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Simplicity of skew inverse semigroup rings with an application to Steinberg algebras

Given an action α of an inverse semigroup $\mathcal{S}$ on a associative ring $\mathcal{A}$ one may construct its associated skew inverse semigroup ring $\mathcal{A} \rtimes_\alpha \mathcal{S}$. We assume that $\mathcal{A}$ is commutative and we define a certain commutative subring $\mathcal{T}$ of $\mathcal{A} \rtimes_\alpha S$ which coincides with the embedding of $\mathcal{A}$ in $\mathcal{A} \rtimes_\alpha S$ whenever S is unital. Our main result asserts that $\mathcal{A} \rtimes_\alpha S$ is a simple ring if, and only if, $\mathcal{T}$ is a maximal commutative subring of $\mathcal{A} \rtimes_\alpha S$ and $\mathcal{A}$ is $\mathcal{S}$-simple. As an application of our result we present a new proof of the simplicity criterion for a Steinberg algebra $A_R(\mathcal{G})$ associated with a Hausdorff and ample groupoid $\mathcal{G}$.