

On cell problems for nonlinear PDEs and its application to homogenization

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Abstract

In this talk, I will give an introductory talk on the homogenization for fully nonlinear PDEs. To prove “homogenization” in a periodic setting, it is well-known that the cell problem, which is a kind of nonlinear eigenvalue problems, plays an important role. In the talk, I will show some of basic arguments in Lions-Papanicolaou-Varadhan (1987), and Evans (1992) and prove the homogenization in a periodic setting by using a perturbed test function method introduced in Evans (1989) as a starting point.

In the second half of the talk, I will show some of recent development in Davini-Fathi-Iturriaga-Zavidovique (2016), Mitake-Tran (2017) on the selection problem appearing in the cell problem. These results did not currently have a clear application to homogenization, but may have potential. I finally refer to a lecture note [6] on this direction.

[1] A. Davini, A. Fathi, R. Iturriaga, M. Zavidovique, *Convergence of the solutions of the discounted equation*, Invent. Math. 206 (1) (2016) 29-55.

[2] L. C. Evans, *The perturbed test function method for viscosity solutions of nonlinear PDE*, Proc. Roy. Soc. Edinburgh Sect. A 111 (1989), no. 3-4, 359-375.

[3] L. C. Evans, *Periodic homogenisation of certain fully nonlinear partial differential equations*, Proc. Roy. Soc. Edinburgh Sect. A 120 (1992), no. 3-4, 245-265.

[4] P.-L. Lions, G. Papanicolaou, S. R. S. Varadhan, *Homogenization of Hamilton-Jacobi equations*, unpublished work (1987).

[5] H. Mitake, H. V. Tran, *Selection problems for a discount degenerate viscous Hamilton-Jacobi equation*, Adv. Math. 306 (2017), 684-703.

[6] N. Q. Le, H. Mitake and H. V. Tran, *Dynamical and geometric aspects of Hamilton-Jacobi and linearized Monge-Ampere equations*, to appear in Lecture Notes in Mathematics, Springer.