



PURDUE UNIVERSITY

Department of Mathematics Colloquium

Speaker: Professor Scott Baldridge, LSU
Title: "Cube Knots and Knot Floer Homology from Cube Diagrams"
Date: Tuesday, March 10, 2009
Time: 4:30 P.M.
Place: MATH 175

Abstract

Abstract: In this talk we will introduce the notion of a cube diagram—a surprisingly subtle, extremely powerful new way to represent a knot or link. In 1926, Reidemeister showed that two knots are isotopic if a 2-dimensional knot projection of one could be transformed via knot projections into a 2-dimensional knot projection of the other by using a series 3 moves (the Reidemeister moves). Since then, Reidemeister's theorem has been used to define and prove the existence of many knot invariants. On the other hand, simple, easy-to-check 3-dimensional versions of Reidemeister's theorem (like triangle moves) are generally ineffective for defining and proving knot invariants: such moves are simply too flexible and/or uncontrollable to be able to check whether a quantity is a knot invariant or not.

Cube diagrams are our attempt to "split the difference" between the flexibility of isotopy in \mathbb{R}^3 and specific, controllable moves in a knot projection. The main goal in defining cube diagrams was to develop a data structure that describes an embedding of a knot in \mathbb{R}^3 such that (1) every link is represented by a cube diagram, (2) the data structure is rigid enough to easily define invariants, yet (3) a limited number of 5 moves are all that are necessary to transform one cube diagram of a link into any other cube diagram of the same link.

As an example of the usefulness of cube diagrams we present a homology theory constructed from cube diagrams and show that it is equivalent to knot Floer homology, one of the most powerful known knot invariants.

Note: This talk should be accessible to graduate students and hopefully be of interest to a wide range of mathematicians.

Refreshments will be served in the Math Library Lounge, 4:00 P.M.

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