

ABSTRACT

This thesis is dedicated to Young tableaux, representations of symmetric groups and decompositions of tensor spaces. The first part of this thesis is dedicated to the theory of representations of finite groups. Complete theory of Young tableaux including proofs is also elaborated. This theory is elaborated over a field of complex numbers.

In the next chapter the problem of projections of tensor spaces is solved. Some of these projections we can obtain by help of Young tableaux. However projections over a field of real numbers are solved here. New results are stated in sections 3.3 and 3.4. In the section 3.3 projections of tensors of type $(1, k)$, which have symmetries and antisymmetries given by fixed Young diagram, are given. The method of computation of these projections is also developed. I want to use this method to compute all projections of tensors of type $(1, 3)$ over the field of complex numbers. The section 3.4 is dedicated to projections of tensors which are symmetric in superscripts and subscripts or antisymmetric in superscripts and subscripts.

Next chapter is dedicated to trace decompositions of tensors. The first section of this chapter deal trace decomposition of tensors and two proofs of the trace decomposition theorem are given. The section 4.2 is dedicated to F -decompositions of tensors. Own results are examples of that decompositions. Next results, which are not included here, was published in [9]. The theorem in the section 4.3 gives quaternionic trace decomposition of tensors. The proof of this theorem is own result.

Publications:

L. Lakomá, J. Mikeš, *On the Special Trace Decomposition Problem on Quaternionic Structure*, Proc. of the Third Internat. Workshop on Diff. Geom. and its Appl.; The First German-Romanian Seminar on Geom., Sibiu, Romania, Sept. 1997, 225-229.

I independently elaborated the proof of the quaternionic decomposition theorem in this paper.

L. Lakomá, J. Mikeš, L. Mikušová, *Decomposition of Tensor Spaces*, Proc. of conf., Brno, Czech Republic, Aug. 1998.

I computed exams of F -trace decomposition in this paper.

L. Lakomá, *Projections of Tensor Spaces*, Acta UPOL, 1999, to appear.