Optimization

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opt-2005feb17.tex typeset 2005 February 17 10:09 in pdfLaTeX on a linux system

Optimization

★

minimize *cost*
subject to *constraints*

★ 2 types of optimization problem:

- *easy*
- *hard*

Diet

	cost	Cal	Carbo	Protein	A	C	Ca	Fe
Quarter Pounder	1.84	510	34	28	15	6	30	20
McLean Deluxe	2.19	370	35	24	15	10	20	20
Big Mac	1.84	500	42	25	6	2	25	20
Filet-o-Fish	1.44	370	38	14	2	0	15	10
McGrilled Chicken	2.29	400	42	31	8	15	15	8
Fries, small	0.77	220	26	3	0	15	0	2
Sausage McMuffin	1.29	345	27	15	4	0	20	15
1% Lowfat Milk	0.60	110	12	9	10	4	30	0
Orange Juice	0.72	80	20	1	2	120	2	2

	min	max
Cal	2000	∞
Carbo	350	375
Protein	55	∞
A	100	∞
C	100	∞
Ca	100	∞
Fe	100	∞

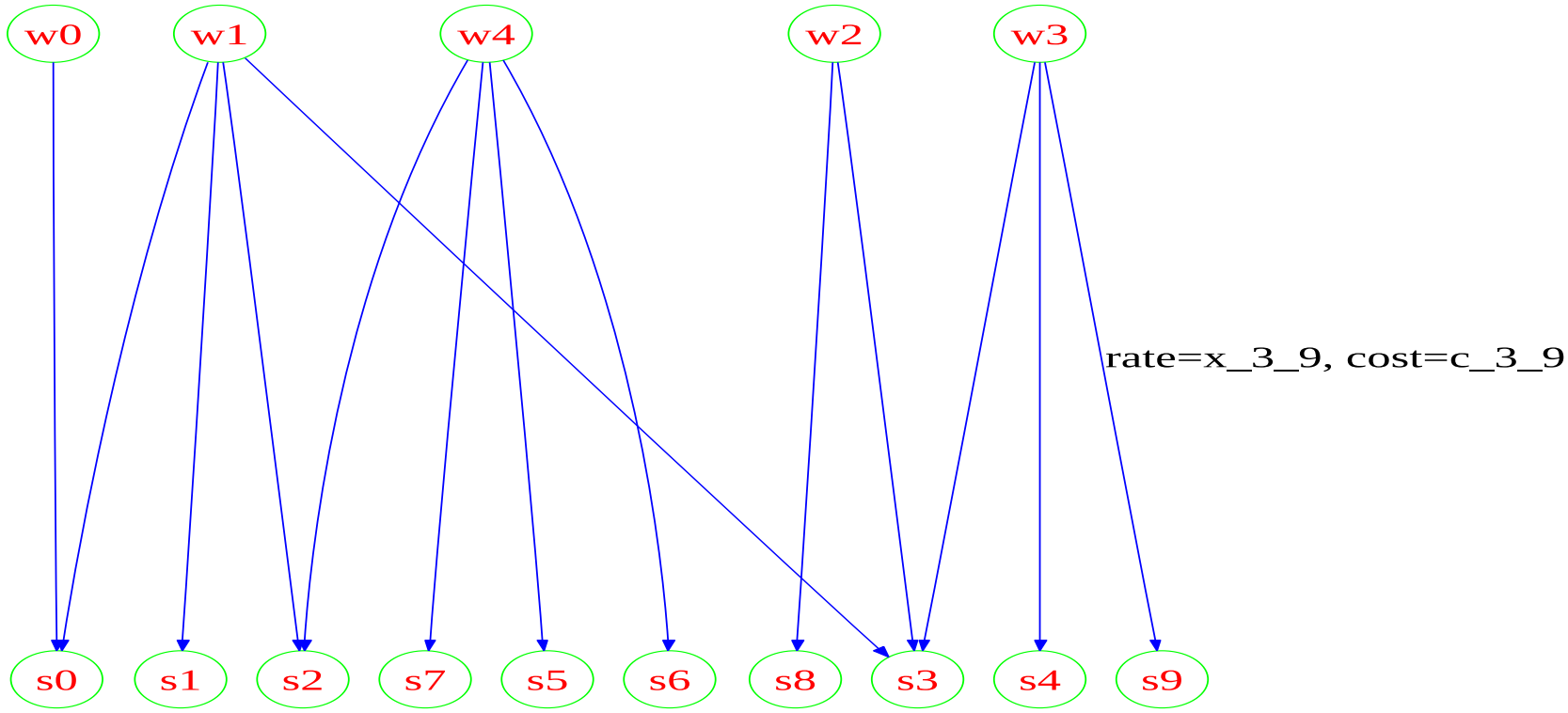
minimize *cost of food*

subject to *nutrients within bounds*

Linear programming

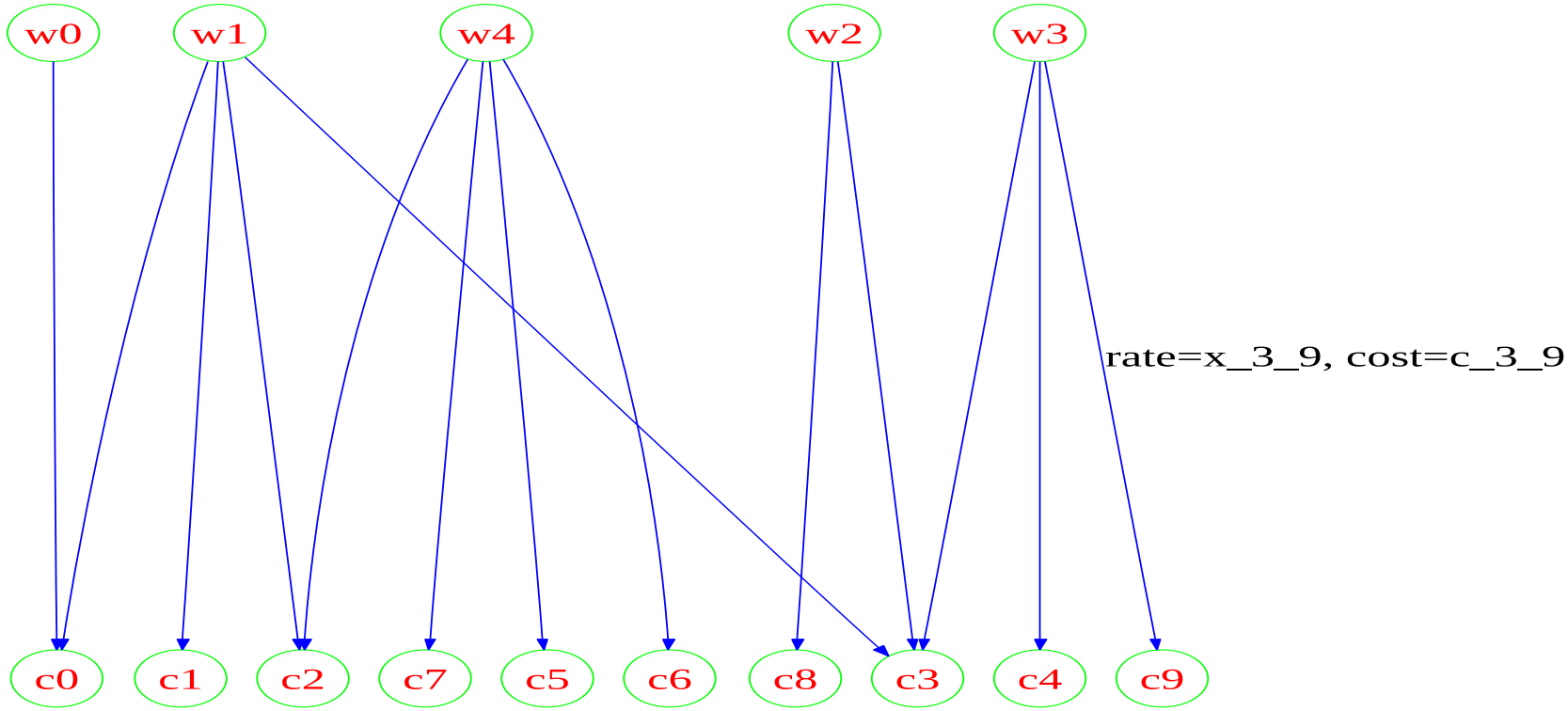
$$
\begin{aligned}
\text{minimize} \quad & c_1 x_1 + c_2 x_2 + \dots \\
\text{subject to} \quad & a_{11} x_1 + a_{12} x_2 + \cdots < b_1 \\
& a_{21} x_1 + a_{22} x_2 + \cdots < b_2 \\
& a_{31} x_1 + a_{32} x_2 + \cdots < b_3
\end{aligned}
$$

