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Reflections on refractions. (English) Zbl 0956.51015

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Summary: In computer graphics, it is often an advantage to calculate refractions directly, especially when the application is time-critical or when line graphics have to be displayed. We specify efficient formulas and parametric equations for the refraction on straight lines and planes. Furthermore, we develop a general theory of refractions, with reflections as a special case. In the plane case, all refracted rays are normal to a characteristic conic section. We investigate the relation of this conic section and the diacaustic curve. Using this, we can deduce properties of reciprocal refraction and a virtual object transformation that makes it possible to produce 2D-refraction images with additional depth information. In the three-dimensional case, we investigate the counter image of a straight line. It is a very special ruled surface of order four. This yields results on the order of the refrax of algebraic curves and on the shading of refracted polygons. Finally, we provide a formula for the diacaustic of a circle.

MSC:

51N05 Descriptive geometry

51N35 Questions of classical algebraic geometry

51N99 Analytic and descriptive geometry

68U05 Computer graphics; computational geometry (digital and algorithmic aspects)

Keywords:

computer graphics; refractions; reflections

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