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ACCURACY EVALUATION OF STEREO CAMERA SYSTEMS WITH GENERIC CAMERA MODELS

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Abstract. In the last decades the consumer and industrial market for non-projective cameras has been growing notably. This has led to the development of camera description models other than the pinhole model and their employment in mostly homogeneous camera systems. Heterogeneous camera systems (for instance, combine Fisheye and Catadioptric cameras) can also be easily thought of for real applications. However, it has not been quite clear, how accurate stereo vision with these cameras and models can be. In this paper, different accuracy aspects are addressed by analytical inspection, numerical simulation as well as real image data evaluation. This analysis is generic, for any camera projection model, although only polynomial and rational projection models are used for distortion free, Catadioptric and Fisheye lenses. Note that this is different to polynomial and rational radial distortion models which have been addressed extensively in literature.

For single camera analysis it turns out that point features towards the image sensor borders are significantly more accurate than in center regions of the sensor. For heterogeneous two camera systems it turns out, that reconstruction accuracy decreases significantly towards image borders as different projective distortions occur.

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