Vertex in-out-antimagic total labeling of digraphs

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A vertex in-out-antimagic total labeling of a directed graph (digraph) $D = (V, A)$ with n vertices and m arcs is a bijection from the set $V \cup A$ to the set of integers $\{1, 2, \ldots, m+n\}$ such that all n vertex in-weights are pairwise distinct and simultaneously all n vertex out-weights are pairwise distinct, where the vertex in-weight is the sum of the vertex label and the labels of all incoming arcs and the vertex out-weight is the sum of the vertex label and the labels of all outgoing arcs.

In this paper we conjecture that all digraphs allow such labeling and provide a general way how to label dense digraphs and certain sparse digraphs.