

Abstract Submitted
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Refraction correction for 3D optical measurements inside cylinders TOMMASO ASTARITA, GERARDO PAOLILLO, Università di Napoli "Federico II" — The present work proposes a calibration camera model to precisely express the projection from 3D world to 2D image coordinates for measurements inside transparent cylinders. Snell's law is used to model the refraction of the optical rays at the external and internal surfaces of the cylindrical wall and a standard pinhole camera is used to describe the lens behavior. Making use of the perspective and refraction laws, the mapping function consists of a relatively small number of parameters and all of these have a clear geometrical or physical meaning. A calibration procedure for the proposed camera model is also outlined. Finally, the innovative model is comparatively assessed against the classical pinhole camera model and different polynomial-based models by using experimental data from an investigation of Rayleigh-Bénard convection. Although the model is tested for tomographic particle image velocimetry measurements in flows occurring inside cylinders, it can be used also in a variety of other imaging applications, as well.

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