Some other works

Schauder estimate

The Schauder estimate is a fundamental estimate in elliptic equations. In [so1] we found a short and elementary proof for the estimate. The proof also applies to (fully) nonlinear elliptic and parabolic equations. In particular it also applies to the Dini continuous case.

Semilinear elliptic equation

In [so2] we prove the existence of nonzero solutions to the Neumann problem of semilinear elliptic equation with critical growth exponents. Some partial results were independently obtained by Adimurthi-Yadava. The corresponding Dirichlet problem was studied in a paper of Brezis-Nirenberg.

Kahler-Einstein metric

In [so3] we prove the existence of Kahler-Ricci solitons on toric Kahler manifolds with positive first Chern class, in all dimensions. The soliton is Kahler-Einstein metric when the Futaki invariant vanishes. It is well known that the existence of Kahler-Einstein metrics was proved by S.T. Yau when the first Chern class is negative or vanishes (the negative case also by Aubin). When the first Chern class is positive, it was solved by Tian in the 2-dim case, he also found counterexamples in high dimensions.

Free boundary problem

In [so4,so5] we studied the 1-dim Stefan problem with the kinetic condition $s'(t) = e^{\lambda u}$ at the free boundary $\{(x,t) : \ x = s(t)\}$. We proved the existence of global-in-time solutions if $\lambda < \sqrt{2\pi e}$ and the blow-up of solutions if $\lambda \geq \sqrt{2\pi e}$. The main interesting point here is the critical constant $\sqrt{2\pi e}$, which involves both π and e.

References

[so1] X.-J. Wang, Schauder estimates for elliptic and parabolic equations, Chinese Ann. Math. (B), 27(2006), 637-642.

[so2] X.-J. Wang, Neumann problems of semilinear elliptic equations involving critical Sobolev exponents, J. Differential Equations, 93(1991), 283-310.

[so3] X.H. Zhu, X.-J. Wang, Kahler-Ricci solitons on toric manifolds with positive first Chern class, Advances in Math., 188(2004), 87-103.

[so4] Z.C. Guan, X.-J. Wang, Existence and blowup of solutions to two-phase non-equilibrium problems, SIAM J. Math. Anal. 27(1996), 1038-1048.

[so5] Z.C. Guan, X.-J. Wang, Critical exponent in a Stefan problem with kinetic condition, European J. Applied Math., 8(1997), 525-532.