The Funayama envelope as the T_D-hull of a frame

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A topological space X is T_D provided each point is locally closed, and a frame L is T_D-spatial provided L is isomorphic to the frame of opens of a T_D-space. While there is no satisfactory pointfree generalization of T_D-spatiality in the language of frames, the richer formalism of MT-algebras does afford such a generalization. Indeed, an MT-algebra M is T_D provided the set of locally closed elements of M join-generates M. By utilizing the Funayama embedding of a frame into a complete Boolean algebra, with each frame L we may associate the MT-algebra $\mathcal{F}(L)$—the Funayama envelope of L—which always satisfies the T_D-separation axiom. We regard $\mathcal{F}(L)$ as the T_D-hull of L, and show that $L \mapsto \mathcal{F}(L)$ extends to an equivalence between the category of frames and frame homomorphisms and the category of T_D-algebras and special morphisms between them that preserve proximity-like structure of MT-algebras. As a consequence, we generalize the T_D-duality of Banaschewski and Pultr to the setting of MT-algebras, yielding a pointfree version of the T_D-coreflection of T_0-spaces.

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