Mathematical Methods and Models in Biosciences
June 18-23, 2023, Pomorie, Bulgaria
https://biomath.math.bas.bg/biomath/index.php/bmcs

Distributional solutions of nonlinear diffusion equations with a moving Dirac source term

Marek Fila[1†], Petra Macková[1], Jin Takahashi[2], Eiji Yanagida[3]

[1]Department of Applied Mathematics and Statistics,
Comenius University, Bratislava 84248, Slovakia
petra.mackova@fmph.uniba.sk

[2]Department of Mathematical and Computing Science,
Tokyo Institute of Technology, Tokyo 152-8552, Japan
takahashi@c.titech.ac.jp

[3]Department of Mathematics,
Tokyo Institute of Technology, Tokyo 152-8551, Japan
y-aska@msc.biglobe.ne.jp

We focus on the study of singular solutions of nonlinear diffusion equations, specifically the fast diffusion and porous medium equations. Building on work on the existence of asymptotically radially symmetric solutions by Fila, Takahashi, and Yanagida, we focus on their uniqueness and the equation they satisfy in the sense of distributions. This equation involves a moving Dirac source term, which is also found in parabolic systems used in various biological applications.

References

[1] M. Fila, P. Macková, Fast diffusion equation: uniqueness of solutions with a moving singularity, arXiv:2304.13433 [math.AP], 2023.

[2] M. Fila, P. Macková, J. Takahashi, E. Yanagida, Moving singularities for nonlinear diffusion equations in two space dimensions, *Journal of Elliptic and Parabolic Equations*, 6:155-169, 2020.

[3] M. Fila, P. Macková, J. Takahashi, E. Yanagida, Anisotropic and isotropic persistent singularities of solutions of the fast diffusion equation, *Differential and Integral Equations*, 35:729-748, 2022.

†Marek Fila, a supervisor, friend, and co-author of this paper, passed away in April 2023. In his memory, the second author has decided to publish the research, as this work with his valuable impact was finished before his passing.