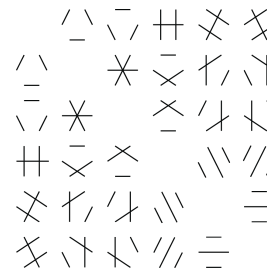# Mathematics Seminar

Rocky Mountain Algebraic Combinatorics Seminar

Polynomial-time isomorphism tests for groups of most finite orders

James B. Wilson
Colorado State University

Using statistics of prime factorizations of integers and structures of finite groups we demonstrate that the complexity of group isomorphism is polynomial time for almost all orders of groups. Reports on joint work with H. Dietrich, Monash University.

The Clebsch Map from a Combinatorial Perspective

Anton Betten
Colorado State University

Cubic surfaces with 27 lines are all birational. What this means is that we can always find a polynomial map which takes one surface to another. This key observation was made by Alfred Clebsch (1833 – 1872) in the mid 18hundereds. The map that Clebsch found takes a cubic surface and maps it to a projective plane. Six lines on the surface are special. They collapse to points under this map. Knowing the configuration of these six points is equivalent to knowing the surface up to projective equivalence. Clebsch may have taken his motivation from earlier work of Chasles (1793 – 1880), who considered a similar map from the hyperboloid to the plane. Today, anybody can create these polynomial maps with a few lines of Maple code, for instance (Noam Elkies has an example on his website, for instance).

In the talk, we will consider cubic surfaces over a finite field (those fields did not really exist at the time of Clebsch and Chasles, hence were not considered in their work). We are interested in classifying cubic surfaces with 27 lines over $\mathbb{F}_q$ up to projective equivalence. A closer look at the Clebsch map leads to a classification algorithm. As a by-product, a counting formula can be derived which counts the number of distinct cubic surfaces with 27 lines in $PG(3, q)$.

This is joint work with Fatma Karaoglu from the University of Sussex in the UK.

Weber 223
4–6 pm
Friday, February 2, 2018
(Refreshments in Weber 117, 3:30–4 pm)
Colorado State University

This is a joint Denver U / UC Boulder / UC Denver / U of Wyoming / CSU seminar that meets biweekly.
Anyone interested is welcome to join us at a local restaurant for dinner after the talks.

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