Essential Matrix Parameterization and the Rank-2 Issue

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Abstract

Using nonlinear parameterization to preserve the rank-2 property of an estimated essential matrix is proposed in this paper. The essential matrix can be parameterized by using the external camera parameters of the corresponding image pair, and the problem of essential matrix estimation becomes to solve a nonlinear system. The proposed method determines an essential matrix by solving a nonlinear system with six parameters, and, at the same time, finds the rotation angles of the camera-coordinate axes and determines the translation vector up to a scale. Besides external parameters, the proposed method can estimate an essential matrix that maintains the rank-2 property of a theoretical essential matrix and has good accuracy. Experimental results show that the proposed method can determine an essential matrix with rank 2 even when the input data contain large noise and the performance can compete with those of current best methods.