Optimal Solutions to Dr. Eick's Linear Programming Problems

Paul J. Ledbetter III

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In the forthcoming project for Dr. Eick's Evolutionary Programming class, our goal is to minimize the total cost for a particular transportation problem subject to different costs. One of the cost functions, f_1, is linear in the number of units transported, and therefore amenable to direct solution by a well known algorithm. I have made use of this, and have obtained the optimal transportation scheme using the GNU Linear Programming Kit.

In the first problem, the sources 1...5 have capacities 5, 5, 20, 15, and 15 respectively. And the destinations 1...6 have capacities 8, 8, 8, 8 ,8, and 20 respectively. The cost function associated with the transportation is

$$f_1(i, j, u) = (|i - j| + 1)^2 * u,$$

where i is the integer index corresponding to the source, j is the integer index corresponding to the destination, and u is the total number of units transported. u is not constrained to be real valued. An optimal scheme is presented in Table 1.

	Destinations					
Sources	1	2	3	4	5	6
1	5	···	···	···	···	···
2	3	2	···	···	···	···
3	···	6	8	6	···	···
4	···	···	···	2	8	5
5	···	···	···	···	···	15
Total Cost						214

Table 1: Problem One Solution

In the second problem, the sources 1...5 have capacities 12, 12, 12, 12, and 12 respectively. And the destinations 1...6 have capacities 8, 8, 8, 8,8, and 20 respectively. An optimal scheme for this problem is presented in Table 2.

Note that, the transportation costs are guaranteed to be *optimal*, but the schemes presented not necessarily unique. I will explain in more detail during my presentation next week how I was able to obtain these solutions.

	Destinations					
Sources	1	2	3	4	5	6
1	10	2	...	...	...	...
2	...	8	4	...	...	...
3	...	...	6	6	...	...
4	...	...	...	4	8	...
5	...	...	...	...	2	10
Total Cost						150

Table 2: Problem Two Solution