PC02

PACKAGE SPECIFICATION HSL ARCHIVE

1 SUMMARY

Given n+1 points x_i, y_i i=0, 1, 2 ,..., n calculates the **coefficients of the polynomial that passes through** all n+1 **points,** i.e. the interpolation polynomial

$$P(x) = a_0 + a_1 x + a_2 x^2 + ... + a_n x^n$$

such that

$$P(x_i) = y_i \qquad i=0, 1, 2,..., n.$$

The coefficients of the Lebesgue polynomials $L_k(x)$, i.e. such that $L_k(x_i) = 0$, $i \neq k$ and $L_k(x_k) = 1$, are calculated using `PC01` and `PB01`, the coefficients $a_0, a_1,..., a_n$ are then obtained from

$$P(x) \equiv \sum_{k=0}^{n} y_k L_k(x)$$

ATTRIBUTES — **Version:** 1.0.0. **Types:** `PC02A`; `PC02AD`. **Calls:** `PB01` and `PC01`. **Original date:** May 1964. **Origin:** L.Morgan, Harwell.

2 HOW TO USE THE PACKAGE

2.1 Argument list

The single precision version

```
CALL PC02A(X,Y,COE,W1,W2,N)
```

The double precision version

```
CALL PC02AD(X,Y,COE,W1,W2,N)
```

`X` is a `REAL` (`DOUBLE PRECISION` in the D version) array which must be set by the user to contain the x coordinates of the points, i.e. set `X(I)`, `I`=1, 2,..., `N+1` to the values x_i, i=0, 1, 2,..., n.

`Y` is a `REAL` (`DOUBLE PRECISION` in the D version) array which must be set by the user to contain the y coordinates of the points, i.e. set `Y(I)`, `I`=1, 2,..., `N+1` to the values y_i, i=0, 1, 2,..., n.

`COE` is a `REAL` (`DOUBLE PRECISION` in the D version) array of length at least n+1 which wil be set by the subroutine to contain the coefficients of the polynomial, i.e. a_i, i=0, 1, 2,..., n will be returned in `COE(I)`, `I`=1, 2,..., `N+1`.

`W1` is a `REAL` (`DOUBLE PRECISION` in the D version) array of length at least n+2 which is used by the subroutine as workspace.

`W2` is a `REAL` (`DOUBLE PRECISION` in the D version) array of length at least n+1 which is used by the subroutine as workspace.

`N` is an `INTEGER` which must be set by the user to n the degree of the polynomial.

3 GENERAL INFORMATION

Workspace: Provided by the user in the argument arrays `W1` and `W2`.

Use of common: None.

Other routines called directly: `PB01` and `PC01`.

Input/output: None.

Restrictions: None.

4 METHOD

The coefficients of the Lebesgue polynomials $L_k(x)$, i.e. such that $L_k(x_i)=0$, $i \neq k$ and $L_k(x_k)=1$, are calculated using `PC01` and `PB01`, the coefficients $a_0, a_1, ..., a_n$ are then obtained from

$$P(x) \equiv \sum_{k=0}^{n} y_k L_k(x)$$