Topological N-groups on the Reals

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Abstract: Let N be a topological nearring and let G be a topological group. Suppose there exists a continuous map from $N \times G$ which sends (n, g) to $ng \in G$ such that $(n_1 + n_2)g = n_1 g + n_2 g$ and $(n_1 n_2)g = n_1(n_2 g)$ for all $n_1, n_2 \in N$ and $g \in G$. Then G, together with this multiplication on the left by elements of N, is referred to as a topological N-group or topological nearmodule. In this paper, N will be a topological nearring whose additive group is a Euclidean N-group and G will be the additive group R of real numbers. Within this class of nearrings, we completely determine those nearrings N for which there exist nontrivial multiplications such that R is a topological N-group and we determine precisely when two of these nearrings are isomorphic.