Example: “ex001”

Remark: Example of the paper optdes.

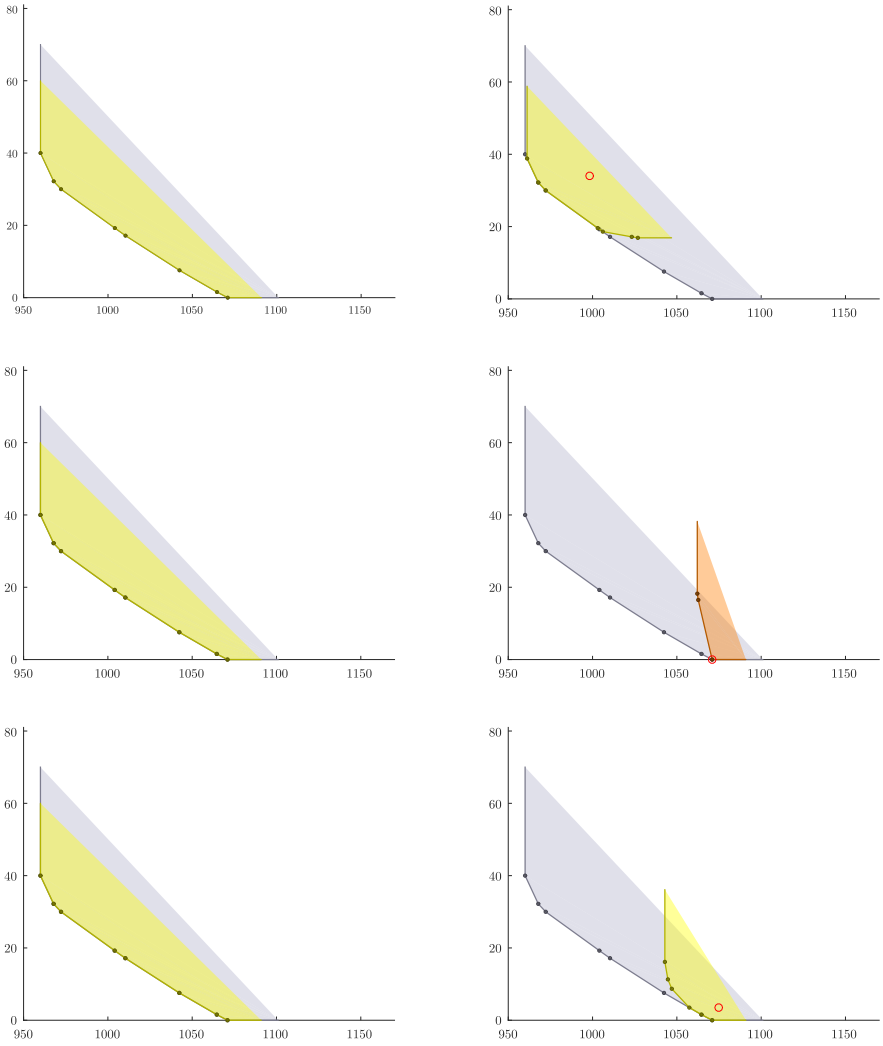
Data for the Network supply capacity design problem

