

On Mathematical Issues on Discretization of the Blow-up Problems

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I consider a semilinear parabolic equation $u_t = u_{xx} + f(u)$ ($0 < x < 1$, $0 < t$) or a nonlinear wave equation $u_{tt} = u_{xx} + f(u)$ ($0 < x < 1$, $0 < t$). Under a certain assumption, it is known that solutions blow up in finite time. I then propose a finite difference scheme for them. The purpose of my talk is to mathematically analyze the convergence. In particular, I will report my recent results (jointly with Chien-Hong Cho) on how well we can approximate the ‘blow-up time’. I also consider asymptotic profile of discrete solutions, and examine whether one-point blow-up can be reproduced or not.