

## ADAS Subroutine xxsplf

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      SUBROUTINE XXSPLF( LSETX , LSETY , IOPT , FINTX ,
&                      NIN   , XIN   , YIN   ,
&                      NOUT  , XOUT  , YOUT  ,
&                      X     , DY    ,
&                      Q     , D1    , D2    , D3    ,
&                      LINTRP
&                      )
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C-----
C
C ***** FORTRAN77 SUBROUTINE: XXSPLF *****
C
C PURPOSE:          TO INTERPOLATE/EXTRAPOLATE USING CUBIC SPLINES
C
C                  (IF IOPT < 0 NO EXTRAPOLATION TAKES PLACE = VALUES
C                  SET TO ZERO).- LOGICAL ARRAY 'LINTRP()' SPECIFIES
C                  WHETHER OUTPUT SPLINE IS INTERPOLATED '.TRUE.' OR
C                  EXTRAPOLATED '.FALSE.'.
C
C                  (AS FOR 'XXSPLN' EXCEPT 'LINTRP' ARGUMENT ADDED).
C                  (AS FOR 'XXSPLE' EXCEPT WITH OPTION TO USE
C                  PREVIOUSLY CALCULATED SPLINE DERIVATIVES)
C
C CALLING PROGRAMS: GENERAL USE
C
C SUBROUTINE:
C
C I/O   : (L*4)  LSETX   = .TRUE.  => SET UP SPLINE PARAMETERS RELATING
C                               TO 'XIN' AXIS.
C                               .FALSE. => DO NOT SET UP SPLINE PARAMETERS
C                               RELATING TO 'XIN' AXIS.
C                               (I.E. THEY WERE SET IN A PREVIOUS
C                               CALL )
C                               ( 'LSETX' IS ALWAYS RETURN AS '.FALSE.' ON
C                               RETURN FROM THE SUBROUTINE ).
C                               ** IMPORTANT: SEE NOTES BELOW ON 'LSETX' **
C I/O   : (L*4)  LSETY   = .TRUE.  => CALCULATE SPLINE DERIVATIVES
C                               RELATING TO 'YIN' AXIS.
C                               .FALSE. => DO NOT SET UP SPLINE DERIVATIVES
C                               RELATING TO 'YIN' AXIS.
C                               (I.E. THEY WERE SET IN A PREVIOUS
C                               CALL )
C                               ( 'LSETY' IS ALWAYS RETURN AS '.FALSE.' ON
C                               RETURN FROM THE SUBROUTINE ).
C                               ** IMPORTANT: SEE NOTES BELOW ON 'LSETY' **
C INPUT : (I*4)  IOPT    = SPLINE END CONDITIONS/EXTRAPOLATION CONTROL
C                               SWITCH - SEE NOTES BELOW
C                               I.E. DEFINES THE BOUNDARY DERIVATIVES.
C                               (VALID VALUES = 0, 1, 2, 3, 4)
C                               IF IOPT < 0 THEN NO EXTRAPOLATION TAKES
C                               - ANY VALUES REQUIRING EXTRAPOLATION WILL BE
C                               SET TO ZERO (END CONDITIONS AS FOR IOPT=0)
C INPUT : (R*8)  FINTX   = INTERPOLATING X-COORDINATE TRANSFORMATION.
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C                                     EXTERNAL FUNCTION (SEE ROUTINES BELOW)
C
C INPUT : (I*4)  NIN      = NUMBER OF KNOTS
C INPUT : (R*8)  XIN()    = X-VALUES OF KNOTS
C INPUT : (R*8)  YIN()    = Y-VALUES OF KNOTS
C
C INPUT : (I*4)  NOUT     = NUMBER OF OUTPUT VALUES TO BE INTERPOLATED
C                                     EXTRAPOLATED.
C INPUT : (R*8)  XOUT()   = X-VALUES AT WHICH INTERPOLATION/EXTRAPOLA-
C                                     TION REQUIRED
C OUTPUT: (R*8)  YOUT()   = INTERPOLATED/EXTRAPOLATED Y-VALUES FOR
C                                     REQUESTED 'XOUT()' VALUES.
C
C I/O   : (R*8)  X()      = TRANSFORMED VALUES OF 'XIN()'. (ARRAY SIZE:
C                                     NIN) REQUIRED INPUT IF LSETX IS .FALSE.
C I/O   : (R*8)  DY()     = DERIVATIVES AT INPUT KNOTS. REQUIRED INPUT
C                                     IF LSETY IS .FALSE.
C I/O   : (R*8)  Q()      = SECOND DERIVATIVE FOR KNOT. REQUIRED INPUT
C                                     IF LSETX IS .FALSE. AND LSETY IS .TRUE.
C I/O   : (R*8)  D1()     = MULTIPLICATION FACTOR USED IN CALCULATING
C                                     'U()'. REQUIRED INPUT IF LSETX IS .FALSE.
C                                     AND LSETY IS .TRUE.
C I/O   : (R*8)  D2()     = MULTIPLICATION FACTOR USED IN CALCULATING
C                                     'U()'. REQUIRED INPUT IF LSETX IS .FALSE.
C                                     AND LSETY IS .TRUE.
C I/O   : (R*8)  D3()     = MULTIPLICATION FACTOR USED IN CALCULATING
C                                     'U()'. REQUIRED INPUT IF LSETX IS .FALSE.
C                                     AND LSETY IS .TRUE.
C
C OUTPUT: (L*4)  LINTRP() = .TRUE.  => 'YOUT()' VALUE INTERPOLATED.
C                                     .FALSE. => 'YOUT()' VALUE EXTRAPOLATED.
C                                     (ARRAY SIZE: NOUT)
C
C (I*4)  NKNOTS = PARAMETER = MAXIMUM NUMBER OF KNOTS ALLOWED
C (I*4)  NIOPT  = PARAMETER = MAXIMUM VALUE OF IOPT ALLOWED
C
C (I*4)  I      = GENERAL ARRAY USE
C (I*4)  K      = INDEX OF 'XOUT()' VALUE FOR INTERPOLATION/
C                                     EXTRAPOLATION.
C (I*4)  NIN0   = 'NIN' - 1
C (I*4)  INTER  = INDEX OF CLOSEST/NEXT HIGHEST VALUE OF
C                                     'XIN()' TO THE VALUE OF 'XOUT()' BEING
C                                     INTERPOLATED/EXTRAPOLATED. WHEN LOOPING
C                                     OVER MULTIPLE YOUT EVALUATIONS, THE INDEX
C                                     OF THE LAST EVALUATION IS USED AS THE
C                                     INITIAL GUESS FOR THE NEXT.
C (I*4)  NOPT   = VALUE OF 'IOPT' USED IN CALCULATING END-
C                                     CONDITIONS FOR STORED 'X-VALUE' SPLINE
C                                     PARAMETERS. (NOTE: IF 'IOPT < 0', THEN
C                                     'NOPT = 0'.) - I.E. 'NOPT = MAX( 0, IOPT )'.
C
C (R*8)  XK     = VALUE OF 'XOUT(K)' BEING INTERPOLATED/
C                                     EXTRAPOLATED

