Awesome Geometric Algebra

Release 0.0.1

Utensil Song

Jul 11, 2020

CONTENTS:

1 The Vision 1

2 Books 3

3 Papers 5

4 Notes 7

5 Videos 9

6 Physics Papers 11

7 Indices and tables 13

Bibliography 15

CHAPTER

ONE

THE VISION

This is not going to be just another curated list of Geometric Algebra/Calculus resources inspired by awesome lists, and it will not be just maintaining one `README.md`.

The preliminary result of this work is rendered at https://awesome-geometric-algebra.rtfd.io . There's almost nothing yet.

The vision for this work is:

- **Citation-based**: every resource colleted here will use sphinxcontrib-bibtex to maintain the citations in the familiar form of `.bib` files, including books, papers, articles and online resources like online pdf files, blog posts, videos, as well as software packages.
- **Web-based**: almost all of the citations will have the "url" property, at least linking to related information if not directly consumable.
- **Multi-perspective**: every resource colleted here thus can be referenced by label multiple times like in a paper, so it can live in different "lists" from different angles.
- **Broader view**: Geometric Algebra is related to many areas of Mathematics, and has applications in Physics, Computer Science and other areas, and its pros and cons can only be identified in a broader view.
- **Demonstrated**: with the help of nbsphinx and Jupyter kernels or Julia bridge for Python, Julia, Javascript, Haskell, C++, Mathematica etc., existing software packages of Geometric Algebra written in different languages will be demonstrated in the form of Jupyter Notebooks, verified by CI, and a running environment will be setup in cloud IDE, REPL or Jupyter services (if no proprietary software are involved), just one click away.

CHAPTER

TWO

BOOKS

CHAPTER

THREE

PAPERS

CHAPTER

FOUR

NOTES

CHAPTER

FIVE

VIDEOS

CHAPTER

SIX

PHYSICS PAPERS

CHAPTER

SEVEN

INDICES AND TABLES

- genindex
- modindex
- search

BIBLIOGRAPHY

[Doran et al., 2003] Chris Doran, Anthony Lasenby, and Joan Lasenby. *Geometric algebra for physicists*. Cambridge University Press, 2003. URL: http://geometry.mrao.cam.ac.uk/2007/01/geometric-algebra-for-physicists/.

[Dorst et al., 2007] Leo Dorst, Daniel Fontijne, and Stephen Mann. *Geometric algebra for computer science: an object-oriented approach to geometry*. Morgan Kaufmann series in computer graphics. Elsevier ; Morgan Kaufmann, Amsterdam : San Francisco, 2007. ISBN 9780123694652 9780123749420. OCLC: ocn132691969. URL: http://www.geometricalgebra.net/.

[Hestenes, 1998a] David Hestenes. New foundations for mathematical physics. 1998. URL: http://geocalc.clas.asu.edu/html/NFMP.html.

[Doran, 1994] Chris J. L. Doran. Geometric algebra and its application to mathematical physics. Technical Report, 1994. URL: http://geometry.mrao.cam.ac.uk/1994/01/geometric-algebra-and-its-application-to-mathematical-physics/.

[RA, 1996] CJLDO RA. Geometric algebra, spacetime physics and gravitation. 1996. URL: http://geometry.mrao.cam.ac.uk/wp-content/uploads/2015/02/96Gravit_Dynamics_Procs.pdf.

[Macdonald, 2017] Alan Macdonald. *Linear and geometric algebra*. CreateSpace Independent Publishing Platform, 2017. ISBN 9781453854938. OCLC: 1047743419. URL: http://faculty.luther.edu/~macdonal/laga/index.html.

[Macdonald, 2016] Alan Macdonald. *Vector and geometric calculus*. Alan Macdonald, Charleston, SC, 2016. ISBN 9781480132450. OCLC: 968334339. URL: http://faculty.luther.edu/~macdonal/vagc/index.html.

[Perwass, 2009] Christian Perwass. *Geometric algebra with applications in engineering*. Number 4 in Geometry and computing. Springer, Berlin, 2009. ISBN 9783540890676. OCLC: ocn262720659. URL: http://link.springer.com/book/10.1007/978-3-540-89068-3.

