

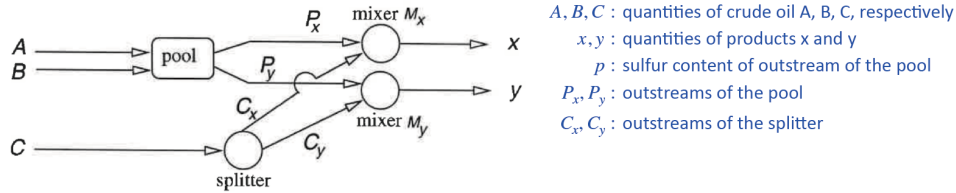
Numerical Optimization, 2021 Fall

Homework 1 Solution

1 AMPL实现

考虑如下 Haverly pooling 问题, 如图 1 示, 请使用AMPL实现并求解.

Example: Haverly Pooling Problem



$$\begin{aligned} \max_{x,y,A,B,p,C_x,C_y,P_x,P_y} \quad & 9x + 15y - 6A - 8B - 10(C_x + C_y) \\ \text{s.t.} \quad & P_x + P_y - A - B = 0 \\ & x - P_x - C_x = 0 \\ & y - P_y - C_y = 0 \\ & pP_x + 2C_x - 2.5x \leq 0 \\ & pP_y + 2C_y - 1.5y \leq 0 \\ & pP_x + pP_y - 3A - B = 0 \\ & 0 \leq x \leq 200, 0 \leq y \leq 200, 0 \leq p \leq 100 \\ & 0 \leq A, B, C_x, C_y, P_x, P_y \leq 500 \end{aligned}$$

sulfur content of A=3
sulfur content of B=1
sulfur content of C=2
sulfur content of x ≤ 2.5
sulfur content of y ≤ 1.5
Demands of x and y are ≤ 200
Supplies of A, B, C_x, C_y, P_x, P_y ≤ 500

数值最优化

前言

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图 1: Example: Haverly Pooling Problem.

注意: 使用AMPL solver或者NEOS solver均可. 另外, 请在提交的作业中注明使用的求解器类型, 把求解结果呈现出来 (截图附在PDF文件即可), 并将源代码放在单独文件中. 提交的作业请打包为.zip文件, 包含你的PDF以及源码. [100pts]

Model:

```
var x >= 0, <= 200;
var y >= 0, <= 200;
var p >= 0, <= 100;
```

```

var A >= 0, <= 500;
var B >= 0, <= 500;
var Cx >= 0, <= 500;
var Cy >= 0, <= 500;
var Px >= 0, <= 500;
var Py >= 0, <= 500;

maximize res: 9 * x + 15 * y - 6 * A - 8 * B - 10 * (Cx + Cy);

subject to cons1: Px + Py - A - B = 0;
subject to cons2: x - Px - Cx = 0;
subject to cons3: y - Py - Cy = 0;
subject to cons4: p * Px + 2 * Cx - 2.5 * x <= 0;
subject to cons5: p * Py + 2 * Cy - 1.5 * y <= 0;
subject to cons6: p * Px + p * Py - 3 * A - B = 0;

```

Command:

```

solve;
display A, B, x, y, p, Px, Py, Cx, Cy;

```

Result by BARON:

```

Objective 1800
A = 100
B = 300
x = 200
y = 200
p = 1.5
Px = 200
Py = 200
Cx = 0
Cy = 0

```

Alternatively, if you specify initial parameters and/or use a different solver, you may obtain different solutions. For example,

Model:

```

var x := 100;
var y := 0;
var p := 7;
var A := 75;

```

```

var B := 25;
var Cx := 500;
var Cy := 11;
var Px := 0;
var Py := 1;

maximize res: 9 * x + 15 * y - 6 * A - 8 * B - 10 * (Cx + Cy);

subject to cons1: Px + Py - A - B = 0;
subject to cons2: x - Px - Cx = 0;
subject to cons3: y - Py - Cy = 0;
subject to cons4: p * Px + 2 * Cx - 2.5 * x <= 0;
subject to cons5: p * Py + 2 * Cy - 1.5 * y <= 0;
subject to cons6: p * Px + p * Py - 3 * A - B = 0;

subject to cons7: 0 <= x <= 200;
subject to cons8: 0 <= y <= 200;
subject to cons9: 0 <= p <= 100;
subject to cons10: 0 <= A <= 500;
subject to cons11: 0 <= B <= 500;
subject to cons12: 0 <= Cx <= 500;
subject to cons13: 0 <= Cy <= 500;
subject to cons14: 0 <= Px <= 500;
subject to cons15: 0 <= Py <= 500;

```

Command:

```

solve;
display A, B, x, y, p, Px, Py, Cx, Cy;

```

Result by LGO:

```

Objective 1600.044484
A = 66.666
B = 266.69
x = 200
y = 200
p = 1.39997
Px = 133.356
Py = 200
Cx = 66.6438
Cy = 0

```
