

ADAS Subroutine xxder1

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SUBROUTINE XXDER1 (FCN, M, N, X, FVEC, FJAC, LDFJAC, INFO, IPVT, WA,  
& LWA)
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C-----  
C  
C ROUTINE: XXDER1 (MINPACK ROUTINE LMDER1)  
C  
C PURPOSE:  
C   MINIMIZE THE SUM OF THE SQUARES OF M NONLINEAR FUNCTIONS IN N  
C   VARIABLES BY A MODIFICATION OF THE LEVENBERG-MARQUARDT  
C   ALGORITHM.  
C  
C   THIS IS DONE BY USING THE MORE GENERAL LEAST-SQUARES SOLVER  
C   LMDER. THE USER MUST PROVIDE A SUBROUTINE WHICH CALCULATES  
C   THE FUNCTIONS AND THE JACOBIAN.  
C  
C INPUT:  
C   FCN IS THE NAME OF THE USER-SUPPLIED SUBROUTINE WHICH  
C   CALCULATES THE FUNCTIONS AND THE JACOBIAN. FCN MUST  
C   BE DECLARED IN AN EXTERNAL STATEMENT IN THE USER  
C   CALLING PROGRAM, AND SHOULD BE WRITTEN AS FOLLOWS.  
C  
C   SUBROUTINE FCN(M,N,X,FVEC,FJAC,LDFJAC,IFLAG)  
C   INTEGER M,N,LDFJAC,IFLAG  
C   DOUBLE PRECISION X(N),FVEC(M),FJAC(LDFJAC,N)  
C   -----  
C   IF IFLAG = 1 CALCULATE THE FUNCTIONS AT X AND  
C   RETURN THIS VECTOR IN FVEC. DO NOT ALTER FJAC.  
C   IF IFLAG = 2 CALCULATE THE JACOBIAN AT X AND  
C   RETURN THIS MATRIX IN FJAC. DO NOT ALTER FVEC.  
C   -----  
C   RETURN  
C   END  
C  
C   THE VALUE OF IFLAG SHOULD NOT BE CHANGED BY FCN UNLESS  
C   THE USER WANTS TO TERMINATE EXECUTION OF LMDER1.  
C   IN THIS CASE SET IFLAG TO A NEGATIVE INTEGER.  
C  
C   M IS A POSITIVE INTEGER INPUT VARIABLE SET TO THE NUMBER  
C   OF FUNCTIONS.  
C  
C   N IS A POSITIVE INTEGER INPUT VARIABLE SET TO THE NUMBER  
C   OF VARIABLES. N MUST NOT EXCEED M.  
C  
C   LDFJAC IS A POSITIVE INTEGER INPUT VARIABLE NOT LESS THAN M  
C   WHICH SPECIFIES THE LEADING DIMENSION OF THE ARRAY FJAC.  
C  
C   TOL IS A NONNEGATIVE INPUT VARIABLE. TERMINATION OCCURS  
C   WHEN THE ALGORITHM ESTIMATES EITHER THAT THE RELATIVE  
C   ERROR IN THE SUM OF SQUARES IS AT MOST TOL OR THAT  
C   THE RELATIVE ERROR BETWEEN X AND THE SOLUTION IS AT  
C   MOST TOL.  
C
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C WA IS A DOUBLE PREC. WORK ARRAY OF LENGTH LWA.
 C
 C LWA IS A POSITIVE INTEGER INPUT VARIABLE NOT LESS THAN 5*N+M.
 C
 C I/O:
 C X IS AN ARRAY OF LENGTH N. ON INPUT X MUST CONTAIN
 C AN INITIAL ESTIMATE OF THE SOLUTION VECTOR. ON OUTPUT X
 C CONTAINS THE FINAL ESTIMATE OF THE SOLUTION VECTOR.
 C
 C OUTPUT:
 C FVEC IS AN OUTPUT ARRAY OF LENGTH M WHICH CONTAINS
 C THE FUNCTIONS EVALUATED AT THE OUTPUT X.
 C
 C FJAC IS AN OUTPUT M BY N ARRAY. THE UPPER N BY N SUBMATRIX
 C OF FJAC CONTAINS AN UPPER TRIANGULAR MATRIX R WITH
 C DIAGONAL ELEMENTS OF NONINCREASING MAGNITUDE SUCH THAT
 C

