Combinatorial Optimization – Lab Session 3/4

Dynamic programming

Matthieu Basseur and André Rossi

Year 2015-2016

1 Introduction

The purpose of this lab session is to implement a dynamic programming algorithm for two problems. The first one is a resource allocation problem, and the second one is the 0-1 knapsack problem. All the implementations will be done using the C programming language.

2 Instructions

2.1 Part 1: Resource allocation problem

An egg producer has 6 crates of eggs that can be sold in 3 different locations. Let $c_j(x)$ be the profit that can be made by sending x crates of eggs at location j. These profits are given in Table 1.

x	$c_1(x)$	$c_2(x)$	$c_3(x)$
0	0	0	0
1	3	4	2
2	4	6	4
3	4	7	6
4	4	8	7
5	4	8	8
6	4	8	9

Table 1: Expected profit of sending x crates of eggs in the locations

Find the optimal solution (*i.e.*, the distribution of the 6 crates that maximizes the profit) by implementing a dynamic programming algorithm.

2.2 Part 2 : 0-1 knapsack problem

Solve the 0-1 knapsack problem using a dynamic programming algorithm. Data will be read from files as in the previous lab session.

Compare the objective value and the computational time required by the three approaches for this problem:

- Linear programming
- Branch-and-bound
- Dynamic programming

2.3 Releasing the report

The lab report has to be submitted using Moodle before Sunday February 7, at 18:00, under the form of a single `tar.gz` archive, containing the students name as in `DUPOND_Elodie.tar.gz`. After this deadline, Moodle won't be able to accept any submission, and the corresponding grade will be automatically set to zero.