

The 42nd KNU-PNU-POSTECH Combinatorics Seminar

Organized by M.Hirasaka, T. Jensen, J.Koolen and M. Siggers

November 6, 2010

Date

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Place

Mathematics Science Building Room 402, POSTECH

Program

11:00–11:50, Heesung Shin (POSTECH)

Certain expansion of Eulerian polynomials via continued fractions

12:00–13.45, Lunch break

13:50–14:40, Andreas Holmsen (KAIST)

Partitions of point sets in Euclidean space

14:50–15:40, Kijung Kim (POSTECH)

Terwilliger algebras of direct and wreath products of association schemes

16:00–16:50, Sangwook Kim (KAIST)

Flag enumerations of matroid base polytopes

17:00–17:50, Mitsugu Hirasaka (PNU)

Coherent configurations over two copies of association schemes of prime order.

Available Devices for Presentation

We encourage speakers to give a classical styled talk with chalk and blackboard. However, one beam projector is equipped at the room.

Speaker: Heesung Shin (POSTECH)

Title: Certain expansion of Eulerian polynomials via continued fractions

Abstract: This talk is motivated by a conjecture of Brändén (European J. Combin. **29** (2008), no. 2, 514–531) about the divisibility of the coefficients in an expansion of generalized Eulerian polynomials, which implies the symmetric and unimodal property of the Eulerian numbers. We show that such a formula and the inherent conjecture can be derived from the continued fraction expansion of the ordinary generating function of Eulerian polynomials and the Flajolet-Viennot combinatorial theory of continued fractions. We also discuss an analogous expansion for the corresponding formula for derangements and prove a (p, q) -analogue of the fact that the (-1) -evaluation of the enumerator polynomials of permutations (resp. derangements) by the number of excedances gives rise to tangent numbers (resp. secant numbers). The (p, q) -analogue unifies and generalizes our recent results (European J. Combin. **31** (2010), no. 7, 1689–1705.) and that of Josuat-Vergès (European J. Combin. **31** (2010), no. 7, 1892–1906).

Speaker: Andreas Holmsen (KAIST)

Title: Partitions of point sets in Euclidean space

Abstract: Tverberg's theorem from 1966 states that any set of $(n + 1)(k - 1) + 1$ points in \mathbf{R}^n can be partitioned into k non-empty sets whose convex hulls have non-empty intersection. This classical result has many extensions, and in this talk I will present various results and conjectures concerning convexity and partitions of finite point sets in \mathbf{R}^n .

Speaker: Kijung Kim (POSTECH)

Title: Terwilliger algebras of direct and wreath products of association schemes

Abstract: We will consider structures of Terwilliger algebras of direct and wreath products of association schemes. In general, it is difficult to determine the structure of the Terwilliger algebras although they are known to be semisimple \mathbb{C} -algebras. But, we get the structure of Terwilliger algebras of these cases under some assumptions. This is joint work with Akihide Hanaki and Yu Maekawa.

Speaker: Sangwook Kim (KAIST)

Title: Flag enumerations of matroid base polytopes

Abstract: For a matroid on $[n]$, a matroid base polytope is the polytope in \mathbb{R}^n whose vertices are the incidence vectors of the bases of the matroid.

The cd-index is a polynomial in noncommutative variables c and d which compactly encodes the flag information of polytopes. In this talk, we study the cd-index when a polytope is split by a hyperplane and give the cd-index of matroid base polytopes for rank 2 matroids.

Speaker: Mitsugu Hirasaka (PNU)

Title: Coherent configurations over two copies of association schemes of prime order.

Abstract: One of the theorems by Burnside states that each transitive permutation group of prime degree is doubly-transitive or Frobenius. In this talk we consider a combinatorial analogue of this statement and give some sufficient conditions for a coherent configuration over two copies of association schemes of prime order to be uniquely determined.