On periodic wave factorization

Vladimir VASILYEV [1]

[1] *Pure Mathematics, Lipetsk State Technical University, Lipetsk, Russia*
E-mail: vbv57@inbox.ru

Abstract: We consider a special kind of factorization related to certain domains in multidimensional complex space $\mathbb{C}^m$. This approach was introduced by the author [1,2] for studying solvability of model elliptic pseudo-differential equations in canonical domains. Now we interested in discrete variant of such a theory, and for this purpose we construct a periodic wave factorization to describe solvability properties of some classes of discrete equations.

Let $D \subset \mathbb{R}^m$ be a convex sharp cone, $T(D) \subset \mathbb{C}^m$ is a domain of the following type

$$T(D) = \{z \in \mathbb{C}^m : \ z = x + iy, x \in \mathbb{T}^m, y \in D\}.$$

We say that a function $A(\xi), \xi \in \mathbb{T}^m, A(\xi) \neq 0, \forall \xi \in \mathbb{T}^m$, admits periodic wave factorization with respect to cone D if it can be represented in the form

$$A(\xi) = A_+(\xi)A_-(\xi),$$

where the factors $A_\pm(\xi)$ admit bounded analytical continuation into complex domains $T(\pm D)$ respectively.

If we consider a discrete equation in a cone then an existence of periodic wave factorization with respect to an appropriate cone is a sufficient condition for unique solvability of such equation in Lebesgue spaces. Some preliminary results for special degenerated cones were obtained in [3, 4].

The work was supported by Russian Foundation for Basic Research and government of Lipetsk region of Russia, grant no. 14-41-3595-r-center-a.

Keywords: discrete equation, periodic wave factorization, multidimensional Riemann boundary value problem

2010 Mathematics Subject Classification: 35J46, 42B37

References

[1] Vasilyev, V.B., "Wave factorization of elliptic symbols", *Math. Notes*, Vol. 68, No. 5-6, pp. 556-568, 2000.

[2] Vasilyev, V.B., "Elliptic equations and boundary value problems in non-smooth domains", *Operator Theory: Advances and Applications*, Vol. 213, pp. 105-121, 2011.

[3] Vasilyev, A.V., Vasilyev, V.B., "Discrete singular operators and equations in a half-space", *Azerb. J. Math.*, Vol. 3, No.1, pp. 84-93, 2013.

[4] Vasilyev, A.V., Vasilyev, V.B., "On some classes of difference equations of infinite order", *Adv. Difference Equ.*, Vol. 211, pp. 1-9, 2015.