimate goal of work on aerial triangulation and block adjustment is defining of exterior orientation parameters, that allow to proceed to block processing step, which includes stereo vectorization, creation of DEM, orthomosaic and 3D models(
Solver A	<ul style="list-style-type: none"> • allows to adjust central projection image blocks (aerial photos) • Block adjustment is performed after stage of data collection for phototriangulation, internal and relative images orientation, measurement of ground control points (GCP) • For adjustment of images block it is necessary to preliminary setup of adjustment parameters - specify coordinate system, select adjustment method, choose main adjustment parameters, setup report parameters and define residuals threshold of adjustment. • Initial approximation independent strips method or initial approximation using block scheme is

	<p>basically used to reveal blunders, such as incorrectly specified ground control points coordinates, errors of tie points positioning, etc.;</p> <ul style="list-style-type: none">• Independent stereopairs method is used to increase accuracy of adjustment results, obtained during initial approximation calculation; to recognize small errors and in case of acceptable results, for final adjustment;• Bundle adjustment is used for final block adjustment
Solver S	<ul style="list-style-type: none">• allows to adjust scanner image blocks, view results and perform an accuracy control (satellite imagery)• Rigorous method - the method allows to consider exterior orientation parameters from metadata obtained from RS data provider;• RPC-method - the method uses RPC-coefficients from metadata obtained from RS data provider;• Generic method - the method uses parallel-perspective model or Direct Linear Transformation (DLT) algorithm, that allows to process any scanner images (including IRS, LandSat, etc.). However this requires more ground control points per stereopair as compared to rigorous method;• Import of adjustment - import of images exterior orientation parameters from metadata for ADS 40/80/100 projects
DTM	<p>This module is used to create DTM by pickets, TIN, DEM and contours, edit it in mono and stereo modes and export for other formats. The following data sets (individually or in combination) are used for generation of digital terrain model:</p> <ul style="list-style-type: none">• Pickets - point vector objects, located on relief surface;• Triangulation Irregular Network (TIN) - one of the models of spatially coordinated data, used during designing of digital terrain model as elevation points in nodes of irregular network

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	<p>of triangles, that corresponds to Delaunay triangulation;</p> <ul style="list-style-type: none">• Contour lines - vector lines, that connect points with the same terrain altitude;• Digital elevation model - digital cartographic presentation of terrain surface as regular grid of elevation values.
dDSM	
Mosaic	<ul style="list-style-type: none">• creating the orthomosaic from the source images;• radiometric images correction (filtration, color balance, brightness, contrast, etc.);• pan-sharpening - process of merging multispectral and panchromatic images (see the 'General information about system' User Manual);• correction (removing visual defects) of MS-TIFF images in the DustCorrect module; automatic cutlines creation considering areas without background and cloudiness on images; · different modes of creation and edition cutlines;• splitting output mosaic into sheets depending on parameters;• GCP adding and measurement their coordinates on images;• tie points adding and measurement their coordinates on images smoothing areas along cut lines for creating mosaic image;• import/export of cut lines, sheets borders. ground control points, etc.;• loading DEM and accuracy control of DTM creation
StereoDraw	<ul style="list-style-type: none">• Stereopairs formed by airborne and space borne images are used to create digital maps and DEM• <i>Stereovectorization</i> - an operation of terrain objects vectorization in stereo mode using stereo model, allows to create digital elevation models and 3D topographic maps• In anaglyph mode a stereo image is formed using digital coding of stereopair images,• Page-flipping stereo mode provides quality stereo image using full frames.

