

Simplex Method

In linear programs, the optimal solution, if there is one, can only exist at the corner points of the feasible region. Even though this property eliminates all points in the interior of the feasible region from the possible optimal solutions, the number of corner points (possible solutions) can still be very large. In complicated problems, going randomly through all of the corners points one by one to find the optimal solution can take hundreds of years, and we would like to avoid that. The simplex method is introduced to find an optimal solution to linear programs by starting at a vertex, and start moving from a vertex to another, expectingly improving the value of the objective function after each move until it reaches the maximum.

In the last lecture, we have learned how to solve linear problems using the simplex method by hand. We also learned about the geometric properties in the simplex method, such as unboundedness, degeneracy, and cycling. The 2-phase method was also introduced in the class, it is a method to implement when the question's slack form will not have a feasible solution when setting all non-basic variables to 0. The method, if possible, will convert the problem to an equivalent form with all the non-basic variables to be non-negative, then the simplex method can be carried out normally.

In my opinion, it is not feasible to calculate things all by hand. In fact, it would be impossible if the question is more complicated than in the class examples. Writing codes to let computers do all the calculations would be a better way to solve linear programs.