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Three-view Focal Length Recovery From Homographies

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In this paper, we propose a novel approach for recovering focal lengths from three-view homographies. By examining the consistency of normal vectors between two homographies, we derive new explicit constraints between the focal lengths and homographies using an elimination technique. We demonstrate that three-view homographies provide two additional constraints, enabling the recovery of one or two focal lengths. We discuss four possible cases, including three cameras having an unknown equal focal length, three cameras having two different unknown focal lengths, three cameras where one focal length is known, and the other two cameras have equal or different unknown focal lengths. All the problems can be converted into solving polynomials in one or two unknowns, which can be efficiently solved using Sturm sequence or hidden variable technique. Evaluation using both synthetic and real data shows that the proposed solvers are both faster and more accurate than methods relying on existing two-view solvers.

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