MULTICRITERIA SIMPLEX METHOD: 
A FORTRAN ROUTINE *)

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Multicriteria Simplex Method has been introduced in Linear Multiobjective Programming, Springer-Verlag, New York, 1974. Many people have inquired about the efficiency of the FORTRAN routine published therein. Some complained that they have been unable to implement the program successfully. I think I owe it to the users: students, researchers and practitioners, as well as to Springer-Verlag Publishers, that I publish the new version of the Multicriteria Simplex Method FORTRAN Routine in the same series in which it originally appeared.

The program has been thoroughly tested on CDC 6400 and IBM 360/75 computer systems. Although it is being further improved by optimizing the coding and by supplying additional output flexibilities, it is currently suitable for instructional, research and medium-size applicational purposes. Despite the fact that the current program listing is in a single precision arithmetic, many computers do have problems due to roundoff or truncation. In such cases the double precision statements should be included.

Currently all nondominated bases are printed by the routine. This is, of course, usually larger than the actual number of nondominated extreme points, and one must select a particular representative basis by inspection. But the researchers in multiobjective, multiparametric and numerical programming will appreciate the complete print-out of the bases.

The following test examples are introduced for the users' convenience:

* I would like to acknowledge the invaluable programming assistance I received from Dr. John L. Eatman of the University of Richmond. Also, my students, Ing. John Verstraaten and Ing. Sil van der Ploeg, have performed a large number of test runs which helped to establish final efficiency of this routine.
Problem 1.

Maximize

\[
\begin{bmatrix}
1 & 2 & -1 & 3 & 2 & 0 & 1 \\
0 & 1 & 1 & 2 & 3 & 1 & 0 \\
1 & 0 & 1 & -1 & 0 & -1 & -1
\end{bmatrix}
\begin{bmatrix}
X_1 \\
X_2 \\
X_3 \\
X_4 \\
X_5 \\
X_6 \\
X_7
\end{bmatrix}
\]

subject to:

\[
\begin{bmatrix}
1 & 2 & 1 & 1 & 2 & 1 & 2 \\
-2 & -1 & 0 & 1 & 2 & 0 & 1 \\
-1 & 0 & 1 & 0 & 2 & 0 & -2 \\
0 & 1 & 2 & -1 & 1 & -2 & -1
\end{bmatrix}
\begin{bmatrix}
X_1 \\
X_2 \\
X_3 \\
X_4 \\
X_5 \\
X_6 \\
X_7
\end{bmatrix}
\leq
\begin{bmatrix}
16 \\
16 \\
16 \\
16
\end{bmatrix}
\]

Problem 2.

Maximize

\[
\begin{bmatrix}
2 & 5 & 1 & -1 & 6 & 8 & 3 & -2 \\
5 & -2 & 5 & 0 & 6 & 7 & 2 & 6 \\
1 & 1 & 1 & 1 & 1 & 1 & 1 & 1
\end{bmatrix}
\begin{bmatrix}
X_1 \\
X_2 \\
X_3 \\
X_4 \\
X_5 \\
X_6 \\
X_7 \\
X_8
\end{bmatrix}
\]