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Associativity condition for some alternative algebras of degree three. (English summary)

Conference "Applied Differential Geometry: General Relativity"—Workshop "Global Analysis, Differential Geometry, Lie Algebras", 121–130, *BSG Proc.*, 11, *Geom. Balkan Press, Bucharest*, 2004.

Let A be an alternative algebra of degree three over a field F of characteristic not 2 or 3 (A is an alternative algebra and there exist a linear form T, a quadratic form S, and a cubic form N such that A satisfies the generic polynomial relation $X^3-T(X)X^2+S(X)X-N(X)1=0$) and let $A_0=\{x\in A|T(x)=0\}$ be the isotropic subspace of A. The paper studies conditions on A_0 in order to guarantee the associativity of A. The authors split the problem into two cases: If a cubic root of unity w is contained in F, then $a*b:=wab-w^2ba-\frac{2w+1}{3}T(ab)1$ defines a product on A_0 that preserves the composition ($S(a*b)=S(a)*S(b)$), and A is associative if and only if $(a,c,b)^*+(b,a,c)^*=(a,b,c)^*$ for every $a,b,c\in A_0$, where $(a,b,c)^*=(a*b)*c-a*(b*c)$. If w is not contained in F, the result follows via a suitable scalar extension of A.

{For the entire collection see MR2115820 (2005i:53001)}

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