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A Unique Method to Get Time Complexity of Same type of Infinite Instructions

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Abstract: Computer is growing up day by day in the world around us and it's also become optimized physically and logically .For measuring logical optimization we have space complexity and time complexity. we write those things by the help of asymptotic notation. Now a days, space complexity not give us much problem for inventing large scale storage device at cheap cost . But , time complexity is still a big issue for programmers and Researchers . There are many methods and algorithms to optimize algorithms and many are under process. But , as for human nature, we want more optimize and try to know the unknown things of it.
Keywords: Space complexity, Time complexity, asymptotic notation, algorithms

I. INTRODUCTIONS

Time complexity shows the execution time of any statement or algorithms .It can be polynomial or exponential. It depends on that algorithm. Basically , it's calculated on finite number of statement. But for infinite number of statement there are less amount of work than finite number of statement .

Many mathematical formulas can easily present the time complexity of infinite number of statement, theoretically. But for we cannot present this practically by current technology , researcher has less interest for this .My research is to present time complexity of some type of infinite statements in finite form. By this we can get brief idea about time complexity of some type of infinite statements.

II. METHOD

At first we prove Ramanujan infinite sum,
Let,
G1=1-1+1-1+1-……………..infinity
Now, 1-G1=1-(1-1+1-1+1-1+1……………..infinity)
=>1-G1=1-1+1-1+1-1+1-1+1………………..infinity
=>1+G1=G1
=>2G1=1
=>G1=1/2
Next ,
Let, G2=1-2+3-4+5-6………………………….infinity
G2=1-2+3-4+5-6………………………………….infinity
=>G2= 1-2+3-4+5-6…………………………….infinity

A. Type-1

1) Addition

=>2G2=1-1+1-1+1……………………………………..infinity
=>2G2=G1
=>2G2=1/2
=>G2=1/4
Let, G3=1+2+3+4+5+6+…………………..infinity
=>G3=1+2+3+4+5+6+……………………….infinity
=>G2=1- 2-+3- 4+ 5- 6-…………………………infinity
=>G3-G2=4+8+12+16+………………………….infinity
=>G3-G2=4(1+2+3+4+5+6+…………….infinity)
=>G3-G2=4G3

=>4G3-G3=-G2
=>3G3= -1/4
=>G3= -1/12
Now ,we prove that 1+2+3+4+5+6+………….infinity= -1/12

2) Let Prove The Time Complexity Of Infinite Summation Loop(All Variables Should Be Integer)

```
s=0,i=1;
while(1)---------------------------------(True)
{
s=s+i;
i=i+1;}
```

we all know that, according to answer of sum, the time complexity of any sum is digit of answer or (digit of answer -1)
Now, the answer of the summation in the program is -1/12 according Ramanuajn infinity sum
so the time complexity of this program is 1 or (1-1=0)(But 0 is not Possible)
So Time complexity of this summation is 1.

B. Type-2

1) Subtraction

Let ,G4=1-2-3-4-5-6-…………………infinity
G4-1=-1+1-2-3-4……………………infinity
=>G4-1=1-1-2-3-4-………………infinity
=>G4-1=1-(1+2+3+4+5+………………infinity)
=>G4=1+1-(-1/12)
=>G4=1+1+(1/12)
=>G4=25/12
Now, we prove that 1-2-3-4-5-6-………..infinity=25/12

2) Let Prove The Time Complexity Of Infinite Subtraction Loop(All Variables Should Be Integer)

```
s=1,i=2;
while(1)-----------------(True)
{
s=s-i;
i=i+1;}
```

we all know that, according to answer of subtraction, the time complexity of any subtraction is digit of answer or above. Now, the answer of the subtraction in the program is 25/12 (according proven value by Ramanuajn infinity sum approach.)
So, lower bound is 1 because digit of s(variable) is 1 (1 is the smallest number to be the count of digit of subtraction)

C. Type-3

1) *Multiplication:* We all are know that multiplication of all positive integer is (2*π)^(1/2) by the help of Reimann zeta function which is equivalent to 2.50662827463

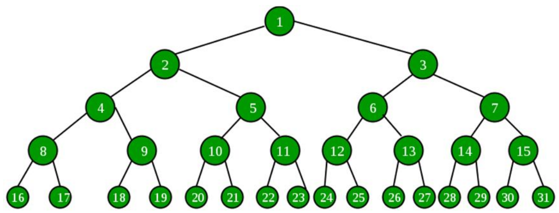
2) Let Prove The Time Complexity Of Infinite Multiplication Loop(All Variables Should Be Integer)

```
s=1,i=2;
while(1)-----------------(True)
{
s=s*i;
i=i+1;
}
```

Now, the answer of the multiplication in the program is equivalent to 2.50662827463 (according proven value by Reimann zeta function approach.)
We know that time complexity of any multiplication is O(n) and highest digit of an multiplication is 2*n

We also know that output is highest count of digit of output which is have by above numbers or it may be less than is highest count of digit of output which is have by above numbers So, one probability to be time complexity by the help of answer of above multiplication is O(1/2) = O(0.5) because count of digit of output of above answer is 1 as an integer.

