# On finite subgroups of SO(3), regular polyhedrons in R4 and the spherical motion of rigid body

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Based on the fact of two-sheeted covering group SO(3) by group of unit quarternions Sp(1) and vertices coordinates of tesseract, 16-cell, 24-cell, 120-cell, 600-cell, their images are found in the way of equal distribution of dots on the unit sphere S3. Animation of smooth spherical motion of rigid body along the shortest [1] and random [2] path through the nodes of the resulting graph for 24-cells is done by the method of nonlinear interpolation of quarternions. Spherical motion of rigid body is associated with the movement of the point on the hypersphere in four-dimensional space along the arcs of large circle through the vertices of regular four-dimensional polytope. For an analytical presentation of the law of continuous movement used the original algebraic representation of the Heaviside function. The algorithm allows in a wide range to change the time intervals displacements between nodes, as well as the laws of motion on these intervals. Many tasks of motion control and navigation, robotics and computer graphics relate with the description of a rigid body rotation in three-dimensional space. We give a constructive solution for the smooth movement of a rigid body to solve such problems [3, 4].

## References

[1] `https://www.youtube.com/watch?v=_k00jJIBqWY`.

[2] `https://www.youtube.com/watch?v=KwqQVov83jk`.

[3] S.A. Berestova, N.P. Kopytov, E.A. Mityushov, *Engineering Journal: Science and Innovation*, 7, 2017.

[4] E.A. Mityushov, N.E. Misyura, S.A. Berestova, *The Bulletin of Udmurt University. Mathematics. Mechanics. Computer Science*, 27, 1, 2017.

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