On the automorphisms of a family of small $(q, 8)$-graphs

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Abstract

For given integers $k \geq 2$ and $g \geq 3$, the k-regular graphs of girth g are called (k, g)-graphs. In the cage problem one has to construct the smallest possible (k, g)-graph (with respect to the order). The smallest such graphs are called (k, g)-cages.

It is known that the $(q + 1, 8)$-cages, when q is an odd prime power, arise as incidence graphs of generalized quadrangles, thus they are very symmetric in the sense of automorphisms and transitivity.

There were a few attempts to construct small $(q, 8)$-graphs from the $(q + 1, 8)$-cages as induced subgraphs. In this talk, maybe surprisingly, we show that a family of such $(q, 8)$-graphs of order $2q(q^2-1)$ is not so symmetric in comparison with other families. More precisely, we show that their group of automorphisms has precisely 4 orbits on the set of vertices.

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