Using JAVA Applets to Teach Linear Programming

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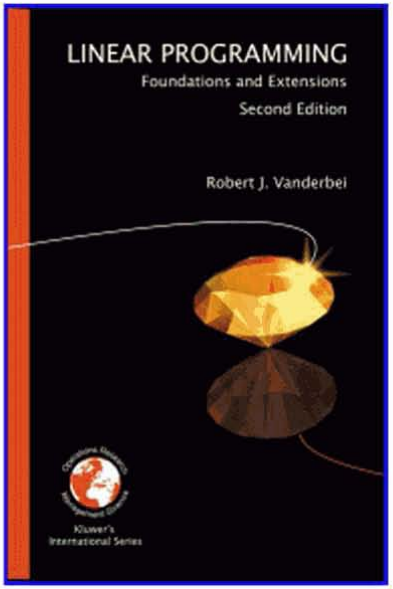
http://www.princeton.edu/∼rvdb

Linear Programming: Foundations and Extensions



- Order
- Table of Contents
- Lecture Notes-Undergraduate level (pdf format)
- Lecture Notes-Graduate level (pdf format)
- Online version of 2nd Edition (note that the hyperlinks in the text really work)
- Associated software (C/C++ source code)
- Additional Exercises
- Online Exercises
- Errata
- Simple pivot tool (a java applet to help solve exercises from Chapters 1 to 5)
- Advanced pivot tool (a java applet to help solve exercises from Chapters 5 to 7)
- Online pivot exam (a java applet to evaluate your knowledge of the simplex method)
- The Network-Simplex Pivot Tool

The Primal Simplex Method

$$\begin{array}{lrcl} \text{maximize} & c^T x & & \\ \text{subject to} & Ax & \leq & b \\ & x & \geq & 0. \end{array}$$

Rewrite with slack variables

$$\begin{array}{lrcl} \text{maximize} & \xi & = & c^T x \\ \text{subject to} & w & = & b - Ax \\ & & & x, w \geq 0 \quad . \end{array}$$

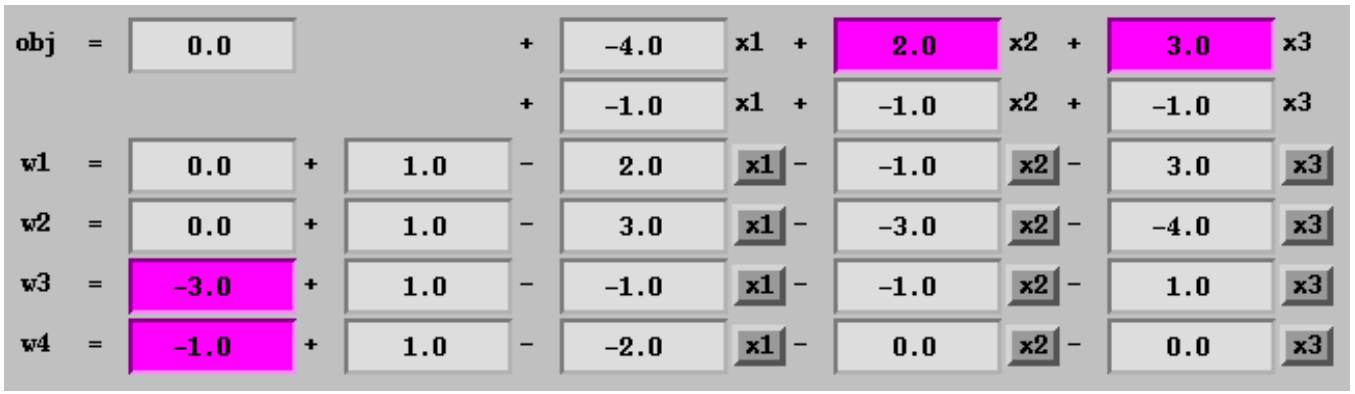
Solve with Pivot Tool

Current Dictionary

obj	=	0.0	+	-1.0	x1	+	3.0	x2	+	-3.0	x3
w1	=	7.0	-	3.0	x1	-	-1.0	x2	-	-2.0	x3
w2	=	3.0	-	-2.0	x1	-	-4.0	x2	-	4.0	x3
w3	=	4.0	-	1.0	x1	-	0.0	x2	-	-2.0	x3
w4	=	8.0	-	-2.0	x1	-	2.0	x2	-	1.0	x3
w5	=	5.0	-	3.0	x1	-	0.0	x2	-	0.0	x3

Two-Phase Methods: Advanced Applet

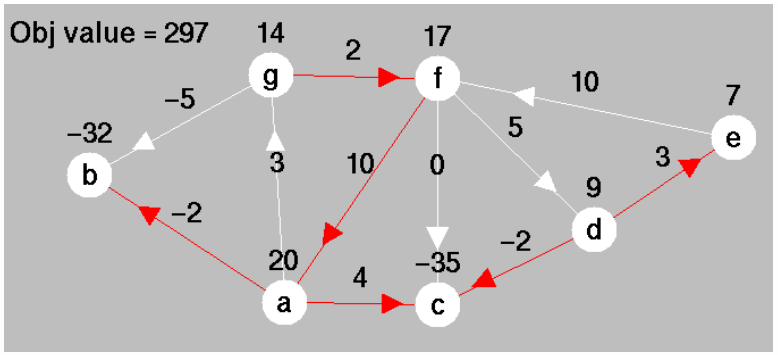
An Example:

