The Structure of Graphs Without Even Holes or Odd Pans

Kathie Cameron, Wilfrid Laurier University, Canada, *kcameron@wlu.ca*
Steven Chaplick, Technische Universität Berlin, Germany, *chaplick@math.tu-berlin.de*
Chính T. Hòang, Wilfrid Laurier University, Canada, *chinhthoang@gmail.com*

A hole is an induced cycle with at least four vertices. A pan is a hole with a pendant edge. Pan-free graphs generalize claw-free graphs which generalize line-graphs, and thus independent sets in pan-free graphs generalize matchings and colourings of pan-free graphs generalize edge-colourings. Minty's (1980) polytime algorithm for maximum weight independent set in claw-free graphs led to much research on claw-free graphs, including the generalization of it by Brandstadt, Lozin and Mosca (2010) to pan-free graphs. We show that pan-free even-hole-free graphs can be decomposed by clique-cutsets into joins of cliques and specially-structured unit circular-arc graphs. Finding a minimum colouring of pan-free graphs is NP-hard and the complexity of colouring even-hole-free graphs is unknown. Our structure theorem is the basis of our $O(nm)$ certifying algorithm for recognizing pan-free even-hole-free graphs and for our $O(n^3)$ algorithm for colouring them.