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C (R\*8) XKK = TRANSFORMED VALUE OF 'XOUT(K)' BEING  
 C INTERPOLATED/EXTRAPOLATED.  
 C (R\*8) T1 = INVERSE OF SEPARATION OF KNOTS EITHER  
 C SIDE OF CURRENT KNOT.  
 C (R\*8) T2 = (CURRENT KNOT POSITION TO NEXT HIGHEST KNOT  
 C POSITION) DIVIDED BY 'T1'  
 C (R\*8) T3 = (CURRENT KNOT POSITION TO NEXT LOWEST KNOT  
 C POSITION) DIVIDED BY 'T1'  
 C (R\*8) T4 = INTERPOLATION FACTOR FOR CURRENT KNOT  
 C (R\*8) DL1 = (REQUESTED 'XOUT()' VALUE TO NEXT HIGHEST  
 C KNOT POSITION) DIVIDED BY SEPARATION OF  
 C KNOTS EITHER SIDE OF 'XOUT(K)'.  
 C (R\*8) DL2 = (REQUESTED 'XOUT()' VALUE TO NEXT LOWEST  
 C KNOT POSITION) DIVIDED BY SEPARATION OF  
 C KNOTS EITHER SIDE OF 'XOUT(K)'.  
 C (R\*8) DL2 = (REQUESTED 'XOUT()' VALUE TO NEXT LOWEST  
 C (R\*8) DL3 = SEPARATION OF KNOTS EITHER SIDE OF  
 C 'XOUT(K)' \* 'DL1' \* 'DL2'.  
 C  
 C (L\*4) LEXTRP = .TRUE. => 'EXTRAPOLATION SWITCHED ON'.  
 C .FALSE. => 'EXTRAPOLATION SWITCHED OFF'.  
 C  
 C (R\*8) QVAL() = VALUE OF 'Q(1)' : FUNCTION OF 'NOPT'  
 C (R\*8) D2VAL() = VALUE OF 'D2(1)' : FUNCTION OF 'NOPT'  
 C (R\*8) D3VAL() = VALUE OF 'D3(1)' : FUNCTION OF 'NOPT'  
 C (R\*8) UVAL() = VALUE OF 'U(NIN)' : FUNCTION OF 'NOPT'  
 C (R\*8) AGRL() = POLYNOMIAL CONSTANTS FOR CUBIC SPLINE FOR  
 C GIVEN 'XOUT(K)' VALUE.  
 C (R\*8) H() = SEPARATION, ALONG X-AXIS, OF KNOT FROM NEXT  
 C HIGHEST KNOT.  
 C (R\*8) HINTER = SEPARATION, ALONG X-AXIS, IN INTERVAL FOR  
 C INTERPOLATION  
 C (R\*8) U() = TEMPORARY STORAGE OF DECOMPOSED FACTORS  
 C (R\*8) DELY() = SEPARATION, ALONG Y-AXIS, OF KNOT FROM NEXT  
 C HIGHEST KNOT.  
 C  
 C (L\*4) LUVAL() = .TRUE. => VALUE OF 'UVAL()' REFERS TO RATE  
 C OF CHANGE OF SLOPE AT FINAL POINT.  
 C .FALSE. => VALUE OF 'UVAL()' REFERS TO FINAL  
 C SLOPE  
 C FUNCTION OF 'NOPT'

