Задача о назначениях в pyomo

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Постановка задачи

$$\begin{cases} \sum\limits_{ij} x_{ij} c_{ij} \to \min \\ \forall j \sum\limits_{i} x_{ij} = 1 \\ \forall i \sum\limits_{j} x_{ij} = 1 \\ x_{ij} \in \overline{0,1} \end{cases}$$

- c_{ij} — стоимость выполнения i-м работником j-й работы

- $x_{ij} = 1 \Leftrightarrow i$-й работник выполняет j-ю работу.

Модель pyomo

```
$ cat assignment_problem.py
from __future__ import division
from pyomo.environ import *

model = AbstractModel()

model.I = Set()
model.J = Set()

model.c = Param(model.I, model.J)

model.x = Var(model.I, model.J, domain=NonNegativeReals)

def obj_expression(model):
return summation(model.c, model.x)

model.OBJ = Objective(rule=obj_expression)

def constI(model, i):
# return the expression for the constraint for i
return sum(model.x[i,j] for j in model.J) == 1

def constJ(model, j):
# return the expression for the constraint for i
return sum(model.x[i,j] for i in model.I) == 1

# the next line creates one constraint for each member of the set model.I
model.c1 = Constraint(model.I, rule=constI)
model.c2 = Constraint(model.J, rule=constJ)
```

Данные

```
$ cat assignment_problem.dat
set I := 1 2 3 4;
set J := 1 2 3 4;

param c:
1 2 3 4 :=
1 1 2 1 2
2 2 3 3 4
```

```
3 1 0 0 1
4 1 1 1 1
;
```

Запуск с glpk

```
$ pyomo solve assignment_problem.py assignment_problem.dat --solver=glpk
[    0.00] Setting up Pyomo environment
[    0.00] Applying Pyomo preprocessing actions
[    0.00] Creating model
[    0.03] Applying solver
[    0.06] Processing results
Number of solutions: 1
Solution Information
Gap: 0.0
Status: feasible
Function Value: 4.0
Solver results file: results.yml
[    0.07] Applying Pyomo postprocessing actions
[    0.07] Pyomo Finished

$ cat results.yml
# ==========================================================
# = Solver Results                                         =
# ==========================================================
# ----------------------------------------------------------
#   Problem Information
# ----------------------------------------------------------
Problem:
- Name: unknown
Lower bound: 4.0
Upper bound: 4.0
Number of objectives: 1
Number of constraints: 9
Number of variables: 17
Number of nonzeros: 33
Sense: minimize
# ----------------------------------------------------------
#   Solver Information
# ----------------------------------------------------------
Solver:
- Status: ok
Termination condition: optimal
Statistics:
Branch and bound:
Number of bounded subproblems: 0
Number of created subproblems: 0
Error rc: 0
Time: 0.0167489051819
# ----------------------------------------------------------
#   Solution Information
# ----------------------------------------------------------
Solution:
- number of solutions: 1
number of solutions displayed: 1
- Gap: 0.0
Status: feasible
Message: None
Objective:
OBJ:
Value: 4
Variable:
x[1,3]:
Value: 1
x[2,1]:
Value: 1
x[3,2]:
```

Value: 1
x[4,4]:
Value: 1
Constraint: No values