Sabbatical leave report

Jürgen Bierbrauer
Department of Mathematical Sciences
Michigan Technological University
HOUGHTON, MI 49931

January 19, 2006

This is a report on the results obtained during my Sabbatical leave in the Fall semester of 2005 at the University of Salzburg.

The main results concern bounds on ordered orthogonal arrays (OOA) and tms-nets. Virtually all bounds on error-correcting codes and orthogonal arrays are consequences of the classical linear programming (LP) bound. In my new paper **A direct approach to linear programming bounds** I give a simplified approach to this bound which enables me to generalize it to cover OOA, ordered designs and tms-nets. The main consequences are the following:

- Description of a new class of orthogonal polynomials generalizing the classical Kravchouk-polynomials and their main properties. The LP-bound is expressed in terms of those polynomials.
- Elementary proofs of some classical known bounds: the generalized Plotkin bound and the generalized Rao bound.
- Description of a Lloyd polynomial which in the future should make it possible to attack **perfect** ordered codes.
- A new bound, the **quadratic bound,** which excludes certain net parameters and improves on the corresponding entries of the MinT data base.

The paper was completed only recently and has been submitted for publication in **Designs, Codes and Cryptography.** I include a copy.