D. Type-4



Insertion in Binary Tree

Let, create a balanced binary tree and insert data in proper way for infinite time.
Time complexity of insertion in binary tree is
Log (n){best case} n {worst case}
Let prove the above problem ,
Time complexity for best case,
=>log(1)+log(2)+log(3)+…………………. Infinity
=>2.303*(1/2)*ln(2*π)
=>2.116(By the help of Reimann Zeta function)
Time complexity for worst case,
=>1+2+3+4+………infinity
=>-1/12(by help of Ramanujan infinity sum)
We can see that the best case and worst case is swapped for infinite instructions .

III. RESULT

By the above method we see that many type of infinite instructions have a time complexity which can represent in finite form . by seeing the trends of those time complexity ,We get a brief idea that time complexity of other infinite instructions may be a finite number.

IV. CONCLUSION

The main intention of this presentation is to Speed up the curiosity for infinite computation problem. The advantage of this research is to get brief idea of computation of infinite statement and create technology to compute this type of computation problem. The research will help the future researchers to do their research in this field as well as related fields.

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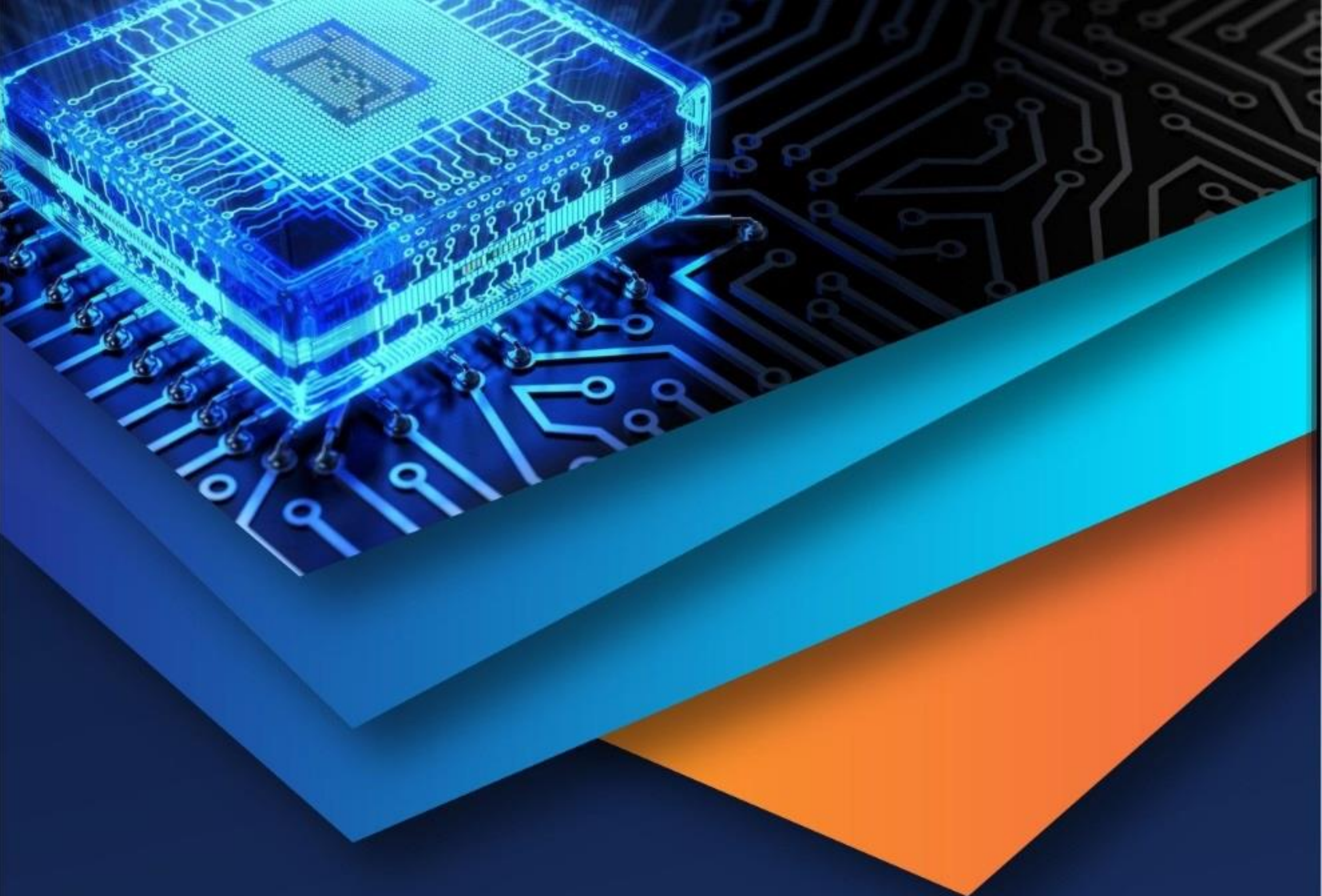

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