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A novel high accuracy 3D scanning device for rock-art sites

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Abstract. We are currently developing a novel 3D scanning device for rock-art. Within the European project 3D-Pitoti, this scanner shall be used to acquire 3D structure and radiometric surface properties of ancient rock-art sites in Valcamonica. Overall design goals include high spatial accuracy and precision, as well as radiometric quality beyond phototexture. This paper is devoted to the geometric measurement principle of the new scanner. We present a novel scanning scheme based on various constraints to Structure from Motion, that guarantees high accuracy of the resulting scans by combining tachymeter-based tracking of the scanner, stereo, and structure-from-motion. This method provides scale information (by calibrated stereo), and does not require ground control points, because outside-in tracking avoids the typical issues of drift in structure-from-motion. The system is designed for flexibility, high throughput, approx. 0.1 mm precision, and an overall accuracy of the reconstructed 3D structure that conforms with the specifications of the tachymeter.

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