Dihedral-like constructions of automorphic loops

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Automorphic loops are loops in which all inner mappings are automorphisms. We study a generalization of the dihedral construction for groups. Namely, if $(G, +)$ is an abelian group, $m \geq 1$ and $\alpha \in \mathrm{Aut}(G)$, let $\mathrm{Dih}(m, G, \alpha)$ on $\mathbb{Z}_m \times G$ be defined by

$$(i, u)(j, v) = (i + j,\ ((-1)^j u + v)\alpha^{ij}).$$

The resulting loop is automorphic if and only if $m = 2$ or ($\alpha^2 = 1$ and m is even). The case $m = 2$ was introduced by Kinyon, Kunen, Phillips, and Vojtěchovský. We present several structural results about the automorphic dihedral loops in both cases.