

## **Conditions for motion-background segmentation using fundamental matrix**

### **Abstract**

In common motion segmentation and estimation applications, where the exact nature of objects' motions and the camera parameters are not known a priori, the most general motion model (the fundamental matrix) is applied. Although the estimation of a fundamental matrix and its use for motion segmentation are well understood, the conditions governing the feasibility of segmentation for different types of motions are yet to be discovered. In this work, the authors study the feasibility of separating motions of a 3D object from its static background using the fundamental matrix. The authors theoretically prove that a pure translational motion cannot be separated from its static background and the success of motion background segmentation depends on the rotational part of the motion. An extensive set of controlled experiments using both synthetic and real images was conducted to validate the theoretical results. In addition, the authors quantified the conditions for successful motion-background segmentation in terms of the minimum required rotation angle. These results are useful for practitioners designing motion segmentation or estimation solutions for computer vision problems.

**Keywords** — Background segmentation, fundamental matrix, motion segmentation, camera parameter