Lou, Bendong
Periodic travelling wave solutions of a curvature flow equation in the plane. (English)
Zbl 1138.35035

This paper deals with the study of periodic travelling wave solutions of a curvature flow equation in the plane. The main result of this paper establishes the existence and the uniqueness of such a solution, whose graphic is a periodic ondulating line which is in a finite distance from a straight line with a prescribed inclination α, so that the propagation is just like that in oblique disposed striations. Two particular cases have a particular interest in this analysis. First, if $\alpha = 0$, then the periodic travelling wave solution is a horizontal straight line which travels in the y-direction with average speed c_0. Next, in the case $\alpha = \pi/2$, then there exists not-periodic travelling wave solution which travels in the $-x$-direction with a speed depending on the arithmetic means of two well-defined quantities.

Reviewer: Vicenţiu D. Rădulescu (Craiova)

MSC:

35K55	Nonlinear parabolic equations
35B27	Homogenization in context of PDEs; PDEs in media with periodic structure
35B10	Periodic solutions to PDEs

Cited in **1** Document

Keywords:

periodic travelling wave solutions; curvature flow equation; homogenization problem; existence; uniqueness; periodic ondulating line

Full Text: DOI Euclid

References:

[1] C. M. Brauner, P. Fife, G. Namah and C. Schmidt-Lainé, Propagation of a combustion front in a striated solid medium: a homogenization analysis, Quart. Appl. Math. 51 (1993), 467–493. · Zbl 0803.35009

[2] X. Chen and G. Namah, Wave propagation under curvature effects in a heterogeneous medium, Appl. Anal. 64 (1997), 219–233. · Zbl 0878.35009 · doi:10.1080/00036819708840532

[3] X. Chen and G. Namah, Periodic travelling wave solutions of a parabolic equation: a monotonicity result, J. Math. Anal. Appl. 275 (2002), 804–820. · Zbl 1072.35539 · doi:10.1016/S0022-247X(02)00428-6

[4] N. Krylov and N. N. Bogoliubov, The application of methods of nonlinear mechanics to the theory of stationary oscillations, Publication 8 of the Ukrainian Academy of Science, Kiev, 1934.

[5] G. Namah and J.-M. Roquejoffre, Convergence to periodic fronts in a class of semilinear parabolic equations, NoDEA Nonlinear Differential Equations Appl. 4 (1997), 521–536. · Zbl 0887.35070 · doi:10.1007/s000300050029

[6] H. Ninomiya and M. Taniguchi, Travelling curved fronts of a curvature flow with constant driving force, Free Boundary Problems: Theory and Applications I, (Chiba, 1999), 206–221, Gakuto Internat. Ser. Math. Sci. Appl. 13, Gakkotosho, 2000, Tokyo. · Zbl 0957.35124

[7] Y. Nishiura, Far-from-equilibrium dynamics, Transl. Math. Monogr. 209, Iwanami Series in Modern Mathematics, American Math. Soc., Providence, R.I., 2002. · Zbl 1013.37001