A brief Survey of Infinite series

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Abstract- Mathematics is obviously important in the science. The degree to which God has any superbness is absolutely infinite. Here we briefly survey and discuss the Infinite series of Mathematics and its convergence and divergence. We also discuss the relationship between mathematics and computer. How the computer science is related to Mathematics.

Keywords- Infinite series, Convergence, divergence

I. INTRODUCTION

The conceptual science of number, quantity, and space, either as abstract concepts (*pure mathematics*), or as applied to other disciplines such as physics and engineering is known as mathematics. A series is a sum of a terms in sequence and the sequence can be of any type in mathematical form like fractional numbers, prime numbers, even, odd etc. a series can be of any type like number of events occurs, people of same kind, number of objects these all are in daily life and it can goes upto infinity. Infinite sequence of numbers { a_n }, a series gives the result of adding all the terms together like $a_1 + a_2 + a_3 + \cdot \cdot \cdot$.These can be written using the summation symbol $\sum$.

$$\sum_{n=1}^{\infty} 1/2^n = 1/2+1/4+1/8+\ldots\ldots.$$

The above equation we have used is for the complex numbers, real numbers, rational numbers in the ordered sum but if we have The sequence of partial sums s_k which is associated to a series $\sum_{n\to 0}^{\infty} a_n$ is defined for
each k as the sum of the sequence $\{a_n\}$
from a_0 to a_k.

$$S_k=\sum_{n\to 0}^{\infty} a_n=a_0+a_1+\ldots..+a_k$$

An **infinite sequence** $<a_n>$ is going to be converge to a real number which is L if a_n sequence is infinitely close to L for all positive infinite hyper integers H (shown in Fig.1). L is known as the limit of the sequence and which is written as:

$$L=\lim_{n\to x} a^n$$

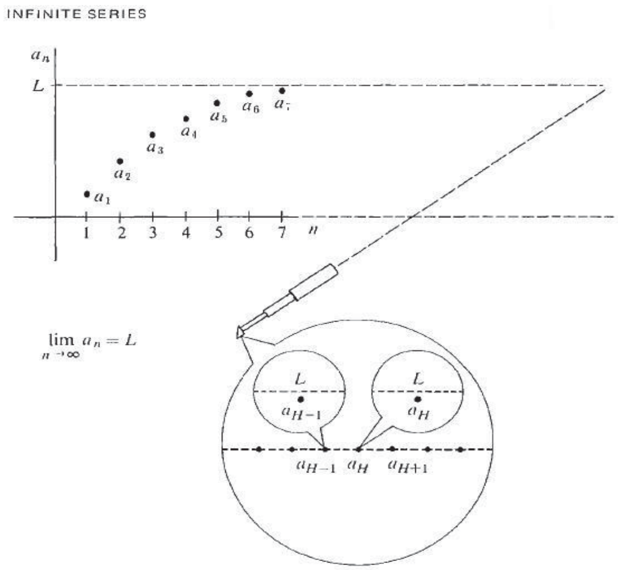

Fig.1 Infinite series

A given sequence or series which does not converges to any real number is known as diverge means the series is divergence. If a_H is positive infinite for all positive infinite hyper integers H, the sequence is diverge to ∞, and we write as.

$$\mathrm{Lim}_{n\to\infty}\ a^n=\infty$$

A Sequences can diverge to — ∞ and also diverge without diverging to ∞ or to — ∞.

II. CONVERGENCE IN SERIES

Now we studied that what is convergence and how it can occur. A series can be convergent if the sum of its partial series or sequence S_n be converges by taking the finite limit. If the limit of S_n sequence does not exist than series is diverge. If the limit of partial sum exists it is known as the sum of series.

$$\sum^{\infty}_{n\to 0} a_n=\lim_{n\to\infty}S_n=\sum^{N}_{n\to 0} a_n$$

If all the a_n are zero than the infinite series can converge. In the above fig.1 we have taken the harmonic series to clearly understand the problem that limit exist or not. If limit exist than series converge. Here we take number of series and calculate the partial sum which tells us that series convergence. Let the Harmonic series H

$$H=1+1/2+1/3+1/4+\ldots..$$

Here we calculate the partial sum by counting the number of terms.number of terms are 4.Partial sum is 2.0833.It converges because its terms are Positive and value is greater than 1. If the value is less than 1 than the series diverges. For calculatung the convergence of series have to use calculator for calculations otherwise use copy and pen to calculate which is very time consuming.

III. EXAMPLES

- *A Geometric series is*

$$\sum^{\infty}_{n=0} z^n$$

In this we multiply the previous terms with the constant number to produced the successive result

$$1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\cdots+\sum_{n=0}^{\infty} 1/2^n$$

It converges if $|z| < 1$.

- *An Arithmetico geometric series is*

$$3+\frac{5}{2}+\frac{7}{4}+\cdots+\sum_{n\to\infty}^{\infty}(3+2n)/2^n$$

- **p series** is

$$\sum_{n=1}^{\infty} 1/n^r$$

If $r > 1$ series converges, $r < 1$ than diverges. The all above examples describe the convergence test.

