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3-D Facial Scanner Using the Inverse Radon Transform

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The purpose of this project is to demonstrate the feasibility of a low-cost facial scanner, which uses the same technology as a million dollar CT scanner by emulating the scanning and reconstruction method by means of visible light, yielding real color and rough depth information. The inverse Radon Transform is used to generate 3-D volumetric image data from a series of 2-D images taken from different angles. The most common application of the inverse Radon Transform is in CT scanners, which use a large number of 2-D images representing X-ray absorption to reconstruct volumetric data about the subject. For the 3-D facial scanner, visible light is used instead of X-rays. A webcam is mounted on a model train that follows a circular track centered on the subject. As the camera revolves around the object, a series of pictures that cover 360° are acquired. Using visible light requires modifications of the volume reconstruction method, because visible light is reflected off instead of passed through the object. The resulting modified inverse Radon Transform algorithm reproduces the colors and patterns of the subject far more faithfully than a standard inverse Radon Transform. With further refinement, applications could range from natural-looking avatars for video games to surgery planning and biometric facial measurements for security screenings.