Tesco



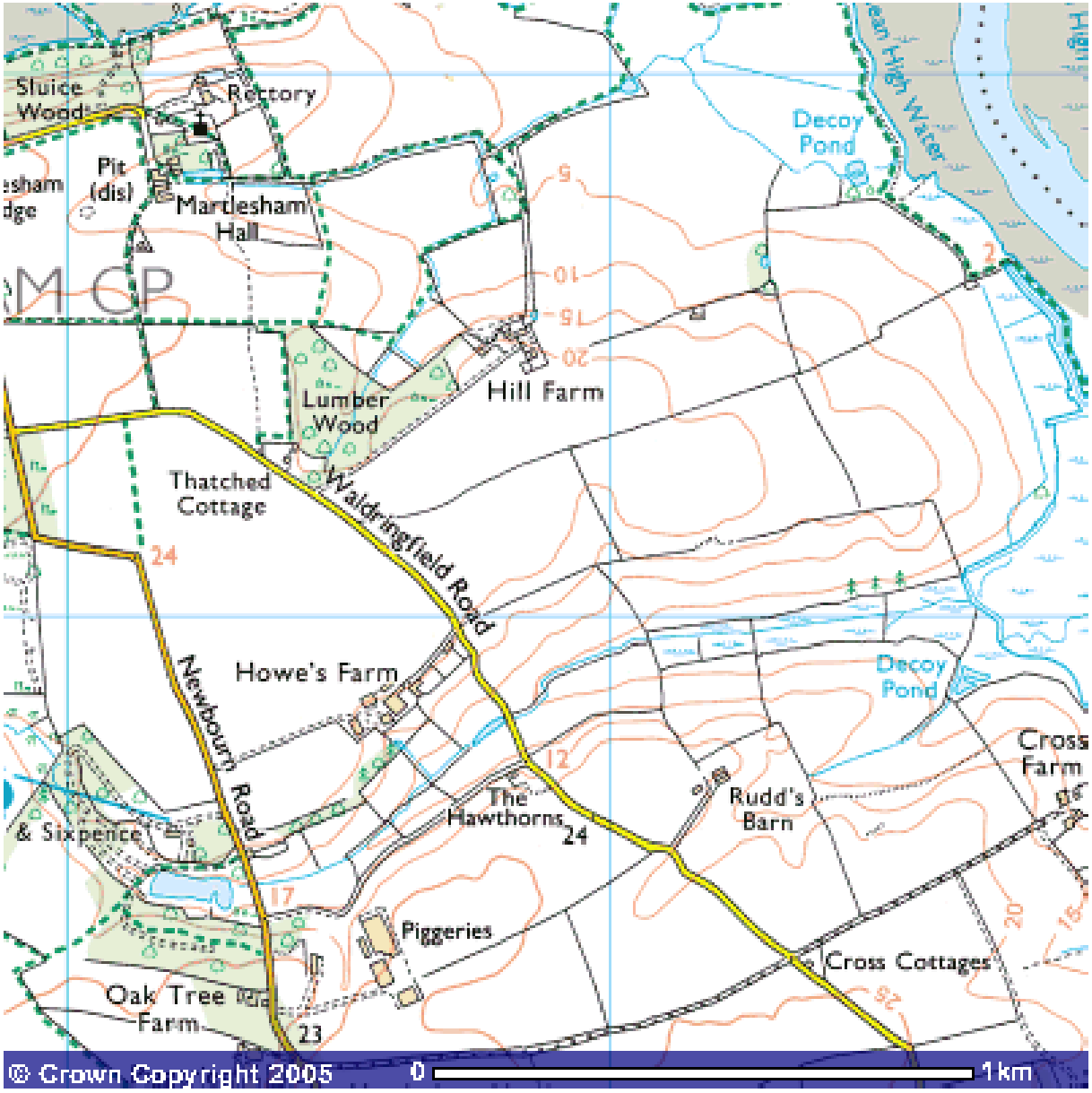
Minimize: transport cost, subject to: all demands satisfied

