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Generating Geometrical Elements for Any Space-Time DENNIS MARKS, Valdosta State U. — To distinguish time from space, use real Clifford algebras $\mathbf{R}_{n;s}$, where n is the number of dimensions and s is their signature ($s = -n, -n+2, \ldots$, or n). $\mathbf{R}_{n;s}$ is isomorphic to algebras of real, complex, or quaternionic matrices $\mathbf{R}(2^{\frac{n}{2}})$, $\mathbf{C}(2^{\frac{n-1}{2}})$, or $\mathbf{H}(2^{\frac{n-2}{2}})$, or of block diagonal matrices ${}^2\mathbf{R}(2^{\frac{n-1}{2}})$ or ${}^2\mathbf{H}(2^{\frac{n-3}{2}})$, for $|(s+3)_{mod8}$ - $4| = 1, 2, 3, 0$, or 4, respectively. Each of the n basis vectors $\mathbf{e}_\nu$ satisfies $\mathbf{e}_\mu \cdot \mathbf{e}_\nu = \eta_{\mu\nu}\mathbf{I}_{n;s}$, where the $\mathbf{e}_\nu$ are orthogonal $\eta_{\mu\nu} = 0$ for $\mu \neq \nu$ and normalized $\eta_{\mu\nu} = +1$ for p space-like dimensions and $\eta_{\mu\nu} = -1$ for q time-like dimensions) and where $\mathbf{I_{n;s}}$ is the identity matrix whose rank is given by the isomorphisms above. The geometrical elements are the scalar $\mathbf{I_{n;s}}$, basis vectors $\mathbf{e}_\nu$, and their products (bivectors, trivectors, etc.) up to the pseudo-scalar n-volume $\mathbf{J_{n;s}} = \mathbf{e_0}\ \mathbf{e_1} \cdot \cdot \cdot \mathbf{e_{n-1}}$. Now $(\mathbf{J}_{n;s})^2 = (-1)^{\frac{s(s-1)}{2}}\mathbf{I}_{n;s} = \sigma_s\mathbf{I}_{n;s}$. The direct product of $\mathbf{R}_{n;s}$, with n orthonormal basis vectors $\mathbf{e}_\nu$ with signature s, and $\mathbf{R}_{n';s'}$, with n' orthonormal basis vectors $\mathbf{e}_{\nu'}$ with signature s', is $\mathbf{R}_{n+n';s+s'\sigma_s}$, with $n+n'$ orthonormal basis vectors $\mathbf{e}_\nu \otimes \mathbf{I_{n';s'}}, \mathbf{J_{n;s}} \otimes \mathbf{e}_{\nu'}$ with signature $s + s'\sigma_s$, for even positive n. Orthonormal basis vectors for any positive n with any possible signature can be generated from the two orthonormal basis vectors of the Minkowskian plane.

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