1. IMAGE: $\mathbb{H} \otimes \mathbb{H} \otimes \cdots \otimes \mathbb{H}$

2. TITLE: HYPQUAT

Hyperquaternions: A New Tool for Modeling and Imaging

3. METHODS

In recent years, new algebraic tools based on Clifford algebras have been developed for physics and geometry. Here, we propose a hyperquaternion formulation of Clifford algebras defined as tensor products of quaternion algebras $\mathbb{H} \otimes \mathbb{H} \otimes \cdots \otimes \mathbb{H}$. Geometry being based on covariance groups, we propose here a hyperquaternion formulation of $4D$ conformal and Poincaré groups with Mathematica source codes.

4. SOURCE CODES

4.1. CODE 1

Girard, P.R., Clarysse, P., Pujol, R., Goutte R., Delachartre, P.: Girard-Hypquat Conformal Groups.nb

> `Mathematica` notebook. Academic Articles and Supplements.
> CODE

4.2. CODE 2

Girard, P.R., Clarysse, P., Pujol, R., Goutte R., Delachartre, P.: DUAL HYPERQUATERNION POINCARE GROUPS.nb.

> `Mathematica` notebook. Academic Articles and Supplements.
> CODE

5. PUBLICATIONS

1) Girard, P.R., Clarysse, P., Pujol, R., Goutte R., Delachartre, Hyperquaternion Conformal Groups. Adv. Appl. Clifford Algebras 31, 56 (2021).
DOI PDF

2) Girard, P.R., Clarysse, P., Pujol, R., Goutte R., Delachartre, P.: Dual Hyperquaternion Poincaré Groups. Adv. Appl. Clifford Algebras **31**, 15 (2021).
DOI PDF

3) Girard, P.R., Clarysse, P., Pujol, R., Goutte, R., Delachartre, P.: Hyperquaternions: An efficient mathematical formalism for geometry. In: Nielsen F., Barbaresco F. (eds), Geometric Science of Information 2019. Lecture Notes in Computer Science **11712**, 116–125, Springer, Cham (2019).
DOI PDF YOUTUBE

4) Girard, P.R., Clarysse, P., Pujol, R., Goutte, R., Delachartre, P.: Hyperquaternions: A new tool for physics. Adv. Appl. Clifford Algebras **28**, 68 (2018).

DOI PDF

5) Girard, P.R., Clarysse, P., Pujol, R., Wang, L., Delachartre, P.: Differential geometry revisited by biquaternion Clifford algebra. In J.-D. Boissonnat *et al.* (Eds.): Curves and Surfaces. Springer (2015).

DOI PDF

6) Girard, P.R.: Quaternions, Clifford Algebras and Relativistic Physics. Birkhäuser, Basel (2007).

DOI

7) Girard, P.R.: Algèbre de Clifford et Physique relativiste. PPUR, Lausanne (2004).

URL