
Measurements of QuickBird Imagery Accuracy (abstract)

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Accuracy features of QuickBird imagery have been investigated in Racurs company according to the order of NPK GEO company. The main purpose of this investigation was to measure the accuracy of orthoimages created by transforming QuickBird images using digital elevation models (DEM) of different accuracy. The following input data have been used for the experiment: two QuickBird images of Ortho Ready Standard and Standard preprocessing levels, digital surface model with height accuracy 0.15 m and DEM created by contour lines taken from 1:25,000 scale map with contour interval 2.5 m. Spatial resolution of both images was 0.6 m. All works were executed using digital photogrammetric software PHOTOMOD.

Maximal error in orthophotomap which was created using 0.15 m accuracy DEM and GCP obtained on photomap of 1:1,000 scale, was 1.089 m on check points, 0.836 m on control points, and RMS on GCP – 0.607. The same check and ground control points were used for building orthophotomap by DEM created using 1:25,000 scale map contour lines. Maximal error of orthophotomap in this case was 1.189 m on GCP and 2.231 m on check points.

Standard Imagery product is the most accurate of Digital Globe products which could be supplied for any territory and does not require an additional data (GCP and DEM) from the customer. Standard Imagery products have an average absolute geolocation accuracy of 23-meter CE90% (RMS in plane point's location is 14 m). During the experiment the difference between plane ground coordinates ΔX and ΔY , obtained on Standard image had been measured and re-calculated into WGS84/UTM, and result is as following:

Min ΔX = -8.564 m	Min ΔY = +3.769 m
Max ΔX = -13.360 m	Max ΔY = +8.406 m
Average ΔX = -11.058 m	Average ΔY = +6.415 m

It is obvious that coordinates obtained from the image contain systematic error. After its exclusion the result is the following:

$$\text{RMS } XY = 1.74 \text{ m, Max } \Delta XY = 2.94 \text{ m}$$

Thus, after the experiment the orthoimage of maximal possible accuracy for this resolution was created. In the project digital photogrammetric software PHOTOMOD was used to process the QuickBird image of Standard Ortho Ready preprocessing level with the DEM of 0.15 m accuracy and GCP measured on the photomap of 1:1,000 scale. RMS was about 1 pixel. When digital surface model obtained from a 1:25,000 scale map with height interval 2.5 m along with the same set of GCP was used maximal deviation of plane point location was about 2.3 m, which corresponds to the accuracy of digital orthomap in 1:5,000 scale.

Standard QuickBird images preprocessed using approximate DEM have big systematic error. It should be considered, otherwise plane error would reach tens of meters. When the systematic error is excluded, the plane accuracy may be increased several times and meet the requirements of digital orthophotomapping in 1:10,000 scale.

Conducted estimation shows that Ortho Ready Standard Product costs 18 USD per sq.km., Custom Orthorectified Product in 1:5,000 scale (which Digital Globe company offers when DEM is available) costs 34 USD per sq.km, and by using only one Standard QuickBird image to create an orthophotomap in 1:5,000 scale will return the investments made to purchase digital photogrammetric software PHOTOMOD.