Practical experience of digital topographic mapping and orthophotos creation using PHOTOMOD software system

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"Uralgeoinform" Center works on the following main directions:

- Production of digital topographic maps and plans of the whole scale range.
- Digital topographic map-making in various thematic content.
- Development, implementation and support of geoinformation systems.
- Creation and updating of digital topographic maps and plans using digital stereo photogrammetric stations.
- Creation of digital orthophotomaps using airborne and space imagery.

Department of digital photogrammetry is one of the production departments of the Center. Photogrammetric works on creation and updating of topographic maps and plans of different scales are carried out in this department using modern digital technologies. The technological workflow includes the following stages:

- Preliminary works;
- Phototriangulation;
- Digital orthophotomaps creation;
- Stereoscopic survey of terrain features and relief;
- Digital maps editing and final design in predefined format.

We would like to present a project on creation of digital heights model and digital model of obstacles heights (DMOH) of Kamensk-Uralskiy city, executed in 2005 using PHOTOMOD software system. The customer of these products developed electronic altimeters and software for them, which used our digital 3D maps.

The area of terrain for processing is about 180 sq.km. This presentation includes the description of technical requirements and technological workflow. Results of work executed on digital photogrammetric system CFS TSNIIGAIK (phototriangulation

data, scanned aerial negatives and updated digital city plan in 1:10,000 scale) were used as the initial data.

On the first stage phototriangulation project was restored in PHOTOMOD system. For that it was performed interior orientation, relative orientation and accuracy control and block adjustment. In this stage we processed 114 stereopairs and created terrain models on the whole processed territory.

The second stage – digital terrain model (DTM) creation.
Vector map was imported from DXF format into inner PHOTOMOD format (in StereoDraw module). We saved contour lines in individual map, and then checked them for height errors. In DTM module we created TINs for each stereopair using contour lines. After that we built digital terrain model, which is regular set of points with absolute height data (in this case DTM consist of 4 blocks). On the customer's request DTM was converted into text format.

On the third stage the 2D map in MIF/MID format was imported to PHOTOMOD StereoDraw module and projected on the obtained DTM. Thus we got 3 coordinates of each object's point, and then exported topographic map to SHP format.

During the work the customer specified that they need rather set of pickets with coordinates in text format instead of digital model of obstacles heights (DMOH).

On this stage we vectorized objects on stereopairs considering technical specifications (each point of DMOH should be created by selecting maximal height of the obstacle on the terrain square with side length 10m). Objects higher than 2 m were considered as obstacles. It was necessary to consider absolute height of road objects, settlements, industrial, agricultural and cultural objects, waterworks and vegetation. In forest areas we draw break lines over treetops, on the buildings higher than 2 m we put pickets on the roof. In rural areas one picket for each building was enough. In PHOTOMOD DTM module irregular TINs were built. And TIN nodes located on the high terrain objects were exported into text format.

As a final result or our work we delivered to the customer digital 3D map in SHP format, DTM in text format and set of pickets of high objects (obstacles) in text format. These particular formats were suitable for the customer for conversion into their software. In practice the results used for navigation on 3D terrain map, i.e. when the object moves, the distance to the object was detected by radiolocation method, and its location was detected using our map.