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15/SCI01/007
COMP ENG 500L

(1) Linear programming is an optimization technique for a system of linear constraints and a linear objective function. An objective function defines the quantity to be optimized and the goal of linear programming is to find the values of the variables that maximize or minimize the objective function.

Applications in Engineering

Engineers also use linear programming to help solve design and manufacturing problems. For example, in airfoil meshes, engineers seek aerodynamic shape optimization. This allows for the reduction of the drag coefficient of the airfoil. Constr may include lift coefficient, relative maximin thickness, nose radius and trailing edge angle. Shape optimization seeks to make a shock free airfoil with a feasible shape. Linear programing therefore provides engineers with an essential tool in shape Optimization.

(B) $x_1, x_2, z = ?$

Objective function

Max $z = 30x_1 + 20x_2$

Sub

$2x_1 + x_2 \leq 1000$

$x_1 + x_2 \leq 800$

$x_1, x_2 \geq 0$

$z - 30x_1 - 20x_2 = 0$

x_1	x_2	s_1	s_2	z
2	1	1	0	1000
1	1	0	1	800
-30	-20	0	0	0

$R_1 = Row\ 1/2$, $R_3 = 30R_1 + R_3$

$R_2 = -R_1 + R_2$

x_1	x_2	s_1	s_2	z
1	1/2	1/2	0	500
1	1	0	1	800
-30	-20	0	0	0

1	1/2	1/2	0	500
0	1/2	-1/2	1	300
0	-5	15	0	15 000

1	1/2	1/2	0	500
0	1/2	-1/2	1	300
0	-5	15	0	15000

$R_2 \rightarrow 2R_2$

1	1/2	-1/2	0	500
0	1	1	2	600
0	-5	+5	0	15000

$R_1 = -1/2\ R_2 + R_1$

$R_3 = 5R_2 + R_3$

1	0	1	-1	200
0	1	-1	2	600
0	-5	15	0	15 000

1	0	1	-1	200
0	1	-1	2	600
0	0	10	10	18 000

$x_1 = 200$

$x_2 = 600$

$Z = 18,000$