Homework
A Pickup & Delivery Problem

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Content

A Pickup & Delivery Problem

- A milk man has several points to visit
- either some depots for pickups
- or some customers for deliveries

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A Pickup & Delivery Problem
Data

- We know the number of points to visit (*n*)
- For each point $j \in [1..n]$
- if it is a depot, we know the amount to pickup: $w_j > 0$
- if it is a customer, we know the amount to deliver: $w_j < 0$
- Globally, these amounts are balanced: $\sum_{j=1}^{n} w_j = 0$

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A Pickup & Delivery Problem

- The milk man has to choose the route
- He visits once and once only once every depot/customer
- At the beginning, the truck is empty
- At the end the truck is empty
- In the meanwhile, the load is nonnegative

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- He will decide the visit sequence *s*

- Let us call L_k the truck load

- between the points $s(k)$ and $s(k+1)$

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A Pickup & Delivery Problem
An example

1	-54	3	38	5	7	7	25	9	-20
2	33	4	5	6	-21	8	-24	10	11

$(1^{st}$ 7 25) $(2^{nd}$ 8 1) $(3^{rd}$ 2 3*) $(4^{th}$ 6 13) $(5^{th}$ 9 22)
$(6^{th}$ 5 4) $(7^{th}$ 4 5) $(8^{th}$ 10 18) $(9^{th}$ 3 54) $(10^{th}$ 1 9)

Total load = 168

A Pickup & Delivery Problem
An example

| 1 | -54 | 3 | 38 | 5 | 7 | 7 | 25 | 9 | -20 |
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Theory
Integer Liner Programming

Question (1)

Find a linear mathematical model for this problem.

Theory
Local search

Question (2)

Propose some neighborhoods for this problem.

Programming
An iterated Local Search

Question (3)

Choose (at least) two neighborhoods.
Write the necessary functions to use these
neighborhoods in an ILS.

You use the programming language you like.
BUT, for every function, you will mention:

- the specification: inputs, outputs and side effects.
- comments
- your algorithms must be easy to read
- the reader will guess nothing

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Experiment
Integer Linear programming

Question (4)

Write the model in the GLPK syntax.
Use it to solve exactly the 10-point problems.

Experiment
Iterated local search

Question (5)

ILS: compare the various methods, on the 50 and 100 point problems.

Question (6)

Conclude.

All the files you need

- The files of the presentations
- my models, my algorithms, . . .
- the data of the problem (10, . . . , 50, 100)
- raw data and data for GLPK

are on the link
`http://exotic.univ-tours.fr/???`

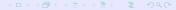For any help or information:
`jean-louis.bouquard@univ-tours.fr`

When and How?

Write you report for June 2nd

And send it to 贾晓宇 `1909220647@qq.com`
or to me.

2 Partnership BIT–University of Tours

Partnership BIT–University of Tours

- 2008: first agreement

- BIT students in 3+3 and 4+3 programs

- BIT students in short term program (Benke sem 8)

- Tours students in short term program (one semester)

- Tours students for research projects

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Partnership BIT–University of Tours
French Engineering Master degree

- Either 3+3 or 4+3 program
- Learn some French language in Beijing before
- First year in Tours: 50% Science, 50% French
- Credit transfer for the Benka degree
- Next 2 years as the other students
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Partnership BIT–University of Tours
Short term program

- all in English
- One semester
- Exchange Program
- Bachelor project on semester 6, February to May

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Thanks and Farewell

谢谢 李冬妮 老师

谢谢 你们

再见