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Use of A Portable 3-D Laser Scanner for Digitally Capturing Outcrop Topography And Lithology in High Spatial Resolution

A three-dimensional laser scanner is a type of land-based LIDAR (Light Detection and Ranging) instrument. It sweeps the surrounding environment with optical rays. The rays produce reflections when they encounter solid objects. The instrument records the angle of each ray and measures the travel time and the brightness of the corresponding reflection. The survey data can be displayed on a computer screen as a cloud of reflection points that delineate the geometrical shape of the scanned objects. A series of scans around the target objects can yield a 3-D digital geometrical model of the objects. The reflection brightness data can be useful for inferring color variation along the surface of the target, if certain conditions are met. We used such a 3-D scanner (Cyrax 2500) in a dry river gorge along the South Prong Canyon in Texas Panhandle. The canyon wall is near vertical, and at some localities, exhibits overhang features. Alternating beds of sandstone and gypsum are exposed on the wall. The gypsum layers occur in thickness varying from several millimeters to several centimeters. Four sets of scans were obtained with reflection points spaced within 1 cm from each other. Three-dimensional scatter plots of the survey data capture the canyon topography in remarkable detail. The scatter plots, color-coded by reflection brightness, also delineate most of the stratigraphic boundaries of the gypsum layers and other structural features exposed on the canyon wall.