On the stability estimation of differential-difference analogue of the integral geometry problem with a weight function

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Abstract: A great deal of the work has been devoted to problems of integral geometry, that is, the problems of determining a function from its integral along a given family of curves. One of the stimuli for studying such problems is their connection with multidimensional inverse problems for differential equations [1]. In some inverse problems for hyperbolic equations were shown to reduce to integral geometry problems and, in particular, a problem of integral geometry was considered in the case of shift-invariant curves. Mukhometov [2] showed the uniqueness and estimated the stability of the solution of a two-dimensional integral geometry on the whole. His results were mainly based on the reduction of the two-dimensional integral geometry problem

$$V(\gamma, z) = \int\limits_{K(\gamma,z)} U(x,y)\,\rho(x,y,z)\,ds, \quad \gamma \in [0,l], \quad z \in [0,l] \tag{1}$$

where $U \in C^2\left(\overline{D}\right), \rho(x,y,z)$ is a known function to the boundary value problem

$$\frac{\partial}{\partial z}\left(\frac{\partial W}{\partial x}\frac{\cos\theta}{\rho} + \frac{\partial W}{\partial y}\frac{\sin\theta}{\rho}\right) = 0, (x,y,z) \in \Omega_1, \tag{2}$$

$$W(\xi(\gamma), \eta(\gamma), z) = V(\gamma, z), V(z,z) = 0, \gamma, z \in [0,l]. \tag{3}$$

Differential - difference analogue of the problem (2)-(3) are studied. The stability estimate for the considered problem (2)-(3) are obtained.

Keywords: integral geometry problem, differential-difference problem, stability, uniqueness.

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References

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