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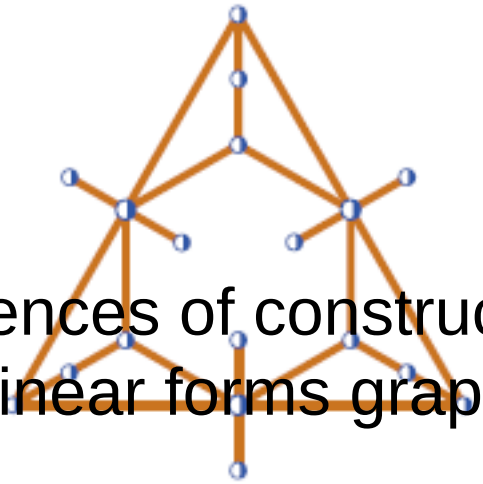

Equivalences of constructions of bilinear forms graphs

Content :

We will show that two constructions of distance-regular graphs with intersection array $ \{7(n-1), 6(n-2), 4(n-4); 1, 6, 28\}, $ both proposed by Muzychuk, give graphs isomorphic to the bilinear forms graphs $H_2(r, 3)$. Both constructions build the graph upon a Fano plane. The first construction comes from a Cayley graph generated by the points of a Fano subplane of a larger projective plane (which exists only in the case of the underlying field being a binary extension). The second construction is a generalization of the first one, but it can also be thought of as a generalization of Latin squares into cubes, as the points of the Fano plane now correspond to equivalence relations on the vertex set of the graph, some of which are defined with Latin square (quasigroup) operations. We show that these operations can be defined in terms of an Abelian group, from which the equivalence with the first construction follows.

We also generalize both constructions by replacing the Fano plane with an arbitrary projective space, again resulting in bilinear forms graphs only. In particular, no graphs can be obtained with the second construction using non-Desarguesian projective planes as long as the conjecture that any finite non-Desarguesian projective plane contains a Desarguesian projective subplane holds.

This is a joint work with A. Juri\v{s}i\'{c} and M. Muzychuk.

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