Should Any 3-Vector Be Considered to Spawn an Infinite Set of Related Vectors?

Kirk T. McDonald
Joseph Henry Laboratories, Princeton University, Princeton, NJ 08544
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1 Problem

In [1] it is implied that any 3-vector $\mathbf{a} = a\,\hat{\mathbf{a}}$ should be considered to generate an infinite set of 3-vectors $\mathbf{A}_{\hat{\mathbf{b}}}$ in arbitrary directions described by unit vectors $\hat{\mathbf{b}}$ according to

$$\mathbf{A}_{\hat{\mathbf{b}}} = A_{\hat{\mathbf{b}}}\,\hat{\mathbf{b}}, \quad \text{where} \quad \mathbf{A}_{\hat{\mathbf{b}}} \cdot \hat{\mathbf{a}} = A_{\hat{\mathbf{b}}}\,\hat{\mathbf{b}} \cdot \hat{\mathbf{a}} = A_{\hat{\mathbf{b}}} \cos(ab) \equiv a, \quad i.e. \quad A_{\hat{\mathbf{b}}} = \frac{a}{\cos(ab)} \geq a. \tag{1}$$

Then, the original vector $\mathbf{a}$ is the vector of minimum magnitude of the set of vectors $\{\mathbf{A}_{\hat{\mathbf{b}}}\}$.

Does this "mathematical" construct make "physical" sense?

2 Solution

NO!

References

[1] J.J. Zhang and P.X. Wang, *Transformation of phase velocity among inertial frames*, Wave Motion **50**, 520 (2013), http://kirkmcd.princeton.edu/examples/GR/zhang_wm_50_520_13.pdf