

國立中山大學應用數學系

學術演講

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講題：Numerical algorithms for blow-up problems
時間：2021/02/26（Friday）16:10 ~ 17:10
地點：理學院四樓理 SC 4009-1 教室
茶會：15:30 於理 SC 4010 室（系辦公室）

Abstract

A solution of a nonlinear evolution equation may become unbounded in a finite time. Such a phenomenon is known as blow-up and the finite time is called the blow-up time. Questions of particular interests for blow-up problems are whether a solution blows up or not and, if it does blow up, when, where and how a solution blows up. Blow-up problems are widely investigated in recent decades and analytical results are abundant. In this talk, we would like to explore such kind of problems from the numerical viewpoint. There are many numerical methods constructed to compute blow-up solutions. Some of them are known to be very effective in numerically resolving the concentration of singularities of a solution of PDEs, such as moving mesh for PDEs and the rescaling algorithm. However, to prove the convergence mathematically for these methods are very difficult, as far as we know. Nakagawa's adaptive algorithm (1976) seems to be the first successful attempt to compute the blow-up solutions with a rigorous convergence proof. His algorithm was later applied to compute the blow-up time for various blow-up problems and analyze the asymptotic blow-up behavior numerically. On the other hand, we proposed an algorithm (2013) for the computation of blow-up solutions. This algorithm is simple, intuitive and can numerically reconstruct many blow-up behaviors with rigorous convergence proofs. We will briefly review these algorithms and report our recent results.

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