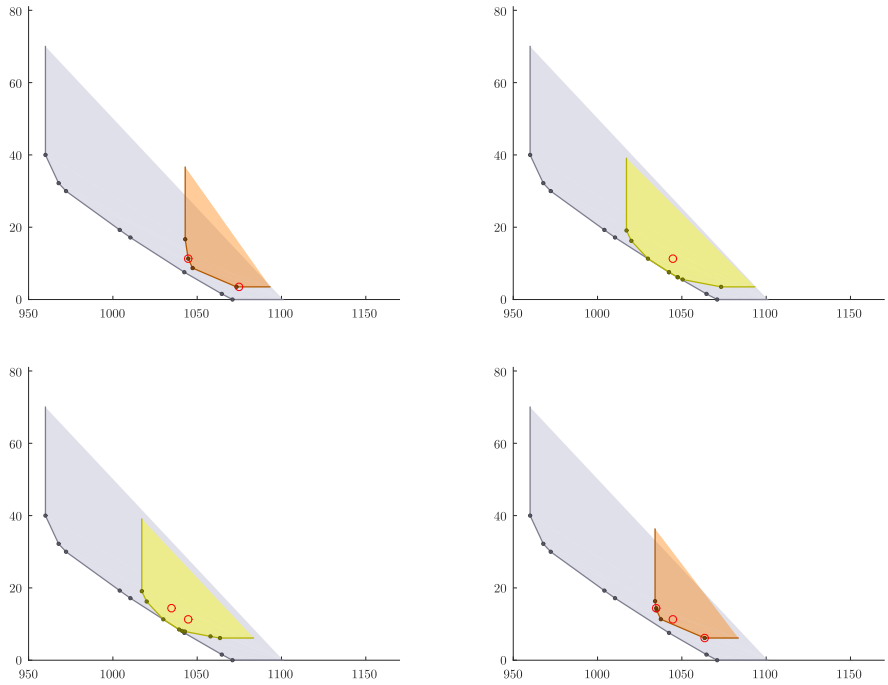
$A \in \mathbb{R}^{n \times n}$ ... digraph
$k \in \mathbb{N}$ ... number of supply nodes
$\tau \in (0,1)$ ... excess of tau percent of arc capacity is accumulated
$\mu \in (0,1)$ ... excess of mu percent of supply capacity is accumulated
$\gamma_1 > 0$ ... weight for arc capacity excess
$\gamma_2 > 0$ ... weight for supply capacity excess
$b \in\in \mathbb{R}^{n-k}$ ... demand at demand nodes $c \in \mathbb{R}^m$ ... costs of flow along arcs
$u \in \mathbb{R}_+^m$ ... capacities of arcs
$a \in \mathbb{R}^k$ ... costs for establishing one unit of supply capacity

$$A = \ldots,\ \ k = 4,\ \ \tau = 0.8,\ \ \mu = 0.9,\ \ \gamma 1 = 1,\ \ \gamma 2 = 3,\ \ b = \begin{pmatrix} 50 \\ 40 \end{pmatrix},\ \ c = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 2 \\ 2 \\ 3 \\ 3 \\ 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ 3 \\ 3 \\ 2 \\ 2 \\ 6 \\ 6 \end{pmatrix},$$

$$u = \begin{pmatrix} 24 \\ 24 \\ 12 \\ 12 \\ 13 \\ 13 \\ 18 \\ 18 \\ 15 \\ 15 \\ 26 \\ 26 \\ 17 \\ 17 \\ 23 \\ 23 \\ 8 \\ 8 \end{pmatrix}, \; a = \begin{pmatrix} 10 \\ 11 \\ 8 \\ 9 \end{pmatrix},$$

Design process





$$z = \begin{pmatrix} 22.2222222224635 & 29.5917810887544 & 28.4491187066995 \\ 5.77777777774142 & 0 & 0 \\ 36.4444444444444 & 36.4444444444444 & 36.4444444444444 \\ 35.5555555553143 & 32.6666666666249 & 32.8343353051141 \end{pmatrix},$$

$$Y_1 =\!\!),(\ Y_2 = \begin{pmatrix} 998.258064516129 \\ 34.0280455740578 \end{pmatrix}, \ Y_3 =\!\!),(\ Y_4 = \begin{pmatrix} 1070.93333333297 \\ 7.90549847806687e-11 \end{pmatrix},$$

$$Y_5 =\!\!),(Y_6 = \begin{pmatrix} 1074.80184331797 \\ 3.50219106047327 \end{pmatrix}, Y_7 = \begin{pmatrix} 1074.80184331797 & 1044.67336644269 \\ 3.50219106047327 & 11.3021910604733 \end{pmatrix},$$

$$Y_8 = \begin{pmatrix} 1044.67336644269 \\ 11.3021910604733 \end{pmatrix}, \ Y_9 = \begin{pmatrix} 1044.67336644269 & 1034.75576036866 \\ 11.3021910604733 & 14.387379491674 \end{pmatrix},$$

$$Y_10 = \begin{pmatrix} 1044.67336644269 & 1034.75576036866 & 1063.50666214319 \\ 11.3021910604733 & 14.387379491674 & 6.13467416810513 \end{pmatrix},$$