“METHODOLOGY FOR THE HORIZONTAL VALIDATION OF A SATELLITE ORTHOIMAGE TO BE USED FOR UPDATING IGM BASE TOPOGRAPHIC CARTOGRAPHY AT 1:50,000 SCALE OF CHILEAN TERRITORY.”

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Introduction

There are a series of factors that have determined the appearance of the move to bring cartography up to date; one of the most decisive of these is the numeric cartographic database. In relation to the development of informatics, bringing a set of cartography up to date has been a slow routine in which the the out-of-date map only serves a support information. Data capture involves mainly aerial photographs, orthophotos, satellite images and their ortho-images for their use in making a set of maps currently valid. Regarding satellite images, their field of applications in cartography is widening, owing to the improvement they are undergoing in their resolution. This leads to an easier approach when carrying out successive updates to the cartography concerned.

On the market there are the Spot 5 images, from which the product derived is the Spotmap HRG (High Resolution Geometric) ortho-image. This research is being performed within the context of creating a methodology aimed at determining in quantitive form the horizontal positional accuracy of the Spotmap orthoimage to be used as base material for bringing the 1:50,000 scale cartography of Chilean territory up to date.

State of the art technology is available that is sufficiently trustworthy for determining if the images are reliable or not in EPH. In the first stage, information from the orientation and residual adjustments, from the photogrammetric block and from the E-043 (Llaillay) map sheet at 1:50,000 scale are gathered together. The research is carried out in a photogrammetric environment with all the stages involved in the validation. Once this is done, the maps are modified to make them currently valid in the ARCGIS platform, which has a Geodatabase, a storage facility that provides the integration of vector and raster information. The PLTS module enables the topological validation of the information, in order to obtain cartographic information within the framework of total quality.

Objectives

The general objective is to validate the Spotmap High Resolution Geometric ortho-image to be used in modifying existing topographic base cartography at 1:50,000 scale of Chilean territory to update it. The specific objectives are:

- Determine the positional accuracy of the Spotmap images (Benchmark), defining a percentage of certainty regarding its circular error.

- Determine the tolerances to allow in the process of modifying and updating spatial data, in order to check the error propagation, in order to finally obtain a product with a pre-determined threshold for horizontal accuracy.
- Perform the process for checking and modifying the graphic and thematic information, in order for the cartography to gather together and reflect the changes that have occurred over time in the territory. This is represented through a Geodatabase in ARCGIS environment with the PLTS module.

Methodology

This validation is performed in a photogrammetric environment which enables the accuracy required by using the software DATEM Summit Evolution. A detailed analysis is done on each of the stages affecting the validation and updating of the base cartography. The comparison, capture and entry into digital media is carried out using the ARCGIS 9.2 platform; this software provides the facilities for working with various products, which is essential for fulfilling the objectives set. In order to determine the circular error and horizontal displacement of the ortho-images, it is important to consider the following variables, in the context of the validation (EPH).

Validation of:
- IGM control points v/s the satellite images.
- Entry to digital media of the image, v/s photogrammetric surveying.
- Analytic control points v/s accuracy in the filed of GPS.
- Stereoscopic models v/s GPS control points.
- Metric control of the modification and bringing the data up-to-date with random samples of the final product.
- Validate, detect, analyze, classifyr and relate the landscape features, with the aim of verifying in the filed the results obtained in modifying the cartography to make it currently valid.

Results

The validation enabled it to be determined, effectively and efficiently, that the percentage of reliability found in the Spotmap ortho-images, considering the circular error and horizontal displacement achieved. This enables the creation of efficient methods and techniques that facilitate the modernization of the information, using the ARCGIS PLTS applications and improving the IGM cartographic processes.

Conclusions

The horizontal positional accuracy and circular error of the ortho-images has been quantified, leading to the conclusion that the use of orhto-images, in comparison with traditional photogrammetric mentods to create cartography complies with the metric requirements for modifying, making currently-valid and output of 1:50,000 cartography. The result greatly exceeds the threshold defined by the cartographic standards; in practical terms this means that, in relation to photogrammetric points, the Spotmap ortho-images have a circular error of 5.0 m, which qualifies them fully to be used as base material or “source of greater horizontal accuracy” at the time of the process for updating maps.