Eigenvalues in Binary and Ternary Number Systems

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Abstract

Aims/ Objectives: One of the biggest issues in discrete mathematical research is to set up the mapping system that would clearly define the transition between various counting groups e.g decimal, ternary, nonary etc. This is only possible if we set a one-to-one correspondence between members of a set In his previous work "Optimization Techniques in Ternary Calculus" the author just tried to do that by relating decimal numbers to their binary correspondence however a universal formula is much more desirable and current investigation will attempt to find this very universal approach[8]

Keywords: Eigenvalue, Eigennumber, Ternary, Binary,N-nary

1 General Information

"We can easily relate ordinal and cardinal numbers by means of the following relation," the author previously said.'[1] [2]

$$2\sum_{i=0}^{n} i = \Delta \tag{1}$$

Now it's high time to explain what it actually means The left part of the equation can be interpreted as
$decimal \ \sum_{ordinal\ i=}^{ordinal\ n=} \ ordinal\ i$
However the right part of the equation (1) is not that easy to interprete We all remember the formula for the sum of numbers in arithmetic progression:

$$\sum_{i=0}^{n} i = \frac{n\,(n+1)}{2} \tag{2}$$

Essentially formula (2) is well known but how does it correspond to Δ and what does the latter have to do with isomorphism if anything at all? Our research aims to give an answer to that question[4] [9]

2. Materials and Methods

We need to review the rules of matrix multiplication and delve into the details of vector algebra here. One of them states that there is always a number λ such that $A_{ij} = \ \lambda \cdot I$[10]

3. Methodology

First, let's determine the size of the matrixA_{ij} Our take on it is a 2×2 matrix the determinant of which is $(a_{11} \cdot b_{22}) - (b_{12} \cdot a_{21})$ Choosing an eigenvalue for the 2×2 matrix is easy The corresponding value can be found in Combinatorics theory[12] Namely the number of combinations without repetition by 2 is calulated by the following formula: $C\binom{p}{2}$ or $\binom{p}{2}$where 2! is a coeficient and the unique value[5][3]

4 Proof

From here on our reasoning starts to make sense If we look at the formulae (2) and (1)we will see that the right and the left parts of them contain the same element 2 which in essense is 2! What will happen if we transform the left part of the formula (2) to begin look like

$$\lambda\left(\lambda_1-0\right)\left(\lambda_2-1\right) \tag{3}$$

where λ_1 and λ_2 are the roots of a quadratic equation accordingly

What is the Eigenvalue's value then? Obviously it is $\frac{1}{2}=\frac{1}{2!}$ The other two values are 1 and 0 accordingly We can conclude that we have proved vector analysis for binary numbers but how about the other systems f.ex Ternary, Quaternary,Nonary etc.? Alright, let's use the analogy from the Proof section to provide a broader perspective on the two systems that are currently being studied: Binary and Ternary.

5 Conclusions

To be able to relate our formula(3) to the right context we must analyze properties of the Eigenvalues and Eigenvector's decomposition In other words we must relate $\binom{p}{2}$ to the data we obtained earlier on in our research $\binom{p}{2}=\lambda\left(\lambda_1-0\right)\left(\lambda_2-1\right)$ Let's compare then formula (2) and it's factors and formula(3) If $\lambda=\frac{1}{2}$ and $\left(\lambda_1-0\right)\left(\lambda_2-1\right)=(n)(n+1)$ then we have $-\frac{1}{2}(n)(n+1)=\binom{p}{2} \leftrightarrow \frac{1}{2}(n)(n+1)=-\binom{p}{2}$ By analogy $\frac{1}{3!}(n)(n+1)=-\binom{p}{3}$ The final and general formula for n-spaces will be in the following form for computation purposes:

$$\frac{1}{n!}(n)(n+1)=-\binom{p}{n} \tag{4}$$

Thus, it can be said that optimization methods are useful in discrete calculus and aid in the development of relationships between different number systems. [6] [7] [11]

Competing Interests

Author has declared that no competing interests exist.

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