Network optimization

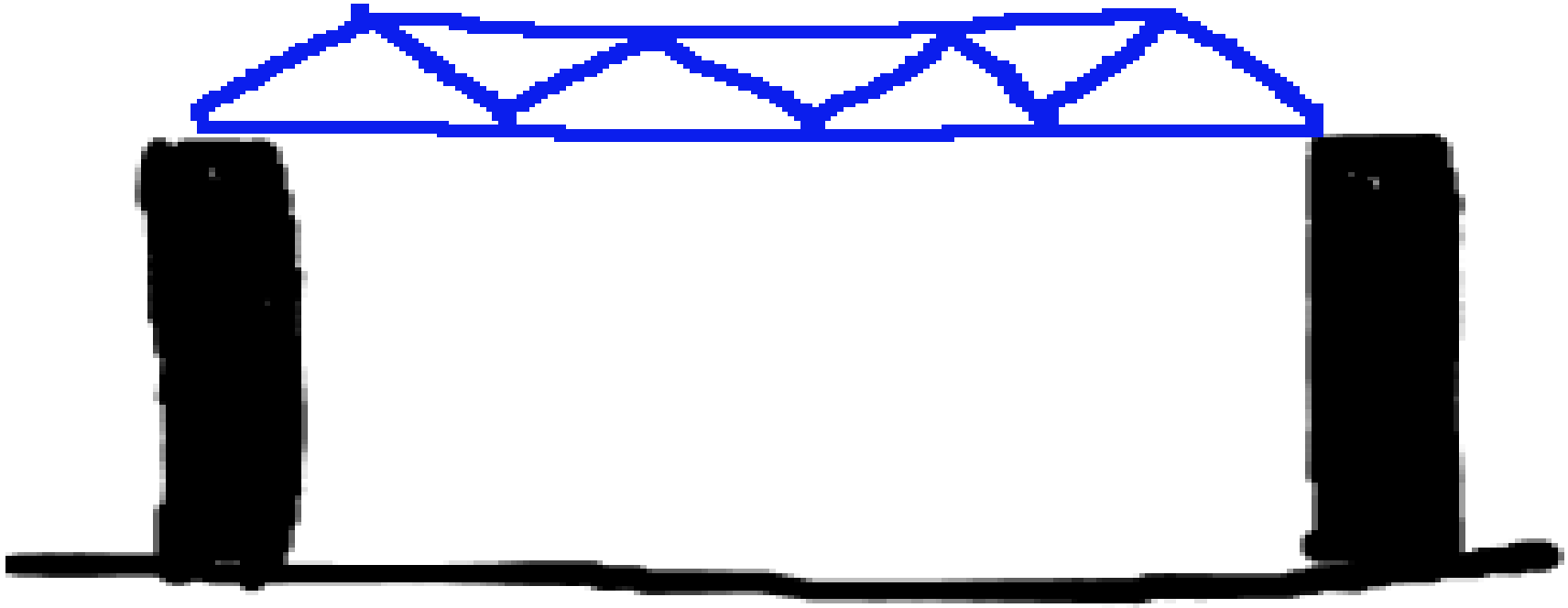


Minimize: transport cost, subject to: all demands satisfied

Convexity


Sluice Wood
Rectory
Pit (dis)
Mardlesham Hall
Decoy Pond
Lumber Wood
Hill Farm
Thatched Cottage
Waldringfield Road
Howe's Farm
Newbourn Road
Decoy Pond
Cross Farm
Rudd's Barn
The Hawthorns
& Sixpence
Piggeries
Cross Cottages
Oak Tree Farm
© Crown Copyright 2005
0
1 km

Truss design



Travelling salesman problem

shortest −ham tour