

**A LINEAR PROGRAMMING TRANSFORMATION
OF AN INCONSISTENT SYSTEM OF LINEAR EQUATIONS
INTO A CONSISTENT SYSTEM**

Mohammad Fatehi, Miguel Paredes, Richard Hinthorn, and Hushang Poorkarimi

The University of Texas-Pan American

1. Introduction. The solution of many decision making problems requires solving a system of linear equations. If such a system happens to be inconsistent, then it is possible to transform it into a consistent system. In [3], Paredes et al. used an algebraic transformation in order to obtain a consistent system; and a weakness of this method from the point of view of the decision maker is discussed there, namely that it involves changing the amount of those resources whose coefficients caused the inconsistency, without taking into account the possibility of changing the amounts of the other resources. In the same paper Paredes et al. proposed to overcome such weakness by parameterizing the constant terms of the system, thus achieving a more flexible solution and giving the decision maker the chance to change the available amount of several resources. A new weakness arises because the solution set obtained is infinite. In [3], it was suggested that this new weakness may be overcome by using linear programming methods, which is the objective of this paper.

Let us informally state our problem and an outline of the solution. If we have an inconsistent system of linear equations, we shall transform it into a consistent system using an iterative process. It is assumed that the system has been operated on by the Gauss Jordan elimination method or some other method to determine the body of consistent and inconsistent equations. The iteration begins with the minimization of the left hand side of any one of the equations causing the inconsistency with respect to the body of consistent equations playing the role of constraints. The phase I of the simplex method [4] is used here to solve the linear programming problems. The objective function formed by the artificial variables is optimized. The left side of the first equation causing the inconsistency is equated to its minimum value obtained from the optimum solution of phase I; and this equation is added to the constraint equations. The left side of the second equation causing the