English summaries

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Local and non local image analysis and some aplications

The principle most of the denoising methods are based on the average of the nearby pixels colors. One of the best known is the so-called sigma-filter which replaces the color of the pixel by an average of their neighboring pixels which also have a similar color value. This type of filters produce the creation of shock effects which can be interpreted in terms of a geometric PDE. By one hand and based in a recent work of the same authors, the comparison of the sigma-filter and the PDE associated allows us to explain the shock and to propose a variant of the sigma-filter which does not create shocks. By the other hand, we present a non local model for image restoration, the NL-means, already introduced for the same authors in 2005. This new algorithm is based on the auto-similarity principle of the image and it improves in great measure the classical algorithms. Finally, we apply the same non local idea to other applications, as the movie restoration and the demosaicking problem.

Núria Fagella

Invariants in complex dynamics

Using Newton's method for complex polynomials as a conducting theme, this lecture tries to show the possible asymptotic behaviours of orbits under iteration of holomorphic maps. We see how these orbits form invariant sets with different possible dynamics, separated by fractal boundaries with amazing topological and dynamical properties.

Keywords: Newton's method, Julia set, Fatou set, iteration, orbit, stable component.

MSC2000 Subject Classification: 37F10, 30D05.

Xavier Mora

The Navier-Stokes equations. A challenge to Newtonian determinism

The question of global existence and uniqueness of solutions of the time-dependent Navier-Stokes equations is reviewed. Special emphasis is put on its philosophical implications and the historical perspective. An attempt is made to approach the core of the problem while keeping technicalities to a minimum.

Keywords: Navier-Stokes equations, global existence, uniqueness, regularity.

MSC2000 Subject Classification: 35Q30, 76D03, 76D05.

Pedro Miguel González Urbaneja

Archimedes, a wise man between history and legend

Archimedes is one of the greatest mathematicians of all times, both for the magnitude of his contribution to the mathematical heritage of mankind and for the geniality of his methods. His mechanicalfact-finding method, historically aims to the indivisible and infinitesimal of the quadrature techniques of the XVIIth century that led to the discovery of Infinitesimal Calculus by Newton and Leibniz, whereas the demonstrative method of exhaustion points to the arithmetic techniques of the limits which base modern Analysis in the century XIXth. The conjunction of both methods, one of them heuristic and empiricist and the other one rigorous and apodictic, place Archimedes in the historic roots of Integral Calculus.

Keywords: mechanical method, discovery, exhaustion method, apodictic, heuristics, quadrature, cubature, integral calculus, sphere, cylinder, conoid, spheroid, circle, spiral, parabola.

MSC2000 Subject Classification: 01A20, 01A70.