

Final — Outline

Formulation of LP's

Geometric Representation

- hyperplanes, half spaces
- convex sets, extreme points, extreme directions
- representation of FR by extreme points, extreme directions
- degeneracy, uniqueness, unbounded objective function

Simplex Method

- standard equality form ($\max cx, Ax = b, x \geq 0$)
- basic variables, nonbasic variables
- basic feasible solution (BFS), basic infeasible solution
- degeneracy and cycling
- tableau: transform original columns, premultiplying by B^{-1}
- basic variables have associated identity columns
- B^{-1} is found in current tableau (slack columns)
- reduced costs $z_k - c_k$ and optimality conditions
- uniqueness
- algebraic representation of directions
- unbounded objective function
- obtaining an initial BFS
- two-phase method, artificial variables
- unrestricted variables

Revised Simplex Method

- dual variables $\pi = c_B B^{-1}$
- reduced costs $z_k - c_k = \pi a_k - c_k$
- determine leaving variable by ratios using β and α_k
- update B^{-1} using a pivot step
- π variables are reduced costs of slack variables
- can verify optimality of proposed solution directly (one step)
- second way of implementing RSM: solving linear equations

Bounded Variable Simplex Method

- nonbasic variables now set to upper/lower bound
- new optimality conditions (upper/lower bound)

Duality

- construction of dual LP

- strong, weak duality theorems

- relations between primal and dual problems

- complementary slackness

- optimal primal tableau provides optimal dual π, λ

- economic interpretation

- dual simplex method

 - detection of primal infeasibility

Sensitivity Analysis

- change in c_k and range on c_k

- change in b_i and range on b_i

- other changes (new variable, new constraint)

- parametric analysis (varying t) for c and b