

Phase-correlation based image registration

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Image registration means finding a geometrical transformation between digital images. This thesis deals with the use of phase correlation for estimation of mutual rotation, scale-change and translation between images. Phase correlation is based on the Fourier transform, therefore the thesis describes the Fourier transform of functions defined on \mathbf{R}^2 and the discrete Fourier transform of functions defined on a finite number of points $\{0, 1, \dots, N - 1\}^2, N \in \mathbf{N}$. The aim of this thesis is not only to show the mathematical background of phase correlation, but also to describe modifications of the phase correlations for estimation of the transformation parameters between images with high dynamic range and faint structures, containing additive or impulse noise and images which are taken with different sensors and optical systems. The mathematical background and the practical aspects of the use of phase correlation for images of this kind cannot be found in literature in details. The thesis also focuses on the modifications of the method used for registration of solar corona images taken during total solar eclipses, which counts among the hardest registration tasks.

This work will be used as author's master thesis.