Huang, Li-Ping; Lv, Benjian; Wang, Kaishun
Automorphisms of Grassmann graphs over a residue class ring. (English)
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Summary: Let $\mathbb{Z}_{p^s}$ be the residue class ring of integers modulo $p^s$, where $p$ is a prime number and $s$ is a positive integer. The Grassmann graph over $\mathbb{Z}_{p^s}$, denoted by $G(n, m, p^s)$, has the vertex set all $m$-subspaces of $\mathbb{Z}_{n}^{m}$ ($n > m \geq 1$), and two vertices are adjacent if and only if their intersection is of dimension $m - 1$. We characterize the automorphisms of $G(n, m, p^s)$ as follows. Let $n \geq 2m \geq 4$ and let $\varphi \in \text{Aut}(G(n, m, p^s))$. Then either $\varphi(X) = XU$ for all $X \in V(G(n, m, p^s))$, or $n = 2m$ and $\varphi(X) = (XU)^\perp$ for all $X \in V(G(2m, m, p^s))$, where $U$ is a fixed invertible matrix and $(XU)^\perp$ is the dual subspace of $XU$. This result also extends W.-L. Chow’s theorem for the geometry of Grassmann space [Ann. Math. (2) 50, 32-67 (1949; Zbl 0040.22901)].

MSC:
05C25 Graphs and abstract algebra (groups, rings, fields, etc.)
14M17 Homogeneous spaces and generalizations

Keywords:
Grassmann graph; residue class ring; Grassmann space; automorphism; maximum clique

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References:

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