Fast 2D-Packing
An Introduction

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Well-Defined Problem

- Optimization problem
- Many forms of packing
- Rectangle, squares, circles, 2D, 3D...
More Examples
Many Areas of Application

- VLSI
- Lumber processing
- Glass cutting
- Sheet metal cutting
- Newspaper typesetting
- Web page design
Hard Problem

- 2D Orthogonal Packing of Rectangles
- No rotation of rectangles
- Shown to be NP Hard in 1979

• **Heuristic** ([Greek](http://en.wikipedia.org/wiki/Greek): "Εὑρίσκω", "find" or "discover") refers to experience-based techniques for problem solving, learning, and discovery that give a solution which is not guaranteed to be optimal. Where the exhaustive search is impractical, heuristic methods are used to speed up the process of finding a satisfactory solution via mental shortcuts to ease the cognitive load of making a decision.

Most Heuristics
Most Heuristics
Most Heuristics
Most Heuristics
Most Heuristics
Time Consuming Heuristics

- Every new addition of a rectangle adds two new empty rectangles to data structure
- Every new addition intersects with possibly several empty rectangles
New Heuristic

Line
New Heuristic
New Heuristic
New Heuristic

Segment
Rule

- You can only add a new rectangle (pack it) if it cuts segments fully.
New Heuristic
New Heuristic
New Heuristic

Diagram of new heuristic process.
New Heuristic
New Heuristic
New Heuristic
Homework 2 Properties

• Rectangles sorted by area
• Greedy algorithm
• Top to bottom, left to right