Evaluation of general rotations with spinors.

A.Mylnikov , I.Rodonaia, H. Onal

This work is devoted to the solution of the following problem: for the given two points x and y in 3D-space is necessary to find all possible (zero and non-zero) centers of rotations and corresponding transformations: unitary complex and real orthogonal ones. By general rotation we mean a rotation about any (zero and non-zero) centers. The point is that the traditional approaches describes only the certain rotation with zero center. The above mentioned problem seems to be more general and interesting because of both theoretically and practically reasons.

Three kind of spaces are used: L^3 – 3D Euclidian space, H- 2D linear space over the field of complex number and L(H) – a set of all hermit functionals over H space which is 3D linear space over the field of real number. Any base e_1, e_2 of H defines corresponding base σ_1, σ_2, σ_3 of L(H), where σ_i – Pauli matrices.

It is proved that transformation matrices C of bases of space H are unitary. The last gave possibility to define a system of complex equations for elements of these matrices provided rotations from point (x_1,x_2,x_3) into point (y_1,y_2,y_3). The system defines both the set of matrices C and equations for 1D invariant subspace of C transformations (subspace of rotation centers).

The relationships between elements of unitary transformations matrices in H and elements of orthogonal transformation matrix in L^3 (L(H)) were obtained.

It is proved that 1D invariant subspace of C transformations in H space coincides with invariant subspace of corresponding to its eigenvalue equal to 1.

It also permits to transform an orthogonal transformation matrix in L^3 (L(H)) into complex-diagonal form without solution of 3-degree characteristic polynomial and to connect these results with elements of Clifford Algebra – bivectors and threevectors.