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SIMULATION OF CLOSE-RANGE PHOTOGRAMMETRIC SYSTEMS FOR INDUSTRIAL SURFACE INSPECTION

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Abstract. Close-range photogrammetric measurement systems are increasingly used for high-precision surface inspection of car body parts. These measurement systems are based on an active light source, the projector, and one or more cameras. Many systems use a sequence of fringe projection, mostly a combination of the gray code and phase shift technique. Basically the quality of the measurement result depends on best possible positions of these sensors, which requires human expert knowledge and experience. But is it possible to use computer-based algorithms to find optimal measuring positions? Simulation processes are discovered as part of a research project aimed at the evaluation of the quality of measuring positions concerning to visibility, the attainable accuracy and realizable feature extraction. One approach is the simulation of the photogrammetric sensor using ray tracing techniques to create photorealistic pictures from the sensor cameras view. This image sequence could be processed with the evaluation software of the system manufacturer in order to calculate a three dimensional point cloud. Following an actual/target comparison should indicate differences that trace back to insufficient measuring positions. In this paper we show how to build up a virtual close range photogrammetric sensor using POV Ray, a free ray tracing software. After introducing the simulation concept, the design of a virtual close range photogrammetric sensor is presented. Based on practical examples of sampled scenes the potential of photorealistic ray tracing is shown. Finally the usability of this simulation approach is discussed.

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