Geometric effect of the control points on Bézier based caustic surfaces

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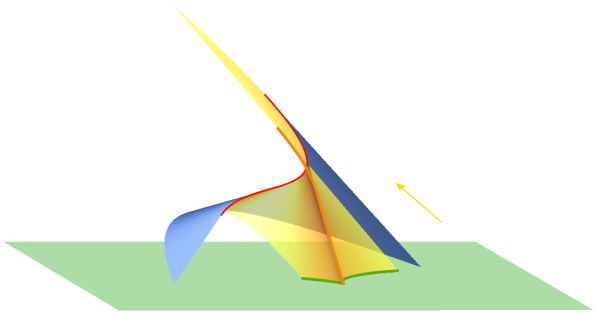
If we consider a planar curve as a mirror, and emit parallel light rays onto the curve, than the reflected rays generally have an envelope, called the caustic of the mirror curve. It is studied in [1] for the case of Bézier-curves as mirrors. In this lecture the conception and properties of the caustics of developable surfaces will be discussed. The reflected light rays and the generators define reflected light sheets at every point of the defining curve. These reflected sheets generally have an envelope surface. If the developable surface is a real mirror e.g. covering the side of a building, then the main question is where will the reflected light beams be concentrated. Numerical solutions are provided, see [2]. In case of tangent surfaces the caustic surface can be formed as the tangent surface of the regression curve of the defining surface. Now let us consider a base plane and a mirror surface standing on this plane. In this case the intersection of the caustic surface and the plain is a new curve which hot point is the intersection of the regresion curve and the plane. If the defining curve of the surface is a free-form curve, then altering its control points, which have a geometric effect on the hot point (and on the surface), we can eliminate or modify the position of this singular point.



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References

[1] Ede Troll and Miklós Hoffmann Caustics of spline curves. *Annales Mathematicae et Informaticae*, 47:201–209, 2017.

[2] Tamás Umenhoffer, Gustavo Patow and László Szirmay-Kalos Caustic Triangles on the GPU. *CGI 2008 Conference Proceedings.*