$$P^T * (JAC * JAC) * P = R^T * R,$$
 C
 C WHERE P IS A PERMUTATION MATRIX AND JAC IS THE FINAL
 C CALCULATED JACOBIAN. COLUMN J OF P IS COLUMN IPVT(J)
 C (SEE BELOW) OF THE IDENTITY MATRIX. THE LOWER TRAPEZOIDAL
 C PART OF FJAC CONTAINS INFORMATION GENERATED DURING
 C THE COMPUTATION OF R.
 C
 C INFO IS AN INTEGER OUTPUT VARIABLE. IF THE USER HAS
 C TERMINATED EXECUTION, INFO IS SET TO THE (NEGATIVE)
 C VALUE OF IFLAG. SEE DESCRIPTION OF FCN. OTHERWISE,
 C INFO IS SET AS FOLLOWS.
 C
 C INFO = 0 IMPROPER INPUT PARAMETERS.
 C
 C INFO = 1 ALGORITHM ESTIMATES THAT THE RELATIVE ERROR
 C IN THE SUM OF SQUARES IS AT MOST TOL.
 C
 C INFO = 2 ALGORITHM ESTIMATES THAT THE RELATIVE ERROR
 C BETWEEN X AND THE SOLUTION IS AT MOST TOL.
 C
 C INFO = 3 CONDITIONS FOR INFO = 1 AND INFO = 2 BOTH HOLD.
 C
 C INFO = 4 FVEC IS ORTHOGONAL TO THE COLUMNS OF THE
 C JACOBIAN TO MACHINE PRECISION.
 C
 C INFO = 5 NUMBER OF CALLS TO FCN WITH IFLAG = 1 HAS
 C REACHED 100*(N+1).
 C
 C INFO = 6 TOL IS TOO SMALL. NO FURTHER REDUCTION IN
 C THE SUM OF SQUARES IS POSSIBLE.
 C
 C INFO = 7 TOL IS TOO SMALL. NO FURTHER IMPROVEMENT IN
 C THE APPROXIMATE SOLUTION X IS POSSIBLE.
 C

C IPVT IS AN INTEGER OUTPUT ARRAY OF LENGTH N. IPVT
 C DEFINES A PERMUTATION MATRIX P SUCH THAT JAC*P = Q*R,
 C WHERE JAC IS THE FINAL CALCULATED JACOBIAN, Q IS
 C ORTHOGONAL (NOT STORED), AND R IS UPPER TRIANGULAR
 C WITH DIAGONAL ELEMENTS OF NONINCREASING MAGNITUDE.
 C COLUMN J OF P IS COLUMN IPVT(J) OF THE IDENTITY MATRIX.

C CALLING PROGRAM: GENERAL USE

C ROUTINES:

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C-----
C   NAME      SOURCE      PURPOSE
C-----
C   FCN       USER       SEE ABOVE
C   LMDER     MINPACK    DOES THE CALCULATION. FOLLOWS LATER IN THIS FILE
C-----

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C MODIFIED: WILLIAM OSBORN

C - FIRST COPIED FOR ADAS USE. REMOVED TOL FROM PARAMETERS
 C AND HARDWIRED AS DSQRT(DPMPAR(1))

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 C subroutine documentation preparation.

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DOUBLE PRECISION FJAC (LDFJAC, N) , FVEC (M) , WA (LWA)
DOUBLE PRECISION X (N)
INTEGER INFO, IPVT (N) , LDFJAC, LWA
INTEGER M, N
DOUBLE PRECISION X (N)
INTEGER N
DOUBLE PRECISION DIAG (N) , FACTOR, FJAC (LDFJAC, N)
DOUBLE PRECISION FTOL, FVEC (M) , GTOL, QTF (N)
DOUBLE PRECISION WA1 (N) , WA2 (N) , WA3 (N) , WA4 (M)
DOUBLE PRECISION X (N) , XTOL
INTEGER INFO, IPVT (N) , LDFJAC, M
INTEGER MAXFEV, MODE, N, NFEV
INTEGER NJEV, NPRINT
DOUBLE PRECISION DELTA, DIAG (N) , PAR, QTB (N)
DOUBLE PRECISION R (LDR, N) , SDIAG (N) , WA1 (N) , WA2 (N)
DOUBLE PRECISION X (N)
INTEGER IPVT (N) , LDR, N
DOUBLE PRECISION A (LDA, N) , ACNORM (N) , RDIAG (N) , WA (N)
INTEGER IPVT (LIPVT) , LDA, LIPVT, M

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INTEGER	N		
LOGICAL	PIVOT		
DOUBLE PRECISION	DIAG (N) ,	QTB (N) ,	R (LDR, N)
DOUBLE PRECISION	SDIAG (N) ,	WA (N) ,	X (N)
INTEGER	IPVT (N) ,	LDR,	N