Rdocumentation

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`AUC_time_weights_estimation` *Weights for AUC Matrix Formulation*

Description

In matrix formulation, the area under a curve of interest, named *Y*, can be expressed as matrix product of a vector of weights *W* and the vector of the values of *Y*. This function calculates the weights *W* when AUC is calculated either by the trapezoid, the Lagrange or the Spline interpolation methods.

Usage

```
AUC_time_weights_estimation(time, method)
```

Arguments

`time`	a numerical vector of time points of length m (x-axis coordinates for AUC calculation).
`method`	a character scalar indicating the interpolation method of interest. Options are 'trapezoid', 'lagrange' and 'spline'. In this version the 'spline' interpolation method is implemented with the "not-a-knot" spline boundary conditions.

Details

In matrix formulation, the AUC of the outcome Y can be expressed as $AUC = W \cdot Y$, with W defined by the following expressions for the trapezoid, the Lagrange and the spline interpolation methods.

Trapezoid method:

$$W_j = \frac{t_{j+1} - t_j}{2} \; if \; j = 1$$

$$W_j = \frac{t_j - t_{j-1}}{2} \; if \; j = m$$

$$W_j = \frac{t_{j+1} - t_{j-1}}{2} \; otherwise$$

Lagrange method: (see AUC_Lagrange_Cjp_coefficients for the definition of the Cjp coefficients)

$$W_j = \frac{C_{[2][j-1]}}{\prod_{l=0;\ l\neq(j-1)}^{P=2}(t_j - t_{j+1})} + \sum_{p=0}^{P=3} \frac{C_{[j-1+p][3-p]}}{\prod_{l=0;\ l\neq(3-p)}^{P=3}(t_j - t_{j-3+p+l})}\ if\ j = 1,2,3$$

$$W_j = \frac{C_{[m][j-(m-2)]}}{\prod_{l=0;\ l\neq(j-(m-2))}^{P=2}(t_j - t_{j-2+l})} + \sum_{p=0}^{m-j} \frac{C_{[j-1+p][3-p]}}{\prod_{l=0;\ l\neq(3-p)}^{P=3}(t_j - t_{j-3+p+l})}\ if\ j = m-2, m-1, m$$

$$W_j = \sum_{p=0}^{m-j} \frac{C_{[j-1+p][3-p]}}{\prod_{l=0;\ l\neq(3-p)}^{P=3}(t_j - t_{j-3+p+l})}\ otherwise$$

Spline method: (see AUC_Spline_matrix_A and AUC_Spline_matrix_B for the definition of Matrices A and B)

$$W_j = \sum_{p=2}^{m} -\frac{(t_p - t_{p-1})^3}{24}(u_{pj} + u_{p-1j}) + W_j^{trap.}$$

where (u_{pj}) is the element $U(p,j)$ with U a matrix defined as $U = A^{-1}B$.

Value

A numerical scalar with same length than the vector `time` corresponding to the weights *W*.

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