Discrete Mathematics Seminar

Time: Friday, 25 April 2014, 1:00 – 2:00 PM
Location: 238 Derrick Hall
Title: An improved upper bound for the bondage number of graphs on surfaces
Speaker: Dr. Jia Huang, School of Mathematics, University of Minnesota

Abstract:

The bondage number $b(G)$ of a graph G is the smallest number of edges whose removal from G results in a graph with larger domination number. Recently Gagarin and Zverovich showed that, for a graph G with maximum degree $\Delta(G)$ and embeddable on an orientable surface of genus h and a non-orientable surface of genus k, $b(G) \leq \min\{\Delta(G) + h + 2, \Delta + k + 1\}$. They also gave examples showing that adjustments of their proofs implicitly provide better results for larger values of h and k. In this paper we establish an improved explicit upper bound for $b(G)$, using the Euler characteristic χ instead of the genera h and k, with the relations $\chi = 2 - 2h$ and $\chi = 2 - k$. We show that $b(G) \leq \Delta(G) + \lfloor r \rfloor$ for the case $\chi \leq 0$ (i.e. $h \geq 1$ or $k \geq 2$), where r is the largest real root of the cubic equation $z^3 + 2z^2 + (6\chi - 7)z + 18\chi - 24 = 0$. Our proof is based on the technique developed by Carlson-Develin and Gagarin-Zverovich, and includes some elementary calculus as a new ingredient. We also find an asymptotically equivalent result $b(G) \leq \Delta(G) + \lceil \sqrt{12 - 6\chi} - 1/2 \rceil$ for $\chi \leq 0$, and a further improvement for graphs with large girth.

Bio:

Jia Huang received his Ph.D. from the University of Minnesota in 2013. His dissertation was on combinatorial representation theory. He is currently a Postdoctoral Associate at the University of Minnesota. He has wide interests in algebra and discrete mathematics. He has done research work in algebraic combinatorics, modular invariant theory, and graph theory. He will be an Assistant Professor of Mathematics at the University of Nebraska – Kearney.