Symmetry Detection of Rational Space Curves.

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Abstract

We present a novel, deterministic, and efficient method to detect whether a given rational space curve $\mathcal{C}$ is symmetric. The method combines two ideas. On one hand in a similar way to [1], [2], if $\mathcal{C}$ is symmetric then the symmetry provides a second parametrization of the curve; furthermore, whenever the first parametrization is proper, i.e. injective except for finitely many parameter values, the latter is also proper and both are related by means of a Möbius transformation [3] that completely determines the symmetry. On the other hand, if $\mathcal{C}$ is symmetric then the curvature and torsion of $\mathcal{C}$ at corresponding points must coincide. By putting together these two ideas we can give an algorithm to directly find the Möbius transformations defining the symmetries of the curve. From here we can compute these symmetries and its characteristic elements (symmetry axes, symmetry planes, etc.) This completes and improves on an earlier method addressing a similar problem [3].

Keywords
Symmetry Detection, Space Curves, Rational Curves

References

