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Metody kombinatoryczne w teorii punktów stałych

Abstract

The thesis is devoted to applications of combinatorial methods in the fixed point theory. We present a new approach selected classical results from combinatorics and topology, e.g., the Sperner Lemma, the Steinhaus chessboard theorem, the Borsuk–Ulam theorem, the Ky Fan lemma and the Poincaré–Miranda theorem, and provide algorithmic proofs of combinatorial counterparts of these results.

Techniques from the graph theory and combinatorics allows us to prove some of the above theorems in wider classes of spaces. To this end, we introduce new types of polyhedrons: n-essential and n-Borsuk–Ulam polyhedrons, and give examples of these objects. We show the procedure of finding the chain connecting the opposite edges of the cube and constructions of maximal chains for the n-essential and n-Borsuk–Ulam complexes.

The main results of the thesis generalize the Steinhaus multilabeled chessboard theorem on the cube I^n and the Poincaré–Miranda theorem to the class of n-essential polyhedrons, and the Borsuk-Ulam theorem to the class of n-Borsuk–Ulam polyhedrons. Moreover, we prove existance of an odd number of proper simplexes for the class of n-essential complexes and for the class of n-Borsuk–Ulam complexes.