

Review of: "Representation of physical quantities: From scalars, vectors, tensors and spinors to multivectors"

Venkatraman Gopalan¹

¹ Pennsylvania State University

Potential competing interests: No potential competing interests to declare.

This is a very tight overview of geometric algebra. For those who know these concepts, this is a nice place to review. For those who are new, it will need to dig into the references given. Some suggestions for the authors to consider: (1) Since this is about geometric algebra, the article might consider some geometry in the form of figures, in addition to the algebra that is presented. There is plenty of scope to do this since all blades are geometric objects. Pascal's triangle can illustrate all the algebras in every dimension that geometric algebra encompasses. (2) The lines following eq (19) should read (I think) as "...all the n^2 elements $u^i v^j$ of the dyad u (tensor product) v ." (3) The authors have taken the route of introducing tensor products before introducing wedge products and finally the geometric product between vectors in the end. It is certainly coherent. In the end, Eqs (6) and (19) look the same; hence, the geometric product and the diadic product are pulled together briefly. It might be worthwhile to elaborate if they are always the same. (4) If I am given a tensor of any rank, is there a one-to-one correspondence between it and a multivector? Is the reverse true? (5) On page 2, first para, it states that this article is in two parts. It goes on to describe "this part" and omits mentioning what part 2 is about until the very end of the article. Summarizing upfront, as "part 1 will cover X, and part two will elaborate on Y," would be more clear. (6) In addition to the reference given, I found the following references very useful: "A new approach to differential geometry using Clifford's geometric algebra" by John Snugg (Birkhäuser Press), and "Understanding Geometric Algebra for Electromagnetic Theory," by John W. Arthur (IEEE Press Series on Electromagnetic Wave Theory). (7) For an interested reader, the following articles describe that there are only 51 types of multivectors in any dimension using their symmetry transformation properties: <https://scripts.iucr.org/cgi-bin/paper?S205327332000217X> and a comment in <https://scripts.iucr.org/cgi-bin/paper?S2053273323003303>. I look forward to part 2 of this article. Well-done review.