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# Novel Computation of Algorithmic Geometric Series and Summability

Chinnaraji Annamalai*[1]

[1]Indian Institute of Technology Kharagpur

**ABSTRACT**

This paper presents a new mathematical technique for computation of geometric series and summability. This technique uses Annamalais computing model of algorithmic geometric series and its mathematical structures for further development of the infinite geometric series and summability. This could be very interesting and informative for current students and researchers.In the research study, a novel technique has been presented for formation and computation of infinite geometric series and summability.

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## 1 Introduction

Annamalais computing model [1] has provided a novel approach for computation of geometric series in a new way.

$$\sum_{i=-m}^{n-1} ax^i = \frac{a(x^n - x^{-m})}{x-1} \Leftrightarrow ax^n = ax^n, (x \neq 1) \tag{1}$$

*Corresponding author: Chinnaraji Annamalai. Email: anna@iitkgp.ac.in

$$a\sum_{i=k}^{a} x^i = \frac{ax^k}{1-x} \quad (0 < x < 1) \tag{2}$$

where $k > 0$ is an integer constant.

# 2 Algorithmic Geometric Series

$$(1a)\sum_{i_1=0}^{+\infty} ax^{i_1}\frac{a}{1-x} \quad (1b)\sum_{i_1=k}^{+\infty} ax^{i_1} = \frac{ax^k}{1-x} \tag{3}$$

$$(2a)\sum_{i_1=0}^{+\infty}\sum_{i_2=i_1} ax^{i_2} = \sum_{i_2=0}^{+\infty} ax^{i_2} + \sum_{i_2=1}^{+\infty} ax^{i_2} + \sum_{i_2=3}^{+\infty} ax^{i_2} + .... = \frac{a}{(1-x)^2} \tag{4}$$

$$(2b)\sum_{i_1=k}^{+\infty}\sum_{i_2=i_1} ax^{i_2} = \sum_{i_2=k}^{+\infty} ax^{i_2} + \sum_{i_2=k+1}^{+\infty} ax^{i_2} + \sum_{i_2=k+2}^{+\infty} ax^{i_2} + .... = \frac{ax^k}{(1-x)^2} \tag{5}$$

Similarly, we can further generate the infinite geometric series and summability.

$$(Na)\sum_{i_1=0}^{+\infty}\sum_{i_2=i_1}^{+\infty}\sum_{i_3=i_2}^{+\infty} .... \sum_{i_n=i_{n-1}}^{+\infty} ax^{i_n} = \frac{a}{(1-x)^n} \tag{6}$$

$$(Nb)\sum_{i_1=k}^{+\infty}\sum_{i_2=i_1}^{+\infty}\sum_{i_3=i_2}^{+\infty} .... \sum_{i_n=i_{n-1}}^{+\infty} ax^{i_n} = \frac{ax^k}{(1-x)^n} \tag{7}$$

Here, if $a = 1$ , then

$$\sum_{i_1=0}^{+\infty}\sum_{i_2=i_1}^{+\infty}\sum_{i_3=i_2}^{+\infty} .... \sum_{i_n=i_{n-1}}^{+\infty} x^{i_n} = \frac{1}{(1-x)^n} \tag{8}$$

&

$$\sum_{i_1=k}^{+\infty}\sum_{i_2=i_1}^{+\infty}\sum_{i_3=i_2}^{+\infty}....\sum_{i_n=i_{n-1}}^{+\infty} x^{i_n} = \frac{x^k}{(1-x)^n} \tag{9}$$

Note that the above serial numbers denote the ranges (1a),(2a),(3a),.....,(Na) and (1b),(2b),(3b),....,(Nb).

# 3 Conclusion

In the research study, a novel technique has been presented for formation and computation of infinite geometric series and summability.

# References

[1] Annamalai C 2018 Annamalais Computing Model for Algorithmic Geometric series and Its Mathematical Structures, Mathematics and Computer Science Science Publishing Group, USA, Vol 3(1), pp 1-6.