A structure-from-motion method: USE of motion in three-dimensional reconstruction of moving objects from multiple-view image sequences

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Abstract: Solving the correspondence problem is the most essential task for multiview reconstruction techniques, yet finding unique correspondences between multiple views is impossible at some points, due to such problems as occlusions and ambiguities. We have developed a closed-form solution through constructive geometry for a special case of the structure-from-motion (SfM) problem with four rigidly moving points. This solution allows the 3-D position of a point on a moving object to be computed without having to find the correspondence between its projections on the image planes of multiple views, given its projected 2-D motion vector on an image plane and 3-D information of three other points. With this method we do not have to depend entirely on stereo/multiview feature correspondences in reconstructing 3-D objects, hence easing those problems caused by occlusions and ambiguities. ?? 2004 IEEE.

Index Keywords: Computer vision; Imaging techniques; Mathematical models; Matrix algebra; Motion estimation; Nonlinear systems; Object recognition; Problem solving; Three dimensional; Multiview vision; Orthographic projection; Structure-from-motion (SfM) problem; Three-dimensional (3D) structure recovery; Image reconstruction

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