The SSLP Test Problems

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The test problem suite consists of data and computational results for 12 two-stage stochastic mixed-integer programs arising in stochastic server location problems (SSLPs). The problem formulation and instance generation are described in [1, 2]. The problems have pure binary first-stage variables, mixed-binary second-stage variables, and discrete distributions.

The following table presents the sizes of the deterministic equivalent and subproblem for each of the 12 problems instances. The instances are named SSLP*m.n.s*, where *m* is the number of potential server locations, *n* is the number of potential clients, and *s* is the number of scenarios. Constrs, Bins, Cvars and Dens refer to the number of constraints, binary variables, continuous variables, and density of the constraint matrix, respectively. The data for the each problem is given as three text files in SMPS format (TIME, CORE, and STOCH files). The SMPS data files are contained in the zip file sslp.zip .

Table 1: Dimensions for the SSLP Instances

	DEP				SUBPROBLEM			
Name	Constrs	Bins	Cvars	Dens	Constr	Bins	Cvars	Dens
SSLP5.25.50	1,501	6,255	250	0.0013	30	130	5	0.0715
SSLP5.25.100	3,001	12,505	500	0.0007	30	130	5	0.0715
SSLP5.50.50	2,751	12,505	250	0.0007	55	255	5	0.0393
SSLP5.50.100	5,501	25,005	500	0.0004	55	255	5	0.0393
SSLP10.50.50	3,001	25,010	500	0.0007	60	510	10	0.0345
SSLP10.50.100	6,001	50,010	1,000	0.0003	60	510	10	0.0345
SSLP10.50.500	30,001	250,010	5,000	0.0001	60	510	10	0.0345
SSLP10.50.1000	60,001	500,010	10,000	0.0009	60	510	10	0.0345
SSLP10.50.2000	120,001	1,000,010	20,000	0.0007	60	510	10	0.0345
SSLP15.45.5	301	3,390	75	0.0066	60	690	15	0.0340
SSLP15.45.10	601	6,765	150	0.0033	60	690	15	0.0340
SSLP15.45.15	901	10,140	375	0.0022	60	690	15	0.0340

Computational results using an implementation of the D^2 algorithm [3] on a Sun 280R with UltraSPARC-III+ CPU running at 900 MHz are given in Table 2. The CPLEX 7.0 Callable Library [4] was used for solving the master and subproblems. To solve the large-scale SSLP DEP formulation for each of the problem instances the CPLEX MIP solver parameters were set at the following values: ``set mip emphasis 1" (emphasizes looking for feasible solutions), ``set mip strategy start 4" (uses barrier at the root), and ``branching priority order on *x* (first-stage decision variables -- first branches on any fractional component of *x* before branching on *y* – second-stage decision variables). A CPU time limit of 10,800 seconds (3 hrs) was imposed and any problem instance run taking more than this time limit was stopped and the percent gap from optimality reported. All the problems that took less than this time limit converged to an optimal solution and the percentage gap between the lower bound and the upper bound was equal to 0%.

Table 2: Computational Results for SSLP using the D^2 Algorithm

				D^2 Algorithm			CPLEX 7.0	
Name	Z_{IP}	Z_{LP}	Z_{IP} Gap	Iterations	D^2-Cuts	D^2-CPU	DEP-CPU	Gap
SSLP5.25.50	-121.600	-160.063	24.03	17	6	0.53	4.58	
SSLP5.25.100	-127.370	-169.667	24.93	17	10	1.03	14.69	
SSLP5.50.50	-311.480	-392.995	20.74	33	11	1.64	10.35	
SSLP5.50.100	-323.700	-407.051	20.48	32	13	3.95	33.25	
SSLP10.50.50	-364.640	-409.194	10.89	252	250	295.95	> 10,800	0.44
SSLP10.50.100	-354.190	-398.297	11.07	300	299	480.46	> 10,800	9.02
SSLP10.50.500	-349.136	-391.185	10.75	309	307	1902.2	> 10,800	38.17
SSLP10.50.1000	-351.711	-395.477	11.07	322	321	5410.1	> 10,800	99.60
SSLP10.50.2000	-347.262	-390.231	11.01	308	307	9055.29	> 10,800	46.24
SSLP15.45.5	-262.400	-280.490	6.45	146	145	110.34	> 10,800	1.19
SSLP15.45.10	-260.500	-278.689	6.53	454	453	1,494.89	> 10,800	0.27
SSLP15.45.15	-253.602	-253.602	5.62	814	813	7,210.63	> 10,800	0.72

[1] Ntaimo, L. and S. Sen, "The 'million-variable' march for stochastic combinatorial optimization," *Journal of Global Optimization*, to appear, 2004.

[2] Ntaimo, L. *Decomposition algorithms for stochastic combinatorial optimization: Computational experiments and extensions*, Ph.D. Dissertation, University of Arizona, 2004.

[3] Sen, S. and J.L. Higle, "The C^3 Theorem and a D^2 Algorithm for Large Scale Stochastic Mixed-Integer Programming: Set Convexification," *Mathematical Programming*, to appear, 2004.

[4] ILOG CPLEX, *CPLEX 7.0 Users Manual and Reference Manual*, ILOG CPLEX Division, Incline Village, NV, 2000.