Oral presentation: 151

Consistency of mixed number algebra in some applications

M. L. P Anuruddhika*, M. Doe and N. P. W. B. V. K. Senanayake

Department of Mathematics, Faculty of Science, University of Kelaniya, Sri Lanka
*prasadianuruddhika@email.com

Mixed number is the sum of a scalar and a vector. The operations of addition, multiplication, inverse and etc. are defined in mixed number algebra. Mixed number algebra is consistent with different laws of Physics such as Pauli matrix algebra and Dirac equation but not consistent with quaternion and geometric products. Even though the quaternion and geometric products are not dealing well with differential operators, mixed product is successfully dealing with them. We have derived the displacement operator, the vector differential operator, the angular momentum operator and Klein-Gorden equation in quantum mechanics in terms of mixed numbers. The Maxwell's equation and the Lorentz force clearly expressed using mixed numbers. Length contraction and time dilation of special Lorentz transformation, most general Lorentz transformation and mixed number Lorentz transformation are clearly explained. Formulas of the relativistic aberration, Doppler's effect and the reflection of light ray by a moving mirror are obtained using special Lorenzt transformation, most General Lorenzt transformation, mixed numbers, quaternion and geometric products Lorenzt transformation. Among them, formulas that we derived using mixed numbers are simpler. In our work it has been shown that the calculations using mixed numbers in quantum mechanics and electrodynamics are easier than calculations using quaternion and geometric products. As a conclusion mixed number algebra can be used in different fields of physics and mathematics.

Keywords: Geometric product, Lorentz transformation, mixed number algebra, quaternion product