

# Quaternions and their applications

YUSUF YAYLI

Ankara University, Ankara, Turkey

email: yayli@science.ankara.edu.tr

Quaternions are brother of complex numbers. Quaternions defined in four dimensional space have quite good applications in three-dimensional kinematics field. In the modeling of robot movements, quaternions comes out as a screw operator and a rotation operator. Another application field is the linear spherical interpolation. Quaternionic fractals are also topics that have been studied in recent years. In quantum physics, they facilitate for the construction of unitary matrices  $SU(2)$ .

This talk will be about the historical development of quaternions and their application to various fields.

**MSC 2010:** 11R52, 15B33, 70B10, 70E15.

**Keywords:** Quaternion, split quaternion, interpolation

## References

- [1] K. Shoemake, Animating rotation with quaternion curves. *ACM Siggraph* **19** (1985), no. 3, 245-254.
- [2] E. Pervin and J. A. Webb, Quaternions in Computer Vision and Robotics. In: *Proc. IEEE Conf. on Computer Vision and Pattern Recognition*, Los Alamitos, CA (1983), 382383.
- [3] B. O'Neill, Semi Riemannian Geometry with Applications Storelativity. *Academic Press Inc., London*, 1983.
- [4] D. Mandic and V. Su Lee Goh, The Magic of Complex Numbers. Complex Valued Nonlinear Adaptive Filters. *John Wiley & Sons*, 2009.
- [5] R. Ghadami, J. Rahebi, and Y. Yaylı, Linear interpolation in Minkowski space. *International Journal of Pure and Applied Mathematics* **77** (2012), no. 4, 469-484.
- [6] R. Ghadami, J. Rahebi, and Y. Yaylı, Spline split quaternion interpolation in Minkowski space. *Advances in Applied Clifford Algebras* **23** (2013), no. 4, 849862.
- [7] S. Aslan and Y. Yaylı, Generalized constant ratio surfaces and quaternions. *Kuwait journal of Science* **44** (2017), no. 1, 42-47.
- [8] S. Kızıltuğ and Y. Yaylı, On the quaternionic Mannheim curves of AW(k)-type in Euclidean E3 space. *Kuwait Journal of Science* **42** (2015), no. 2, 128-140.
- [9] Y. Yaylı, Homothetic motions at  $E^8$  with Cayley numbers. *Mech. Mach. Theory* **30** (1995), no. 3, 417-420.
- [10] Y. Yaylı, Homothetic motions at  $E^4$ . *Mechanism and Machine Theory* **27** (1992), no. 3, 303-305.