ABSTRACT

The purpose of this doctoral thesis is to create digital elevation models derived from very high-resolution stereoscopic satellite imagery, besides the evaluation of planimetric and altimetric accuracies achievable, and their possible applications. Thanks to the geometric resolutions achieved, the latest generation of optical satellites are comparable, in certain parts of application, to the most expensive and demanding classic aircraft photogrammetry. The use of these images is fairly recent, and the information relating to its usage and adaptability for advanced maps scales comes from specific research works in both scientific and private sectors. Among its various functions, of particular interest is the possibility to produce digital elevation models (DEM) from high-resolution images with accuracies comparable to the classical methods of survey. The first part of this thesis just points to that research area using Geoeye-1 satellite images with spatial resolution of 50 cm and the same images in stereo modality. In addition to this, it analyses the problems encountered. The second part focuses on the possibility of using the produced DEM from satellite images in the field of geomorphology, producing from them geomorphometrics indices for evaluating landslide. The first chapter of this thesis introduces the characteristics of remote sensing satellite, shows the characteristics of the sensor Geoeye-1 and the particularities of the images used. The second chapter deals with the mathematical models implemented in software Geomatica of PCI Geomatics and Socet SET BAE System and the differences between them. The third chapter contains the methods of acquisition and distribution of geographic data, the positional accuracies to achieve in order to use these products in cartography. The fourth chapter is entirely centered on the production of DEMs. The first part is on GPS surveying for of ground control points (GCP), which have been used for georeferencing of satellite images. The central part deals with the problems encountered and accuracy tests performed for the products generated. Finally it reports comparisons between the DEM created and certified DEM. The fifth chapter is dedicated to create geomorphometrics indices for a landslide area. Using these indices and contour lines derived from Geoeye-1 DEM, it has been possible to create the boundary of the landslide. The final part of the chapter relates the assessment of the changes that occurred between 2004 and 2012.