[Hildenbrand, 2013] Dietmar Hildenbrand. *Foundations of geometric algebra computing*. Volume 8 of Geometry and Computing. Springer Berlin Heidelberg, Berlin, Heidelberg, 2013. ISBN 9783642317934 9783642317941. URL: http://link.springer.com/10.1007/978-3-642-31794-1, doi:10.1007/978-3-642-31794-1.

[Hestenes & Lasenby, 1966] David Hestenes and Anthony N Lasenby. *Space-time algebra*. Volume 1. Springer, 1966. URL: https://www.springer.com/us/book/9783319184128.

[Hestenes, 1998b] David Hestenes. Space-time calculus. 1998. URL: http://geocalc.clas.asu.edu/pdf/SpaceTimeCalc.pdf.

[Xambo-Descamps, 2018] Sebastià Xambó-Descamps. *Real Spinorial Groups: A Short Mathematical Introduction*. Springer, 2018. URL: https://www.springer.com/gp/book/9783030004033.

[Lounesto, 2001] Pertti Lounesto. *Clifford algebras and spinors*. Volume 286. Cambridge university press, 2001. URL: https://www.cambridge.org/core/books/clifford-algebras-and-spinors/8318F7DD5B5DE06B30BC612BB5617021.

[Hestenes & Sobczyk, 2012] David Hestenes and Garret Sobczyk. *Clifford algebra to geometric calculus: a unified language for mathematics and physics*. Volume 5. Springer Science & Business Media, 2012. URL: https://www.springer.com/gp/book/9789027716736.

[Chisolm, 2012] Eric Chisolm. Geometric algebra. *arXiv preprint arXiv:1205.5935*, 2012. URL: http://arxiv.org/abs/1205.5935.

[Hestenes, 1988] David Hestenes. Universal geometric algebra. 01 1988. URL: http://geocalc.clas.asu.edu/pdf/UGA.pdf.

[Macdonald, 2017] Alan Macdonald. A survey of geometric algebra and geometric calculus. *Advances in Applied Clifford Algebras*, 27(1):853–891, 2017. URL: http://www.faculty.luther.edu/~macdonal/GA&GC.pdf.

[Easter, 2015] Robert Benjamin Easter. G8, 2 geometric algebra, dcga. *viXra. org*, 2015. URL: https://vixra.org/abs/1508.0086.

[Gebken, 2009] Christian Gebken. *Conformal geometric algebra in stochastic optimization problems of 3D-vision applications*. PhD thesis, Kiel University, 2009. URL: https://d-nb.info/1019870109/34.

[Chappell et al., 2011] James M Chappell, Azhar Iqbal, and Derek Abbott. Geometric algebra: a natural representation of three-space. *arXiv preprint arXiv:1101.3619*, 2011. URL: http://arxiv.org/abs/1101.3619.

[Sobczyk, 1992] GE Sobczyk. Simplicial calculus with geometric algebra. In *Clifford Algebras and their Applications in Mathematical Physics*, pages 279–292. Springer, 1992. URL: http://geocalc.clas.asu.edu/pdf-preAdobe8/SIMP_CAL.pdf.

[Yu et al., 2016] Zhaoyuan Yu, Wen Luo, Linwang Yuan, Yong Hu, A-xing Zhu, and Guonian Lü. Geometric algebra model for geometry-oriented topological relation computation. *Transactions in GIS*, 20(2):259–279, 2016. URL: https://solim.geography.wisc.edu/axing/publication/128_tgis12154online.pdf.

[Hitzer, 2002] Eckhard MS Hitzer. Multivector differential calculus. *Advances in Applied Clifford Algebras*, 12(2):135–182, 2002. URL: https://arxiv.org/abs/1306.2278.

[Ramirez et al., 2018] Sergio Ramos Ramirez, José Alfonso Juárez González, and Garret Sobczyk. From vectors to geometric algebra. *arXiv preprint arXiv:1802.08153*, 2018. URL: https://arxiv.org/abs/1802.08153.

[Dorst, 2002] Leo Dorst. The inner products of geometric algebra. In *Applications of Geometric Algebra in Computer Science and Engineering*, pages 35–46. Springer, 2002. URL: https://link.springer.com/chapter/10.1007/978-1-4612-0089-5_2.

