Algebraic structure of combinatorial objects
(Description for the general public)

The proposed project belongs to the area of algebraic combinatorics. This is a discipline in mathematics investigating various finite structures using algebraic methods. We plan to investigate algebraic structure of various combinatorial objects with special emphasis on the structures that reflect kinds of the symmetry of objects. In particular, this includes the automorphism groups of graphs and the symmetry groups of boolean functions.

All the three objectives are connected with well-known general problems in algebraic combinatorics that for a long time resist attempts of many researchers to solve them. While all these problems are apparently hard, nevertheless, there is slow, but steady progress in each of them. More importantly, the research in the area is still going on, and new researchers still join it.

Methods and techniques used are typical for mathematical research. In this case, we make use of knowledge and methods worked out in the theory of permutation groups. In particular, we apply constantly the classification of simple finite groups and classification of primitive groups. In case it is justified, we combine our theoretical studies with the support of computer technology.

Research in this area is theoretical and fundamental. Similar studies are conducted in various research centers around the world. We expect that our results will make a significant contribution to the development of permutation groups theory and its applications.