



International Scientific Conference

Algebraic and Geometric Methods of Analysis
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LIST OF TOPICS

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric and topological methods in natural sciences

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Infinitesimal deformations of surfaces of negative Gaussian curvature with a stationary Ricci tensor

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In [1] it was proved that every simply connected surface $S \in C^4$ non-zero Gaussian and middle of curvatures admits infinitely small (in.sm.) first-order deformations with a stationary Ricci tensor whose tensor fields have the representations

$$T^{\alpha\beta} = \varphi g^{\alpha\beta}, \quad T^k = \varphi_\alpha d^{\alpha k} + \mu_\alpha c^{\alpha\beta} d_\beta^k,$$

where functions $\mu(x^1, x^2)$ and $\varphi(x^1, x^2)$ of class C^3 satisfy the following second-order partial differential equation:

$$(d^{\alpha\beta} \varphi_\alpha)_{,\beta} + 2H\varphi = \mu_{\alpha,k} c^{\alpha\beta} d_\beta^k + \mu_\alpha c^{\alpha\beta} (d_\beta^k)_{,k}. \quad (1)$$

Let S be a surface of negative Gaussian curvature. Then (1) is an equation of hyperbolic type, which in asymptotic lines takes the form

$$\varphi_{12} + d\varphi_1 + l\varphi_2 + c\varphi = f(\mu) \quad (2)$$

where d, l, c are known functions of the point S , $\mu(x^1, x^2)$ is predefined function.

For equation (2), consider the Darboux problem: We will look for such an integral that takes certain values on the characteristics $x^1 = x_0^1, x^2 = x_0^2$; $\varphi(x^1, x_0^2) = \lambda(x^1)$, $\varphi(x_0^1, x^2) = \tau(x^2)$.

Then each pair of functions will $\lambda(x^1), \tau(x^2)$ match the only solution $\varphi(x^1, x^2)$ equation (2) with known right side [2].

Fair

Theorem 1. *Every simply connected surface of negative Gaussian curvature of the class C^4 and without umbilical points admits in.sm.deformations of the first order with preservation of the Ricci tensor. In this case, the strain tensors are expressed in terms of a preassigned function of two variables and two arbitrary functions of the class C^3 , each from one variable.*

It should be noted that many phenomena in mechanics, physics, and biology are reduced to the study of hyperbolic equations. To describe these phenomena completely for hyperbolic equations, the Darboux problem is posed.

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