[Eid, 2017] Ahmad Hosny Eid. Introducing geometric algebra to geometric computing software developers: a computational thinking approach. *arXiv preprint arXiv:1705.06668*, 2017. URL: https://arxiv.org/abs/1705.06668.

[Bromborsky, 2010] Alan Bromborsky. An introduction to geometric algebra and calculus. *Github*, 2010. URL: https://github.com/pygae/galgebra/blob/master/doc/books/bookGA.pdf.

[Breuils, 2018] Stephane Breuils. *Algorithmic structure for geometric algebra operators and application to quadric surfaces*. PhD thesis, National Institute of Informatics, 2018. URL: https://pastel.archives-ouvertes.fr/tel-02085820/file/TH2018PESC1142.pdf.

[Eid, 2018] Ahmad Hosny Eid. An extended implementation framework for geometric algebra operations on systems of coordinate frames of arbitrary signature. *Advances in Applied Clifford Algebras*, 28(1):16, 2018. URL: https://link.springer.com/article/10.1007/s00006-018-0827-1.

[Crane, 2018] Keenan Crane. Discrete differential geometry: an applied introduction. *Notices of the AMS, Communication*, pages 1153–1159, 2018. URL: https://www.cs.cmu.edu/~kmcrane/Projects/DDG/paper.pdf.

[Li, 2017] Hongbo Li. Automated geometric reasoning with geometric algebra: theory and practice. In *Proceedings of the 2017 ACM on International Symposium on Symbolic and Algebraic Computation*, 7–8. 2017. URL: http://www.issac-conference.org/2017/assets/tutorial_slides/Li.pdf.

[Wareham et al., 2004] Rich Wareham, Jonathan Cameron, and Joan Lasenby. Applications of conformal geometric algebra in computer vision and graphics. In *Computer algebra and geometric algebra with applications*, pages 329–349. Springer, 2004. URL: http://geometry.mrao.cam.ac.uk/wp-content/uploads/2015/02/05jl_china.pdf.

[Gunn, 2020] Charles Gunn. Course notes geometric algebra for computer graphics, siggraph 2019. *arXiv preprint arXiv:2002.04509*, 2020. URL: https://arxiv.org/abs/2002.04509.

[Macdonald, 2015] Alan Macdonald. Geometric algebra videos series on youtube. 2015. URL: https://www.youtube.com/playlist?list=PLLvlxwbzkr7igd6bL7959WWE7XInCCevt.

[Macdonald, 2016] Alan Macdonald. Geometric calculus videos series on youtube. 2016. URL: https://www.youtube.com/playlist?list=PLLvlxwbzkr7i6DlChcYEL7nJ8R9ZuV8JA.

[Lasenby et al., 1998] Anthony Lasenby, Chris Doran, and Stephen Gull. Gravity, gauge theories and geometric algebra. *Philosophical Transactions of the Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences*, 356(1737):487–582, 1998. URL: https://arxiv.org/abs/gr-qc/0405033.

[CristinelStoica, 2017] Ovidiu Cristinel Stoica. The standard model algebra-leptons, quarks, and gauge from the complex clifford algebra cl6. *arXiv preprint arXiv:1702.04336*, 2017. URL: https://arxiv.org/abs/1702.04336.

[Hestenes, 1993] David Hestenes. Deconstructing the electron clock. *Physics Letters B*, 318:623–628, 1993. URL: https://www.ime.unicamp.br/~agacse2018/abstracts/InvitedSpeakers/Hestenes-Maxwell-Dirac.pdf.

[Hestenes, 2019a] David Hestenes. Quantum mechanics of the electron particle-clock. *arXiv preprint arXiv:1910.10478*, 2019. URL: https://arxiv.org/abs/1910.10478.

[Hestenes, 2019b] David Hestenes. Zitterbewegung structure in electrons and photons. *arXiv preprint arXiv:1910.11085*, 2019. URL: https://arxiv.org/abs/1910.11085.

[Gresnigt, 2020] Niels G Gresnigt. The standard model particle content with complete gauge symmetries from the minimal ideals of two clifford algebras. *arXiv preprint arXiv:2003.08814*, 2020. URL: https://arxiv.org/abs/2003.08814.