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Finding The Next Term Of Any Sequence Using Total Similarity & Dissimilarity {Version 5}

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Abstract

In this research investigation, the author has detailed a novel scheme of finding the next term of any given sequence.

Theory

Rule 1

For any given sequence of two numbers $S=\{a_1,a_2\}$ we write we write a Truth Statement Equation regarding a_3 as follows:

$$a_3=\frac{\left\{\overbrace{\sum_{i=1}^{n=2}\{Smaller(a_i,a_3)\}}^{DirectSimilarity}\right\}+\left\{\overbrace{\sum_{i=1}^{n=2}\{Larger(a_i,a_3)-Smaller(a_i,a_3)\}}^{DirectDissimilarity}\right\}}{(n=2)} \quad \text{Equation 1}$$

The above is a special kind of Congruence Part (Direct Similarity) and Non-Congruence Part Average (Direct Dissimilarity) of a_3 with respect to a_1 and a_2.

The above Equation cannot be solved for a_3 but can be used to find a_3 by guessing its value. For the correct guess, i.e., the true value of a_3, i.e., the next Term of the Sequence, the above Equation is satisfied, i.e., LHS=RHS.

One can note that this Grand Equation can be used to find the Next Prime as well, given a sequence of Primes from the beginning, while considering 1 as Prime as well, i.e., the beginning or first Prime. One can note the concepts of Similarity & Dissimilarity from author's [1]. The author calls $\sum_{i=1}^{n=2}\{Smaller(a_i,a_3)\}$ as Direct Dissimilarity and $\sum_{i=1}^{n=2}\{Larger(a_i,a_3)-Smaller(a_i,a_3)\}$ as Direct Dissimilarity.

For Guessing, we can usually start with a Guess value much smaller than the smallest data value of the dataset and keep increasing its value by very small increments till the value of the δ_j tends to zero within the limits of our computational ability to guess. The δ_j is given by

$$\delta_j = a_{3Guess} = \frac{\left\{\overbrace{\sum_{i=1}^{n=2}\{Smaller(a_i,a_{3Guess})\}}^{DirectSimilarity}\right\} + \left\{\overbrace{\sum_{i=1}^{n=2}\{Larger(a_i,a_{3\,Guess})-Smaller(a_i,a_{3\,Guess})\}}^{DirectDissimilarity}\right\}}{(n=2)}$$

Equation 3

where a_3 is the j^{th} Guess for a_3

We now consider any given Sequence of the kind,
$S=\{y_1,y_2,y_3,.......,y_{n-1},y_n\}$ which can be further denoted as
$S_{1A}=\{_{L1A}y_1,_{L1A}y_2,_{L1A}y_3,.......,_{L1A}y_{n-1},_{L1A}y_n\}$ where $L1A$ stands for Level One Actual.
We now prepare a table of differences as follows

$_{L1A}y_1$	$_{L1A}y_2$	$_{L1A}y_3$	$_{L1A}y_4$	.	.	$_{L1A}y_{n-1}$	$_{L1A}y_n$
		$_{L1R}y_3$	$_{L1R}y_4$	.	.	$_{L1R}y_{n-1}$	$_{L1R}y_n$
		$\delta_{L1AR3}=$ $_{L1A}y_3-_{L1R}y_3$	$\delta_{L1AR4}=$ $_{L1A}y_4-_{L1R}y_4$			$\delta_{L1AR(n-1)}=$ $_{L1A}y_{n-1}-_{L1R}y_{n-1}$	$\delta_{L1ARn}=$ $_{L1A}y_n-_{L1R}y_n$

where $_{L1R}y_3,_{L1R}y_4,.....,_{L1R}y_{n-1},_{L1R}y_n$ are found applying the aforestated Rule 1, considering two consecutive terms at a time to find the next term.
We now write S_{2A} as
$S_{2A}=\{\delta_{L1AR3},\delta_{L1AR4}.......,\delta_{L1AR(n-1)},\delta_{L1AR(n)}\}$. For the convenience of notation, we write
$S_{2A}=\{_{L2A}y_{3,}\ _{L2A}y_{3,}.......,_{L2A}y_{n-1},_{L2A}y\}$

We now prepare a table of differences as follows

		$_{L2A}y_3$	$_{L2A}y_4$	$_{L2A}y_5$	.	$_{L2A}y_{n-1}$	$_{L2A}y_n$
				$_{L2R}y_5$	.	$_{L2R}y_{n-1}$	$_{L2R}y_n$
				$\delta_{L2AR5}=$ $_{L2A}y_5-_{L2R}y_5$		$\delta_{L2AR(n-1)}=$ $_{L2A}y_{n-1}-_{L2R}y_{n-1}$	$\delta_{L2ARn}=$ $_{L2A}y_n-_{L2R}y_n$

where ${}_{L2R}y_5, {}_{L2R}y_6, \ldots, {}_{L2R}y_{n-1}, {}_{L2R}y_n$ are found applying the aforestated Rule 1, considering two consecutive terms at a time to find the next term.

We now write S_{3A} as

$S_{3A} = \{\delta_{L2AR5}, \delta_{L2AR6} \ldots\ldots, \delta_{L2AR(n-1)}, \delta_{L2AR(n)}\}$. For the convenience of notation, we write

$S_{3A} = \{{}_{L3A}y_{5,}\ {}_{L3A}y_{6,} \ldots\ldots, {}_{L3A}y_{n-1}, {}_{L3A}y_n\}$

In a similar fashion, we keep writing till we can no more do so. That is, till we get

$S_{kA} = \{\delta_{LkAR(n-1)}, \delta_{LkAR(n)}\}$

$S_{kA} = \{{}_{LkA}y_{n-1}, {}_{LkA}y_n\}$ for some k, a positive integer.

Using the aforestated Rule 1, we now find ${}_{L2R}y_{n+1}, {}_{L3R}y_{n+1}, \ldots\ldots, {}_{L(k-1)R}y_{n+1}$ and ${}_{LkR}y_{n+1}$ as we have the previous two terms for each of them. Finally, we now add all these to get

$$y_{n+1} = {}_{L1A}y_{n+1} = \left({}_{L2R}y_{n+1} + {}_{L3R}y_{n+1} + \ldots\ldots + {}_{L(k-1)R}y_{n+1} + {}_{LkR}y_{n+1}\right)$$

The author will detail in the next following version of this research manuscript, the mathematics of analysis of the same if the cases of negative differences crop up.

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