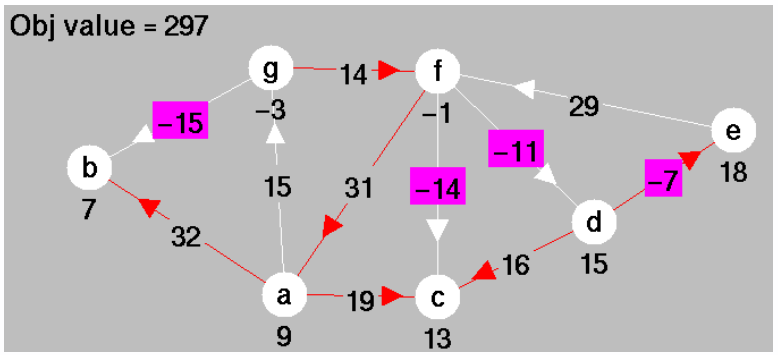


Notes:

- Two objective functions: the true objective (on top), and a fake one (below it).
- For *Phase I*, use the fake objective—it's dual feasible.
- Two right-hand sides: the real one (on the left) and a fake (on the right).
- Ignore the fake right-hand side—we'll use it in another algorithm later.

Network Simplex Tool





Data:

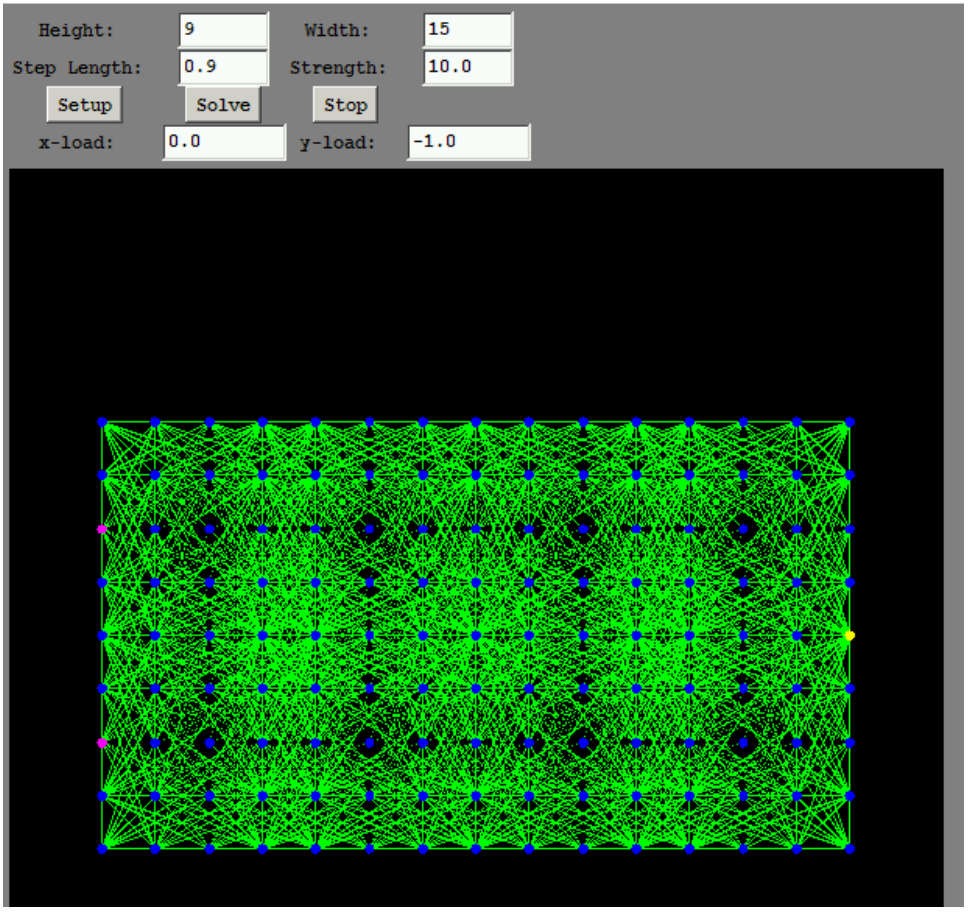
- *Costs* on arcs shown above arcs.
- *Supplies* at nodes shown above nodes.

Variables:

- *Primal flows* shown on tree arcs.
- *Dual slacks* shown on non-tree arcs.
- *Dual variables* shown below nodes.

Interior-Point Methods

Best illustrated on large-scale problems.



Click here to compare with the simplex method

Forthcoming Stuff

- *Integer Programming* (thanks to Hande Benson and her student).