MAPPINGMATTERS

YOUR QUESTIONS ANSWERED

The layman's perspective on technical theory and practical applications of mapping and GIS

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QUESTION:

Q: For a project size of 5000 square miles, how many checkpoints are needed to assess the accuracy of a Lidar dataset? Please provide the breakdown for the number of checkpoints according to the VVA and NVA requirement per the new ASPRS Positional Accuracy Standards for Digital Geospatial Data guidelines.

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Dr. Abdullah: Before I address the question, I would like to bring readers' attention to the latest map accuracy standard used in the U.S. and probably around the world, as it represents the first map accuracy standard designed for digital mapping products and lidar-based digital elevation data. In late 2014, the American Society of Photogrammetry and Remote sensing (ASPRS) approved and later published the new ASPRS Positional Accuracy Standards for Digital Geospatial Data. The new standards can be found through the following ASPRS website:

http://www.asprs.org/PAD-Division/ASPRS-POSITIONAL-ACCURACY-STANDARDS-FOR-DIGITAL-GEOSPATIAL-DATA.html

"Using metric units, ASPRS recommends 100 static vertical checkpoints for the first 2,500 square kilometer area within the project, which provides a statistically defensible number of samples on which to base a valid vertical accuracy assessment"

Going back to the question, the new standard states on page A20:

"Using metric units, ASPRS recommends 100 static vertical checkpoints for the first 2,500 square kilometer area within the project, which provides a statistically defensible number of samples on which to base a valid vertical accuracy assessment. For horizontal testing of areas >2500 km^2*, clients should determine the number of additional horizontal checkpoints, if any, based on criteria such as resolution of imagery and extent of urbanization.*

For vertical testing of areas >2,500 km^2*, add five additional vertical checkpoints for each additional 500* km^2 *area. Each additional set of five vertical checkpoints for 500* km^2 *would include three checkpoints for NVA and two for VVA. The recommended number and distribution of NVA and VVA checkpoints may vary depending on the importance of different land cover categories and client requirements."*

According to the above guidelines, we can estimate the required number of checkpoints using the following computations:

Number of checkpoints suggested for the first 2,500 km^2 (or 956 aq. miles) = 100 (55 checkpoints to be distributed within the non-vegetated vertical accuracy (NVA) area and 45 checkpoints within the vegetated vertical accuracy (VVA) area)

"The recommended number and distribution of NVA and VVA checkpoints may vary depending on the importance of different land cover categories and client requirements."

Additional five checkpoints *(3 checkpoints to be distributed within the NVA area and 2 checkpoints within the VVA area)* for each additional 500 km^2 (or 193 square miles), or for a project area of 5,000 square miles:

Given project area = 5,000 square miles = 12,949 km^2

Area that needs additional check points = 12,949 km^2 – 2,500 km^2 = 10,449 km^2

Number of 500 km^2 lots = 10,449 km^2 / 500 km^2 = 20.89

Number of additional checkpoints = 20.89 x 5 = 105 (63 checkpoints to be distributed within the NVA area and 42 checkpoints within the VVA area)

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Photogrammetric Engineering & Remote Sensing
Vol. 82, No. 8, August 2016, pp. 587–591.
0099-1112/16/587–591

doi: 10.14358/PERS.82.8.587

to someday have a reliable geoid model for the entire country that will enable GPS leveling techniques to be implemented.

Update

Zone transformation parameters for UTM zones were recalculated in 2005 and in 2008. A complete airborne gravity survey of Mongolia was carried out in two fall campaigns 2004-2005 by the Danish National Space Center. Absolute gravity was observed in 2006-2007. A Mongolian geoid height model was produced with 16 cm accuracy for the whole country and 2-5 cm accuracy for the city of Ulaanbaatar. Transformation parameters and the geoid height model are accessible from ALAGaC web page for the public (Munkhtsetseg, D., ***Geodetic Network and Geoid Model of Mongolia***, isprs.org/proceedings/XXXVIII/7-C4/121_GSEM2009).

Acknowledgement

Thanks to Mr. Cole Billeaud for research assistance regarding the update.

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advice on commercial launch services and costs would likewise be helpful. In the chapter on pushbroom imagers, the author expresses the dwell time as a function of the angle subtended by a resolution element, the subsatellite point velocity, and the altitude, as

$$\tau_p = \frac{\beta}{\left(v/h\right)}$$

In other references it is stated that this dwell time should always be less than one-half this value to avoid unacceptable image smear. He does imply this later in the chapter on Submeter Imaging.

Overall this book is a valuable contribution to the remote sensing literature. No doubt much of the information is available in specialized texts and journals on optics and aerospace engineering, but the author, guided by his unique experience, brings this information together in way that is accessible and interesting to the photogrammetrist, cartographer, or remote sensing analyst.

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Or,

Total number of checkpoints required for the project = 100 (for the 1st 2,500 km^2) + 105 (for the remaining 10,449 km^2) = 205 checkpoints distributed as follow:

118 checkpoints within the NVA area

87 checkpoints within the VVA area

"For vertical testing of areas >2,500 km2, add five additional vertical checkpoints for each additional 500 km2 area. Each additional set of five vertical checkpoints for 500 km2 would include three checkpoints for NVA and two for VVA"

Please remember that the new ASPRS standard states, "*The recommended number and distribution of NVA and VVA checkpoints may vary depending on the importance of different land cover categories and client requirements".* Therefore, you have some flexibility in balancing the number of VVA and VVA checkpoints depending on your project and your client understanding of the issue.

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