

o Seminário

Dr Ole Peter Smith,
Instituto de Matemática e Estatística,
Universidade Federal de Goiás

On the Curve and Osculating Factors for Planar Curves

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Responsável: Levi Rosa Adriano
Organização: Grupo de Geometria
Site:

Área: Geometria
Palavras Chaves:

Resumo:

When investigating planar curve parametrization, the Frenet Equations, are usually written in terms of the natural parametrization. Computationally, this complicates matters, as the arc length integral may not be calculable analytically. Even if it is calculable, inverting it analytically may prove impossible, forcing us to turn to numerical methods in order to calculate geometrical characteristics such as curvature and evolute. Writing the Frenet equations in terms of the (time) parameter, we introduce the curvature and osculating factors, to a large extent playing the role of the curvature, respectively the curvature ratio. Initially, these factors presents the advantage of depending on the squared velocity, instead of the cubic dependence exhibited by the curvature quantities. However, these factors presents several other interesting characteristics. First of all, when the curvature ratio of a circle is linear, the osculating factor is unity. Secondly, the curvature and osculating factors are invariant towards a scaling. Furthermore, we point out, surprisingly, these factors turns out to be the same for a curve and (a) any curve parallel to it, (b) it' evolute and (c) it's involute. During the talk, we present a number of analytical evolute examples (all verified by numerical calculations): Parabola, Ellipse and Hyperbola. Rosettas, Cycloid and Trochoids, Epicycloids and Epitrochoids and Hypocycloids and Hypotrochoids. We also presents some examples, where the evolutes has been calculated numerically, only: Folium of Descartes as well as Supercircles and Superellipses. All examples has been drawn in SVG, Scaled Vector Graphics, which as the name indicates, allows for virtually infinite scaling.