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Traditionally, three-dimensional image analysis (a.k.a. computer vision) and three-dimensional image synthesis (a.k.a. computer graphics) were separate fields. Rarely were experts working in one area interested in and aware of the advances in the other. Over the last decade this has changed dramatically, reflecting the growing maturity of each of these areas. The vision and graphics communities are today engaged in a mutually beneficial exchange, learning from each other and coming up with new ideas and techniques that build on the state of the art in both fields. This book is the result of a fruitful collaboration between scientists at the University of Nürnberg, Germany, who, coming from diverse fields, are working together propelled by the vision of a unified area of three-dimensional image analysis and synthesis.

Principles of 3D Image Analysis and Synthesis starts out at the image acquisition end of a hypothetical processing chain, proceeds with analysis, recognition and interpretation of images, towards the representation of scenes by 3D geometry, then back to images via rendering and visualization techniques. Coverage includes discussion of range cameras, multiview image processing, the structure-from-motion problem, object recognition, knowledge-based image analysis, active vision, geometric modeling with meshes and splines, and reverse engineering. Also included is cutting-edge coverage of texturing techniques, global illumination, image-based rendering, volume visualization, flow visualization techniques, and acoustical imaging including object localization from audio and video.

This state-of-the-art volume is a concise and readable reference for scientists, engineers, graduate students and educators working in image processing, vision, computer graphics, or visualization.