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	<ul style="list-style-type: none">• Polarimetric glasses.• For automatic place marker on terrain relief during stereo vectorization the system provides the snap-to-ground mode - a mode of automatic marker following the relief
UAV (or unmanned aircraft system – UAS)	<ul style="list-style-type: none">• creation of UAS project, image block forming, interior orientation of block images,• automatic measurement of tie points coordinates on images, relative orientation of block images,• and also image block adjustment• import of triangulation points from PAT-B and X-POINTS; ○ import of ground control points from text files (*.txt, *.csv); ○ import of interior and exterior orientation data from metadata; ○ import of external orientation data from PAT-B and CSV-files; ○ GPS data;• Create Digital Terrain Model (DTM) - digital cartographic presentation of terrain surface both as regular grid of elevations (DEM) and as triangulated irregular network (TIN).• Create 3D vector objects;• orthophoto production;
PHOTOMOD RADAR MODULES	
Geoprocessor	<ul style="list-style-type: none">• SAR data such as ERS-1/2, Radarsat, SIR-C/X, ENVISAT ASAR, TerraSAR-X, ALOS, COSMO-SkyMed and• Generation of so called ‘secondary information products’ from SAR images, such as digital elevation models.• Geocoding Processor is intended for precision geometric correction of SAR images use by an accurate SAR sensor model based on the satellite position, survey features, and image formation parameters• The inputs of Geocoding Processor are the spaceborne radar imagery presented in single look complex CEOS format for the georeferencing procedure and georeferenced CEOS format for the geocoding/orthorectification once

Stereo Processor	<ul style="list-style-type: none">• Stereo Processor is an integrated software package specially intended for generation of the ground relief digital elevation models (DEM) via processing of the pairs of images acquired by spaceborne SAR's.• Stereo processor provides for users an extraction of terrain height information from stereo pairs of SAR satellite imagery. It allows to generate an accurate digital elevation models (DEMs) of imaged ground surface.
Interferometric Processor	<ul style="list-style-type: none">• InSAR/DInSAR processor has been developed as tool for DEM generation and surface shift estimation using of phase information extracted from complex spaceborne SAR data.• The output DEM or surface shift map are referenced to WGS84 ellipsoid and allocated in geographic projection.
Image Improvement Tools	<p>The radar data processing software package includes the following tools intended for image enhancement:</p> <ul style="list-style-type: none">• speckle-noise filters - linear and non-linear : mean, median, Lee, Frost, Kuan, Sigma• Global speckle noise filter approach based on wavelet decomposition with different bias (D4 Daubechies , CD F 9/7, CDF 117, odegard)• edge detection - sobel, laplas, prewitt, kirsh• Allows preview before saving
Image Analysis Tools	<ul style="list-style-type: none">• It has software tool for classification performs an estimation process by criterion of minimum distance• User interface has opportunity to select the desirable metrics (Euclidian , Mahalanobis, Bayesian etc)• Software tool of coherent change detection intended for acquiring of data on ground surface backscattering properties variation on time interval between two acquisition made under interferometric conditions• Realized in software approach to change detection is based on analysis of differential

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	<p>phase or so called coherency information derived by processing of interferometric pair of images</p> <ul style="list-style-type: none">• the phase properties of backscattered signal depend of ground surface roughness on scale of radar wavelength that cover the range from 3 up to 30 cm. This means that the millimeter's scale changes could be extracted
Oil Spill Detection Processor	Oil slicks detection processor is intended for oil slicks detection against a background of homogeneous sea surface
Sea-Waves Analysis Module	<ul style="list-style-type: none">• Sea waves analysis software tool is intend for automatic generation of estimates of spatial period, direction of propagation and height of large energy carrying waves over radar images of sea surface
Ship Detection Module	<ul style="list-style-type: none">• Ship detection processor is designated for processing of spaceborne radar images acquired over sea and ocean surface in part of ships finding and evaluation of their most valuable parameters, the like of speed of ships, their sizes, and cartographical coordinates.
Polarimetric Processor	<ul style="list-style-type: none">• Polarimetric processor realizes the technique of joint processing of images acquired with different signal polarization. In common case it allows to classify the resolution cells on images upon their physical properties.• Input data for polarimetric processor are the radar images presented in complex format, path coordinate system, in slant range projection• Processor can deal both with full polarimetric matrix (four combination of polarizations for transmitted and received signals) on input and with incomplete polarimetric matrix (two combination).
Image Quality Evaluation tools	

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