

Master 2019

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2D Maximum Likelihood Estimation: Multibounce Gradient Estimation – Evaluation of Gradient Estimation Methods in Experimental Ray Tracing with Multibounce Sensors.

ABSTRACT - Masterthesis

This master thesis evaluates a method of estimation of the incident ray from multiple reflection spots on a detector. If the sensing device is hit by a small optical test-beam, light is reflected several times inside. At each reflection, part of the beam passes the etalon. The camera detects these spots on the etalon, acquiring an image of a series of light spots in a straight line. If the orientation of the line in the image plane (dx , dy and the distance between spots is determined, the gradient of the incoming test-beam can be calculated. Unfortunately, real spots are neither of precise circular shape nor sharp edged. They are blurred, distorted, low in contrast and sometimes they overlap. In this thesis, a method for deriving the gradient of incoming test-beams by estimating the line orientation and spot distance from camera images is implemented and evaluated. The focus of this thesis is on overlapping spots of the multibounce sensor as opposed to the traditional approach of non-overlapping spots. The Method described will be a construction of a pattern that is comparable to the measured. This construction is done depending on several parameters that will be optimized.