Abstracts

WVU-China Workshop on Graph Theory and Combinatorics

September 14, 2017

- **9:00-9:50**

Conflict-free connections of graphs

Xueliang Li

Nankai University

An edge-colored graph G is *conflict-free connected* if, between each pair of distinct vertices of G, there exists a path in G containing a color used on exactly one of its edges. The *conflict-free connection number* of a connected graph G, denoted by $cfc(G)$, is defined as the smallest number of colors that are needed in order to make G conflict-free connected. These concepts are comparatively new and have some potential use in connection with frequency assignment problems for cellular networks. This talk aims to give a survey of the known results in this subject.

- **10:00-10:50**

First-Fit chain partitions in partially ordered sets

Kevin Milans

West Virginia University

Dilworth's theorem states that for each poset P, the minimum size of a partition of the points of P into chains equals the width of P. The First-Fit algorithm is a simple, greedy method for partitioning the points of a poset P into chains. Let $x_1, \ldots, x_n$ be the points of P. After processing x_1 through x_i, First-Fit assigns x_{i+1} to the first chain in which x_i fits. Even when P has width 2, First-Fit may use arbitrarily many chains. However, if P does not contain certain other posets, then it can be shown that the number of chains used by First-Fit is bounded by a function of w. Given a poset Q, let $\mathrm{FF}_Q(w)$ be the maximum, over all posets P of width w that do not contain Q, of the number of chains used by First-Fit on P in the worst case. Bosek, Krawczyk, and Matecki proved that $\mathrm{FF}_Q(w)$ is finite if and only if Q has width 2. It would be nice to have a characterization of the posets Q for which $\mathrm{FF}_Q(w)$ is bounded by a polynomial in w. We present some recent progress toward this goal. This is joint work with Michael Wigal.

- **11:00-11:50**

Splitting graphs and digraphs

Guanghui Wang

Shandong University

Splitting graphs under degree constraint, connectivity constraint have received much attention. We will introduce some results about splitting digraphs and edge-colored graphs.

- **12:00 pm -1:30 pm, Lunch Break**

- **1:30-2:20**

Polychromatic colorings of complete graphs with respect to 1-regular and 2-regular subgraphs

John Goldwasser

West Virginia University

If G is a graph and H is a set of subgraphs of G, then an edge coloring of G is called H-polychromatic if every graph from H gets all colors present in G. The H-polychromatic number of G is the largest number of colors such that G has an H-polychromatic coloring. We determine precisely the H-polychromatic number of G when G is a complete graph on n vertices and H is the family of all matchings spanning $n-$p vertices of G (p fixed), when H is the family of all $(n-p)$-cycles, and when H is the family of all 2-regular subgraphs of G spanning at least $n-p$ vertices.

This is joint work with Ryan Hansen, Maria Axenovich, Bernard Lidicky, Ryan Martin, David Offner, John Talbot and Michael Young.

- **2:30-3:20**

Adding To and Removing From the Structure of Graph Decompositions

Mike Schroeder

Marshall University

Can the complete graph be decomposed into Hamilton cycles? The complete graph minus a one-factor? Multipartite graphs? Can these graphs be decomposed into cycles of an arbitrary length, or paths of an arbitrary length? Each of these questions have been answered, and often their solutions have some amount of structure to them.

In recent years, work has been done to find graph decompositions which either have more structure –like invariance of the parts under certain actions on the graph, or less structure–like not containing the decomposition of an induced subgraph. In this talk, we will discuss some of the classical decompositions and the existence of those which have either more structure or less structure.

- **3:30-4:20**

General Matroids and the Almost Intersection Property

Jerzy Wojciechowski

West Virginia University

he Matroid Intersection Conjecture was formulated by Nash-Williams for pairs of finitary matroids on the same set. It originates from Knig's Theorem saying that in a finite bipartite graph the minimal size of a vertex cover is equal to the maximal size of an independent set of edges. Knig's Theorem has been generalized by Aharoni to arbitrary bipartite graphs and by Edmonds to pairs of finite matroids on the same set. Establishing the conjecture of Nash-Williams would generalize both those theorems.

We introduce the Almost Intersection Property for pairs of general matroids on the same ground set. We prove that if such a pair satisfies the Almost Intersection Property then it satisfies the Matroid Intersection Conjecture of Nash-Williams. We also present some corollaries of that result.

This is joint work with Nathan Bowler, Johannes Carmesin and Shadisadat Ghaderi.

- **4:30-5:20**

Nowhere-zero Flow Problems

Jiaao Li

West Virginia University

Bill Tutte initiated the study of nowhere-zero flow in 1950s as a generalization of map-colouring problems, and he proposed some intriguing flow conjectures which are still some of the major open problems in graph theory. Extending Tutte's flow conjectures, Jaeger(1981) conjectured every $4p$-edge-connected graph admits a $(2+1/p)$-flow, known as the circular flow conjecture. The cases $p = 1, 2$ imply Tutte's 3-flow conjecture and 5-flow conjecture, respectively. In this talk, we will introduce some recent results on Tutte's flow conjectures and related topics including circular flow, modulo orientation and group connectivity of graphs. Some nice positive results on Tutte and Jaeger's conjectures are obtained recently by Thomassen(JCTB 2012) and Lovasz et al.(JCTB 2013). Nevertheless, we disprove Jaeger's circular flow conjecture for $p \geq 3$. Some more positive results on Tutte's flow conjectures are also obtained.