LEVEL SETS

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Acá debe ir el abstract.

1. Curve Evolution

The numerical analisys of the motions of plane curves driven by a function of the curvature. If C is a smooth (say C^2) curve, they are described by a partial differential equation (PDE) of the type:

$$\frac{\partial C}{\partial t} = G(\kappa)\mathbf{N}$$

$$\kappa = \text{ curvature}, \quad \mathbf{N} = \text{ normal vector to the curve}$$

This equation means that any point of the curve moves with a velocity which is a function of the curvature of the curve at this point

A **a propagating interface** is a closed surface in some space that is moving under a function of local, global and independent properties. Local properties are properties determined by local information about a curve, such as its curvature. Global properties are properties determined by the larger shape and positioning of the surface. Independent properties are properties not determined by the surface itself, such as underlying flow of the surface. Level set method is one computational technique for tracking a propagating interface over time.

Malladi and Sethian:

Consider a closed curve moving in the plane, that is, let $\gamma(0)$ be a smooth, closed initial curve in Euclidean plane $\mathbb{R}^2$, and let $\gamma(t)$ be the one-parameter family of curves generated by moving $\gamma(0)$ along its normal vector field with speed $F(K)$, a given scalar function of the curvature K. Let $x(s,t)$, be a position vector which parameterizes $\gamma(t)$ by s, $0 \le s \le S$.

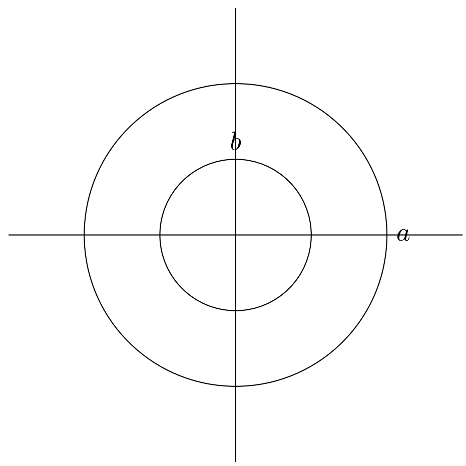

Figure 1.

The parametric functions that describe the circles are:

$$x_a(\theta) = a\cos\theta \quad y_a(\theta) = a\sin\theta$$

$$x_b(\theta) = b\cos\theta \quad y_b(\theta) = b\sin\theta$$

and taking into account that , an ellipse (Fig. 3) can be described using two concentric circles, the parametric functions of the ellipse are:

$$\begin{bmatrix} x(\theta) \\ y(\theta) \end{bmatrix} = \lambda \begin{bmatrix} \cos\rho & \sin\rho \\ -\sin\rho & \cos\rho \end{bmatrix} \begin{bmatrix} a\cos\theta \\ b\sin\theta \end{bmatrix}$$

The ray of the θ angle (green)

$$x(\theta) = a\cos\theta \quad y(\theta) = b\sin\theta$$

, and the radii of the two circles are the lengths of the semi-minor and semi-major axes.

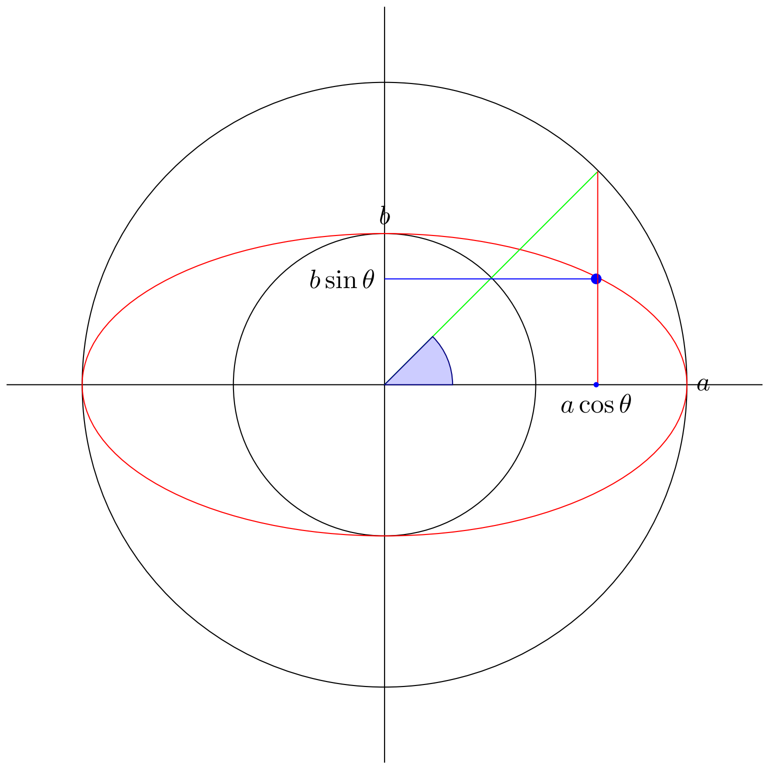

Figure 2.

References

1. M. Barranco and J. R. Buchler, *Phys. Rev.* **C34**, 1729 (1980).
2. D. H. Ballard, Generalizing the Hough Transform to detect Arbitrary Shapes. (1979).
3. M. Nixon and A. Aguado. Feature Extraction and Image Processing.

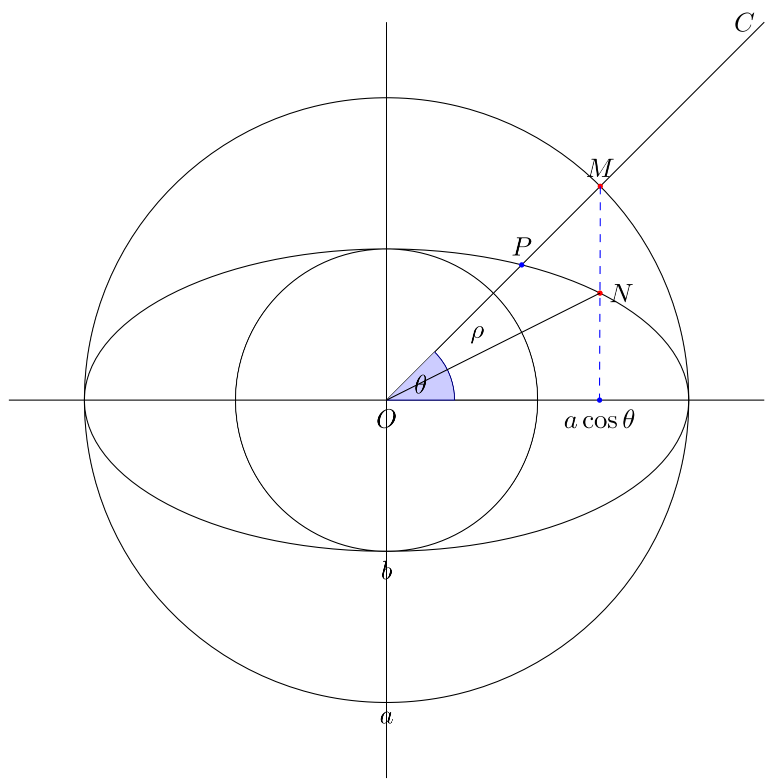

Figure 3.