Visualizing the Internal Structure of SAT Instances

Examples of Structured Instances

Software Verification (Alloy)  Planning (hanoi4)  Hardware Verification (IBM BMC)  Product Configuration (Mercedes C-Class)

Easy vs. Hard: Comparison of DPLL Dynamics

Compare graphs before/after 3 recursive calls (case splits) of DPLL algorithm.

Observations:
- Easy problems: decompos., considerable simplification
- Hard problems: no decompos. “self-similarity”

How to Make Use of Problem Structure?

- Try to partition the problem recursively (balanced MIN-CUT)
- Treat long implication chains especially (“chains” of 2-clauses)
- Use problem specific literal selection strategies (e.g.: select consecutive split variables from same connected component)

Invent new ideas inspired by graphical visualization!

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