

## PROCEDURES OF CORRECTION OF THE GEOMETRY DISTORSIONS FOR DIGITAL IMAGES

F. Barison

Dip. Costruzioni e Trasporti - Università di Padova - Italy  
Via Marzolo 9 - 35100 Padova

A. Guarnieri, A. Vettore

Dip. Territorio TESAF - Università di Padova - Italy  
AGRIPOLIS - Statale Romea 16  
35020 Legnaro (Padova)  
Phone +39-049-8275580, fax +39-049-8372713  
e-mail: [vettoan@ux1.unipd.it](mailto:vettoan@ux1.unipd.it)

### ABSTRACT

Since a few years digital fotocameras have widely spread on the market, principally because of their price, quality image improvement and easy of use. In order to extract from these digital images reliable 3D informations regarding objects position and dimension, both the exact knowledge about perspective and dimensional relations between image and scene, and the knowledge about the geo-metric distortions parameters are needed.

Therefore, the aim of this work was to develop an alternative method to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism. The proposed method, based on Tsai calibration algorithm and Leveberg-Marquardt non linear optimization procedure, starts with a first estimate of inner and exterior orientation parameters in absence of distortion, taking into account only center image points. Then a non linear estimate of all digital camera parameters is carried out, taking into account all image points in order to compute the geo-metric distortions as well.

The method has been implemented in such a way to allow a full camera calibration or a computation of the exterior orientation parameters only, using inner orientation and distortion parameters determined from previous full calibration. This approach can be useful if only an estimate of new targets positions is required, in which the inner and distortion parameters are already given.

KEY WORD: Survey, Quantitative, Computerized, Digital Images

### ABSTRACT

This paper describes the study related to the calibration of digital cameras used in the field of the Politecnico di Milano in order to obtain the most reliable and accurate 3D data and the extraction of the features of the quarries.

In the first step of the research work, the authors have developed a method to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism.

In the second step it has been built up the calibration of the digital cameras used in the field of the Politecnico di Milano. Particularly it has been described the method to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism, and the method to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism.

Particularly it is here related the different methods used in the field of the Politecnico di Milano to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism, and the method to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism. A standard and appropriate methodology was developed in order to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism.

### THE RESEARCH

The research here related is the result of a contract between the Dipartimento di Ingegneria Ambientale e del Rilevamento of the Politecnico di Milano and the Local Government of the Provincia di Padova. The aim of the research is to define the most suitable procedure to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism, and the method to estimate the parameters of the major forms of geometric distortions, i.e. radial, tangential, decentering and thin-prism.