IV. UNIFORM CONVERGENCE

Let the sequence in the form of function$\{f_1,f_2,f_3,\ldots\}$. The series $\sum_{n=1}^{\infty} f_n$ is converges uniformly to *f* if the sequence $\{S_n\}$ of partial sum which is defined by

$$S_n(x) = \sum_{k=1}^{n} f_k(x)$$

Which is converges to f.

V. RELATIONSHIP BETWEEN MATHEMATICS AND COMPUTER SCIENCE

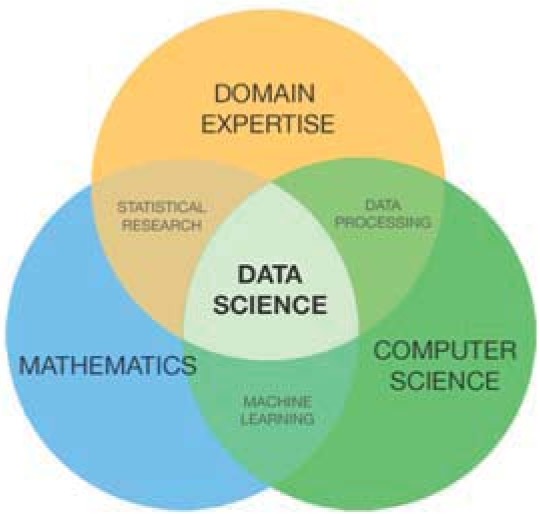

Fig.2 Relationship between Mathematics and Computer Science

The mathematics and Computer science having a great relationship. The computer science is the branch of mathematics. In the computer, programming language is used. In Mathematics expressions, formulas are used. In both step by step we get our answers. As we can see in the fig.2 the mathematics and computer science makes the Machine language. To solve the problems in mathematics we use formulas and we have to take pen, notebook etc. calculate the results after a lot of time. But with the computer science, the formulas used in mathematics is converted into machine language by the expertise and thus it becomes easy to calculate. Higher number of values can be easily calculated. So the mathematics and computer science makes the Machine learning. expertise statistically research the mathematics to convert it into computer science. Then expertise processed the data by the computer science. The whole make data science.

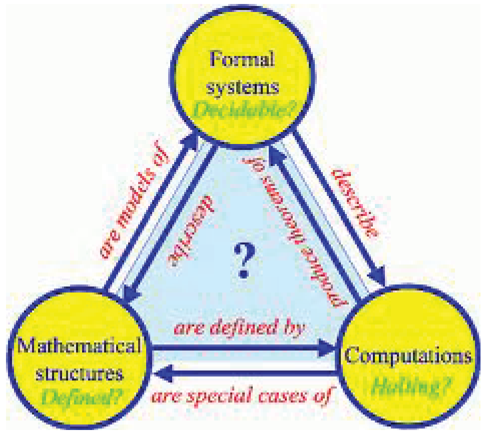

Fig.3 it explians the process relationship

VI. CONCLUSION

With the above come to conclude that how the convergence is done. How it gives the series is converged or diverged. And also mention the relationship of mathematics and computer because here we calculate the convergence only by using the equations. The purpose of discusing the relatioship is that we can get the fast and accurate results by using the simulation. The future work is convergence can be done by using simulation in computer science.

REFERENCES

[1] Daiyuan Zhang "New Expansion and Infinite Series" International Mathematical Forum , Vol.9 , pp.1061 – 1073, May 26, 2014

[2] Philippe Moser "On the Convergence of Fourier Series of Computable Lebesgue Integrable Functions", Journal Of Elsevier B.V,Vol.202, pp. 13-18, 2008

[3] Uribe-Campos Felipe Alejandro "Numerical Infinite Series Solution of the Ground Return Pollaczek Integral" Vol.XVI , pp.49-58.May 2013

[4] Emmanuel Moulay "Non-collapsing wave functions in an infinite universe, journal of Elsevier B.V, Vol.4, pp.164-167, Aug 22, 2014

[5] Chii-Huei Yu "Solving the Partial Differential Problems Using Maple" Vol.12, pp.1144-1153, Dec 2014

[6] Prof. Eric Steinhart "A Mathematical Model of Divine Infinity"Published in theology and science, Vol.7, \pp.261-274, 2009

[7] Hansen Ding *, Qiao Wang, Chaoying Cai, Shumin Jiang "Fictitious play with incomplete learning" Journal Of Elsevier B.V : Vol.63, pp. 1-8, OCT 2013.

[8] http://www.vias.org/calculus/09_infinite_series_01_05.html

[9] http://en.wikipedia.org/wiki/Series_%28mathematics%29

[10] http://www.sciencedirect.com/science/article/pii/037722179390228F

[11] http://systemunknown.com/the-brazil-series-by-bob-dylan-new-series-of-paintings-suggests-he-shouldnt-9813662/

[12] http://en.wikipedia.org/wiki/Series_%28mathematics%29#Definition

[13] http://www.researchgate.net/publication/222458344_The_use_of_mathematical_programming_with_artificial_intelligence_and_expert_systems

[14] https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF 8#q=meaning+of+abstract