Classifications of graphical $m$-semiregular representation of finite groups

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A graph or digraph is called regular if each vertex has the same valency, or, the same out-valency and the same in-valency, respectively. Recently, we extend the classical notion of digraphical and graphical regular representation of a group. A (di)graphical $m$-semiregular representation (respectively, GmSR and DmSR, for short) of a group $G$ is a regular (di)graph whose automorphism group is isomorphic to $G$ and acts semiregularly on the vertex set with $m$ orbits. When $m = 1$, this definition agrees with the classical notion of GRR and DRR. Finite groups admitting a D1SR were classified by Babai in 1980, and the analogue classification of finite groups admitting a G1SR was completed by Godsil in 1981. Pivoting on these two results, we classify finite groups admitting a GmSR or a DmSR (for arbitrary positive integers $m$) and also do some work about bipartite (di)graphs.