



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 problems in mathematical analysis
- Geometric and topological methods in natural sciences

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ІНТЕРНАЦІОНАЛЬНИЙ
ЦЕНТР СПІВРОБІТНИЦТВА

Geodesics on regular tetrahedra in spherical space

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The full classification of closed geodesics on regular tetrahedra in Euclidean space follows from the tiling of Euclidean plane by regular triangles [1].

In [2] we described a complete classification of simple (without self-intersections) closed geodesics on regular tetrahedra in hyperbolic 3-space. In addition, we presented the asymptotic of the number of simple closed geodesics of length not greater than L as L tends to infinity.

In current work we described all simple closed geodesics on regular tetrahedra in three-dimensional spherical spaces. In this space the tetrahedron's curvature is concentrated both into its vertices and into its faces. The value α of the faces' angle of a tetrahedron satisfies $\pi/3 < \alpha < 2\pi/3$. The intrinsic geometry of a tetrahedron depends on α .

By definition a simple closed geodesic on a tetrahedron has the type (p, q) if it has p points on each of two opposite edges of the tetrahedron, q points on each of another two opposite edges, and there are $(p + q)$ points on each edges of the third pair of opposite one.

We proved that on a regular tetrahedron in spherical space there exists the finite number of simple closed geodesic. The length of all these geodesics is less than 2π . Furthermore, for any coprime integers (p, q) we found the numbers α_1 and α_2 depending on p, q and satisfying the inequalities $\pi/3 < \alpha_1 < \alpha_2 < 2\pi/3$ such that

- 1) if the faces' angle of a regular tetrahedron is measured $\alpha \in (\pi/3, \alpha_1)$ then in spherical space there exists unique, up to the rigid motion, simple closed geodesic of type (p, q) on this tetrahedron,
- 2) if the value α of faces' angle is in $(\alpha_2, 2\pi/3)$ then there is no simple closed geodesic of type (p, q) on the tetrahedron with such faces' angle in spherical space.

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