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C CASE STUDY 10
C THE GAUSS-SEIDEL METHOD FOR SOLVING SIMULTANEOUS EQUATIONS
C
C THE PROGRAM SOLVES A SYSTEM OF N EQUATIONS IN N UNKNOWNS.
C N MAY NOT EXCEED 80; N IS READ AS INPUT.
C ONLY THE NON-ZERO ELEMENTS NEED BE ENTERED, ONE ELEMENT PER DATA
C   CARD, WITH ROW AND COLUMN NUMBERS ON EACH CARD.
C A ROW NUMBER OF 99 ACTS AS AN END-OF-DATA SENTINEL.
C THE PROGRAM READS THE FOLLOWING PARAMETERS PRIOR TO ENTERING THE DATA
C   N -- THE NUMBER OF EQUATIONS IN THE SYSTEM FOR THIS RUN
C   MAXIT -- THE MAXIMUM NUMBER OF ITERATIONS TO BE PERMITTED
C   EPSLON -- THE CONVERGENCE CRITERION
C   BIGGST -- THE MAXIMUM SIZE (IN ABSOLUTE VALUE) TO BE PERMITTED
C      OF ANY COEFFICIENT OR CONSTANT TERM
C ALL INPUT IS CHECKED FOR VALIDITY, EVEN IF AN ERROR IS FOUND.
C
C
      DIMENSION A(80, 81), X(80)
      LOGICAL OK
C
C CLEAR ARRAYS
      DO 20 I = 1, 80
         X(I) = 0.0
         DO 10 J = 1, 81
            A(I, J) = 0.0
  10     CONTINUE
  20  CONTINUE
C
C READ CONTROL PARAMETERS DESCRIBED IN INTRODUCTORY COMMENTS
      READ (5, 100) N, MAXIT, EPSLON, BIGGST
      NPLUS1 = N + 1
C
C READ THE ELEMENTS OF THE ARRAYS, WITH CHECKING
C DO LOOP IS USED TO CONTROL MAXIMUM NUMBER OF ELEMENTS
C FIRST SET ERROR COUNT TO ZERO
      NERROR = 0
      LIMIT = N*NPLUS1 + 1
      DO 30 K = 1, LIMIT
         READ (5, 100) I, J, TEMP
         IF ( I .EQ. 99 ) GO TO 41
         OK = .TRUE.
         IF (      (I .LT. 1)
     1       .OR. (I .GT. N)
     2       .OR. (J .LT. 1)
     3       .OR. (J .GT. NPLUS1)
     4       .OR. (ABS(TEMP) .GT. BIGGST) ) OK = .FALSE.
         IF (       OK ) A(I, J) = TEMP
         IF ( .NOT. OK ) WRITE (6, 110) I, J, TEMP
         IF ( .NOT. OK ) NERROR = NERROR + 1
  30  CONTINUE
C
C IF DO IS SATISFIED, THERE WERE TOO MANY DATA CARDS FOR THE
C   VALUE OF N THAT WAS SPECIFIED -- WRITE ERROR COMMENT
      WRITE (6, 120)
      STOP
C
C ALL DATA CARDS HAVE BEEN READ -- CHECK ERROR COUNT AND STOP IF ANY
  41  IF ( NERROR .NE. 0 ) WRITE ( 6, 130) NERROR
      IF ( NERROR .NE. 0 ) STOP
C
C     BEGIN ITERATION SCHEME -- DO LOOP COUNTS THE NUMBER OF ITERATIONS
      DO 70 ITER = 1, MAXIT
C
C        ... NEXT STATEMENT IS EXECUTED ONCE PER SWEEP OF THE SYSTEM
         RESID = 0.0
C
C        ... INDEX I SELECTS A ROW
         DO 60 I = 1, N
C
C           ... NEXT STATEMENT IS EXECUTED ONCE PER ROW
            SUM = 0.0
C
C           ... GET SUM OF TERMS IN ROW I, NOT INCLUDING DIAGONAL TERM
            DO 50 J = 1, N
               IF ( J .NE. I ) SUM = SUM + A(I,J)*X(J)
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