Summary: We study functional graphs generated by quadratic polynomials over prime fields. We introduce efficient algorithms for methodical computations and provide the values of various direct and cumulative statistical parameters of interest. These include: the number of connected functional graphs, the number of graphs having a maximal cycle, the number of cycles of fixed size, the number of components of fixed size, as well as the shape of trees extracted from functional graphs. We particularly focus on connected functional graphs, that is, the graphs that contain only one component (and thus only one cycle). Based on the results of our computations, we formulate several conjectures highlighting the similarities and differences between these functional graphs and random mappings.

MSC:
05C20 Directed graphs (digraphs), tournaments
05C85 Graph algorithms (graph-theoretic aspects)
05C31 Graph polynomials
11T24 Other character sums and Gauss sums

Keywords:
polynomial maps; functional graphs; finite fields; random maps; algorithms

Software:
NTL; PARI/GP

Full Text: DOI arXiv

References:

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