

ADAS Subroutine xxsple

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      SUBROUTINE XXSPLE( LSETX , IOPT   , FINTX ,
&                      NIN   , XIN    , YIN   ,
&                      NOUT  , XOUT   , YOUT  ,
&                      DY    , LINTRP
&                      )
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C-----
C
C ***** FORTRAN77 SUBROUTINE: XXSPLE *****
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
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 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.
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
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C OUTPUT: (R*8)  DY()      = DERIVATIVES AT INPUT KNOTS (ARRAY SIZE: NIN)
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.
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
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 SEPERATION OF
C                   KNOTS EITHER SIDE OF 'XOUT(K)'.
C (R*8)  DL2     = (REQUESTED 'XOUT()' VALUE TO NEXT LOWEST
C                   KNOT POSITION) DIVIDED BY SEPERATION OF
C                   KNOTS EITHER SIDE OF 'XOUT(K)'.
C (R*8)  DL2     = (REQUESTED 'XOUT()' VALUE TO NEXT LOWEST
C (R*8)  DL3     = SEPERATION 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)  X()     = TRANSFORMED VALUES OF 'XIN()'
C (R*8)  H()     = SEPERATION, ALONG X-AXIS, OF KNOT FROM NEXT
C                   HIGHEST KNOT.

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C (R*8) Q () = SECOND DERIVATIVE FOR KNOT
 C (R*8) U () = TEMPORARY STORAGE OF DECOMPOSED FACTORS
 C (R*8) DELY () = SEPERATION, ALONG Y-AXIS, OF KNOT FROM NEXT
 C HIGHEST KNOT.
 C (R*8) D1 () = MULTIPLICATION FACTOR USED IN CALCULATING
 C 'U ()'.
 C (R*8) D2 () = MULTIPLICATION FACTOR USED IN CALCULATING
 C 'U ()'.
 C (R*8) D3 () = MULTIPLICATION FACTOR USED IN CALCULATING
 C 'U ()'.
 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. .

C THEREFORE 'LSETX' NEED ONLY BE SET TO .TRUE. ON ENTRY
 C IF EITHER IT IS ITS FIRST CALL OR IF ANY ONE OF THE
 C FOLLOWING VALUES HAS CHANGED:

C 'NIN' , 'FINTX' , 'XIN(I), I=1,NIN'

C CARE: A VARIABLE MUST BE USED FOR 'LSETX', A CONSTANT,
 C I.E. .TRUE. , CANNOT BE DIRECTLY TYPED AS AN
 C ARGUMENT BECAUSE IT WILL BE CHANGED TO .FALSE.
 C ON RETURN.

C SPLINE END CONDITIONS AND EXTRAPOLATION DEPEND ON 'IOPT' AS
 C FOLLOWS:

IOPT	NOPT	DY(1)	DDY(1)	DY(N)	DDY(N)	EXTRAP'N
< 0	0	-	0.0	-	0.0	NO
0	0	-	0.0	-	0.0	YES
1	1	-	0.0	-1.5	-	YES
2	2	0.0	-	1.0	-	YES
3	3	-0.5	-	-1.5	-	YES
4	4	0.0	-	-	0.0	YES
5	5	-4.5	-	-1.5	-	YES
6	6	+0.5	-	-	0.0	YES
7	7	-3.5	-	-	0.0	YES

C NB. OPTIONS TO BE EXTENDED FOR POWER AND CX APPLICATION

C
C
C -----
C IF (IOPT.LT.0) - NO EXTRAPOLATION TAKES PLACE VALUES SET
C TO ZERO (CARE IF LOG OF OUTPUT IS NEEDED).
C IF (IOPT.GT.7) PROGRAM STOPS
C -----
C

C THIS SUBROUTINE IS AN AMENDED AND STRUCTURED VERSION OF THE
C SUBROUTINE 'ESPLINE' WRITTEN BY H.P. SUMMERS, JET 26TH
C OCTOBER 1989. IT REMOVES THE COMMON BLOCK /IONSPL/ , THE
C SWITCHES 'ISW & ISW2' AND ALSO THE CASE FOR THE INTERPOLATION
C OF CHARGE STATE VALUES. IT INTRODUCES THE FEATURE THAT AN
C ARRAY OF INPUT 'X-VALUES' CAN BE INTERPOLATED/EXTRAPOLATED
C IN ONE CALL.
C

C ROUTINES:

ROUTINE	SOURCE	BRIEF DESCRIPTION
FINTX	-----	EXTERNAL REAL*8 FUNCTION, USED TO TRANSFORM X-COORDINATES.

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 VERSION : 1.4

C DATE : 10-04-2007

C MODIFIED : Allan Whiteford

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

INTEGER	IOPT,	NIN,	NOUT
LOGICAL	LINTRP (NOUT),		LSETX
REAL*8	DY (NIN),	XIN (NIN),	XOUT (NOUT)
REAL*8	YIN (NIN),	YOUT (NOUT)	