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SUBROUTINE GOLUB (A,X,B,M,N)
C
C   A(M,N) ; B(M) GIVEN WITH M>N SOLVES FOR X(N) SUCH THAT
C   || B - AX || = MINIMUM
C   METHOD OF G.GOLUB, NUMERISCHE MATHEMATIK 7,206-216 (1965)
C
C   IMPLICIT DOUBLE PRECISION (D)
C   REAL A(M,N),X(N),B(M),U(50)
C.....DIMENSION U(M)
C.....PERFORM N ORTHOGONAL TRANSFORMATIONS TO A(.,.) TO
C.....UPPER TRIANGULARIZE THE MATRIX
      DO 3010 K=1,N
        DSUM=0.0D0
        DO 1010 I=K,M
          DAJ=A(I,K)
1010    DSUM=DSUM+DAJ**2
          DAI=A(K,K)
          DSIGMA=DSIGN(DSQRT(DSUM),DAI)
          DBI=DSQRT(1.0D0+DAI/DSIGMA)
          DFACT=1.0D0/(DSIGMA*DBI)
          U(K)=DBI
          FACT=DFACT
          KPLUS=K+1
          DO 1020 I=KPLUS,M
1020    U(I)=FACT*A(I,K)
C.....I - UU' IS A SYMMETRIC, ORTHOGONAL MATRIX WHICH WHEN APPLIED
C..... TO A(.,.) WILL ANNIHILATE THE ELEMENTS BELOW THE DIAGONAL K
          DO 2030 J=K,N
C.....APPLY THE ORTHOGONAL TRANSFORMATION
            FACT=0.0
            DO 2010 I=K,M
2010      FACT=FACT+U(I)*A(I,J)
            DO 2020 I=K,M
2020      A(I,J)=A(I,J)-FACT*U(I)
2030    CONTINUE
            FACT=0.0
            DO 2040 I=K,M
2040      FACT=FACT+U(I)*B(I)
            DO 2050 I=K,M
2050      B(I)=B(I)-FACT*U(I)
3010    CONTINUE
C.....BACK SUBSTITUTE TO RECURSIVELY YIELD X(.)
      X(N)=B(N)/A(N,N)
      LIM=N-1
      DO 4020 I=1,LIM
        IROW=N-1
        SUM=0.0
        DO 4010 J=1,I
4010      SUM=SUM+X(N-J+1)*A(IROW,N-J+1)
4020      X(IROW)=(B(IROW)-SUM)/A(IROW,IROW)
      RETURN
      END

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