A Unified Normalization Method for Point And Line-Based Homography Estimation

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ABSTRACT

It is well accepted that data normalization is an essential and imperative step in using the direct linear transformation (DLT) method for homography estimation. Nevertheless, the existing data normalization methods are either point or line-based, thus making them inapplicable in scenarios where both point and line correspondences are available. To fill this gap and further widen the applicability of the DLT method, this study proposed a unified data normalization method for homography estimation using combined point and line correspondences. In this method, the existing point-based normalization method was exploited and then extended to normalize the line coefficients by conducting extra data processing created by the authors. Finally, a unified normalization method was developed by fusing the normalization principles implemented on the point coordinates and line coefficients alone, which allows for choices of using different combinations of point and line correspondences for homography estimation. The field results showed that the proposed method can significantly improve the accuracy and offer higher reliability for homography estimation.