Chester-le-Street ASC

The Equivalent Time Algorithm

The Chester-le-Street ASC Time Converter, which is accessible online and within the Chester-le-Street ASC Online Membership System uses the British Swimming/SPORTSYSTEMS Equivalent Time Algorithm.

This document provides a high-level technical description of the operation of the the clsasc/equivalent-time package.

1 How it works

1.1 In brief

Put simply, the converter converts the time to 50 metres, if it is not already and then converts it to the required course length. This is required to normalize the time.

2 Equations

2.1 Conversion to 50m Time

$$longCourseTime = \frac{sourceTime + \sqrt{sourceTime^2 + 4 \times poolMeasure \times turnFactor \times numTurnFactor}}{2 \times poolMeasure}$$

Where $sourceTime \in \mathbb{R}$.

It follows that $longCourseTime \in \mathbb{R}$. The system provides methods for getting converted times as both real numbers and in a traditional time format (a string).

2.2 Conversion to requestes course length

$$distanceTime = longCourseTime \times poolMeasure$$

$$turnTime = turnValue \times \frac{imperialDistance}{100} + (turnsPerHundred - 1)$$

$$convertedTime = distanceTime \times turnTime + 0.05$$

$$result = \frac{\lfloor convertedTime \times 10 \rfloor}{10}$$

3 Required Data

3.1 poolMeasure

The poolMeasure is a real number ($\mathbb{R}$) which is specified for each event. The number is not calculated but is specified in the algorithm The Chester-le-Street-ASC/EquivalentTime package contains a PoolMeasure class which provides a static function, which when called with a valid pool course length and event string returns a poolMeasure value.

3.2 turnFactor

The turnFactor is a real number ($\mathbb{R}$) that is specified in the algorithm for each event. The package contains a Turns class which provides a static function to get the turnFactor for an event.

3.3 turnsPerHundred

The number of turns per hundred depends on the length of the pool. For example in a 50m pool, the number of turns per hundred is 1, in a $33\frac{1}{3}$m pool it is 2 and in a 25m pool it is 3. It is possible to calculate turnsPerHundred, but as with poolMeasure and turnFactor, we just use a function to return the value given a pool course length string.

3.4 numTurnFactor

The numTurnFactor is used as part of taking into consideration the number of turns per hundred.

$$numTurnFactor = \frac{distance}{100} \times \frac{imperialDistance}{100} \times (turnsPerHundred - 1)$$

3.5 turnValue

The turnValue is a value which relates turnFactor, distance and longCourseTime.

$$turnValue = \frac{turnFactor}{longCourseTime} \times \frac{distance}{100}$$

3.6 imperialDistance

The imperialDistance is a special case used when converting 1500 events in a pool measured in yards. Normally $imperialDistance = distance$ but in this special case $imperialDistance = 1650$.

The $imperialDistance = 1650$ when $distance = 1500$ and $poolLengthFlag = 3$.