

# GEOMETRY–TOPOLOGY SEMINAR

**Louis Theran**

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will speak on

## **Parallel redrawing, rigidity, and slider-pinning**

ABSTRACT: A planar direction network is a simple graph  $G$  with a specified direction  $d_{ij}$  in  $\mathbb{R}^2$  for each edge  $ij$ . The realization problem for direction networks asks for a point set  $(p_i)$  such that  $p_i - p_j = \alpha_{ij}d_{ij}$  for each edge  $ij$  and some non-zero scalar  $\alpha_{ij}$ . Whiteley’s parallel redrawing theorem, a consequence of Laman’s theorem on the rigidity of bar-joint frameworks, says that a generic direction network is realizable with no-zero length edges if and only if the underlying graph  $G$  satisfies Laman’s hereditary counting condition.

We give a short, direct proof of Whiteley’s parallel redrawing theorem. As a consequence we obtain Laman’s theorem. Along the way, we give a more geometric characterization of generic point sets for Laman rigidity and a new explanation Tay’s so-called “combing” proof of Laman’s theorem. A similar argument extends to our own slider-pinning rigidity model.

Joint work with Ileana Streinu.

TUESDAY, 23 MARCH 2010  
LECTURE AT 3:30 PM  
ROOM 617, WACHMAN BUILDING  
DEPARTMENT OF MATHEMATICS