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Approximation of Julia sets with computer assisted validation for complex analytic dynamical systems.

I will discuss some computer assisted methods for mathematically rigorous approximation of Julia sets in complex analytic dynamical systems. The methods are based on solving the Schroder equation for the conjugacy map at a fixed point. This part of the problem is also treated by computer assisted arguments so that good bounds on the radius of convergence of the conjugating series are obtained. When the Schroder equation is solved at the attracting fixed point, then the boundary of the image of the conjugacy map provides an approximation of the Julia set. On the other hand computing the conjugacy map at a repelling fixed point allows for validated study of homoclinic connecting orbits via a certain “discrete free boundary value problem”. The Julia set is approximated from below by taking the union of longer and longer homoclinic excursions. I will sketch the arguments and present some results for both a quadratic and an exponential family of maps. (Received September 05, 2013)