Analysis of the spheric map

Abstract

The master thesis deals with cartometric analysis of maps of the celestial sphere using image correlation. The main goal of this work was to design an algorithm for the identification of stars on old maps of the starry sky using a normalized cross-correlation and the application of a median and Gaussian filter. The analysis itself takes place on small scale maps or. the whole visible sky divided into two hemispheres, shown in a stereographic projection and also takes into account the influence of the cartographic map display on the position of objects, which it tries to eliminate by Helmert transformation, and also the influence of precession, which affects the position of astronomical objects over time. The accuracy of the drawing of the positions of the objects is evaluated by means of isolines drawn on the basis of positional coordinates. The algorithm was implemented in the Matlab programming environment and old maps from the Mapová sbírka PřF and the 5th edition of Bright Star Cataloque were used as test data, which contains the positions of stars with precisely determined coordinates. The achieved results are presented in the form of images of captured objects and created isolines over old maps as well as tables of the three nearest neighbors of the most important drawn stars.

Keywords: cross correlation, median filter, Gaussian filter, stereographic projection, precession