C NOTES: 'LSETX': SET TO .TRUE. ON ENTRY IF A NEW 'XIN' ARRAY IS BEING  
 C USED. IF THE 'XIN' AXIS IS THE SAME FOR A NUMBER OF  
 C CALLS THEN DO NOT RESET 'LSETX' - THIS SUBROUTINE  
 C SETS IT TO .FALSE. FOR YOU. IF THE VALUE OF 'NOPT'  
 C IS CHANGED BETWEEN CALLS THEN THE VALUE OF 'LSETX'  
 C ON ENTRY IS TAKEN AS BEING EQUAL TO .TRUE. NOPT IS  
 C INITIALISED TO -1 SO THAT LSETX WILL BE SET .TRUE.  
 C ON THE FIRST CALL OF THIS SUBROUTINE.

C THEREFORE 'LSETX' NEED ONLY BE SET TO .TRUE. ON ENTRY  
 C IF ANY ONE OF THE FOLLOWING VALUES HAS CHANGED:



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C -----
C FINTX ----- EXTERNAL REAL*8 FUNCTION, USED TO
C TRANSFORM X-COORDINATES.
C XXHUNT ----- SEARCH ROUTINE FOR FINDING INTERVAL
C CONTAINING A PRESCRIBED VALUE IN A
C MONOTONIC VECTOR. INITIAL GUESSES ARE
C USED TO SPEED THE SEARCH.
C
C
C AUTHOR: LORNE D. HORTON (IPP GARCHING)
C L5.213
C IPP EXT. 1635
C DATE: 18/03/03
C
C -----
C Notes: AS FOR 'XXSPLE' BUT WITH 'LSETY' ADDED TO ALLOW
C EXTERNAL SAVING OF SPLINE COEFFICIENTS (FOR
C EXAMPLE, WHEN IT IS NECESSARY TO HOLD MORE THAN
C ONE SPLINE RESULT AT A TIME). IN ADDITION, A
C HUNT ALGORITHM 'XXHUNT' FOR SPEEDING EVALUATION
C HAS BEEN ADDED.
C
C
C XXSPLE COMMENTS
C
C AUTHOR: PAUL E. BRIDEN (TESSELLA SUPPORT SERVICES PLC)
C K1/0/81
C JET EXT. 4569
C
C DATE: 14/01/91 - ADAS91: AS FOR 'XXSPLN' BUT WITH 'LINTRP()' ADDED
C
C VERSION: 1.2
C
C MODIFIED: LORNE HORTON (JET) DATE: 25/10/97
C - ADDED IOPT CHOICES 5, 6 AND 7
C
C VERSION: 1.3
C
C MODIFIED: Martin O'Mullane (JET) DATE: 2/6/99
C - SAVE nin0 and inter variables also. All compilers, ie
C especially g77, do not automatically save (or initialise
C variables to zero).
C
C -----
C
C VERSION : 1.1
C DATE : 18-03-2003
C MODIFIED : Lorne Horton
C - First version.
C
C VERSION : 1.2
C DATE : 10-04-2007
C MODIFIED : Allan Whiteford

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C                   - Modified documentation as part of automated  
C   subroutine documentation preparation.

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INTEGER	IOPT,	NIN,	NOUT	
LOGICAL	LINTRP (NOUT) ,		LSETX,	LSETY
REAL*8	D1 (NIN) ,	D2 (NIN) ,	D3 (NIN) ,	DY (NIN)
REAL*8	Q (NIN) ,	X (NIN) ,	XIN (NIN)	
REAL*8	XOUT (NOUT) ,	YIN (NIN) ,	YOUT (NOUT)	