ABSTRACT

Linear Fractional Programming problems deal with maximizing the ratio of two linear functions subject to a set of linear inequalities and non-negativity constraints on the variables. Several techniques such as Charnes-Cooper method, Wolf method and Kantiswarup method are used to solve these problems.

Charnes-Cooper method transforms the fractional objective function into a linear function by substituting $y = tx$ where $t$ is the reciprocal of the denominator and thus the problem is converted to a linear program. It can be solved using simplex method.

Hartmut Wolf gives an algorithm based on parametric analysis of a related linear substitution problem which, besides determining the optimal solution, provides an additional insight and valuable information on the underlying decision problem.

Kantiswarup has devised a method wherein a new row is formed from the numerator and denominator coefficients of the objective function and this is used to select the entering variable. The selection of leaving variable and iterations are the same as in simplex method.
In this thesis a new algorithm called COMPUTER ORIENTED RATIO ALGORITHM is proposed in which the entering variable is selected, by considering the ratios of the contribution coefficients of the variables in the numerator and the denominator of the objective function. Again, the optimality of the solution is checked using the objective function value and the ratios of the contribution coefficients of the variables. It is assumed that the denominator is always positive. Several cases arise, each giving different optimality condition. The process is tedious for manual working. Therefore this algorithm is more suitable to computers. The matrix version of the algorithm is also proposed in this thesis. To solve problems with mixed type of constraints, dual ratio algorithm is proposed.

Further a ratio algorithm applicable to solve a two-way transportation problem which maximizes the profit per unit cost of transportation has been proposed. A selection criterion suggested by Kantiswarup has also been modified and used to solve two-way transportation problems. Moreover the ratio algorithm is capable of identifying singular points and bad points in problems where the feasible region is unbounded.

This new algorithm seems to possess vast scope for improvement and it will be fruitful if one can exploit it further to solve any linear fractional programming problem without the restrictions assumed here.