Numerical analysis of The sequence of Prime Numbers.

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Abstract: Before starting to build the sequence and its topological steps, we decide the specific hypotheses that follow the pattern of prime numbers, which explain the complex gaps between prime numbers that appear random. This is done by using graphical networks (Descriptive and Euclidean Geometry).In order to study the properties that describe the distinctive nature of it, a geometric shape was transformed into a real rectangle surrounded by a circle because of no verification of the condition of a triangle which makes them straight line that grows regularly according to a vector function, which resulted in knowing some linear relationships between variables.

Keywords: Number theory, Sequences, Prime numbers, Twins prime, Geometry. . . .

1 Introduction :

Prime numbers, which are defined as numbers that are only divisible by one and themselves starting from 2, 3, 5. . . and 29 to infinity, have been associated with many conjectures since ancient history with the aim of knowing their properties and structure. It started with Euclid, who tried to prove that there is infinite number of them and interest in them increased after Euler's product and the pi function, not forgetting that many fields and problems in mathematics have known stagnation due to the nondiscovery of the sequence. But despite all, the vector function succeeds and it was the best way to understand the changes in connection between four prime integers. The eigenvalue λ belongs only to even natural integers, to save the function's output inside the space because the distances are expressed as even numbers, of course when the number Two (2) is excluded from the sequence because it has an odd gap unlike the rest.

$$\frac{d}{dt}\overrightarrow{v} = \lambda(t) \times \begin{bmatrix} 1 \\ 4 \\ 5 \end{bmatrix} + P(t) \cdot I \quad \text{with} \quad \begin{cases} P(t) \text{ is variable prime (initial value)} \\ I \quad \text{is Identity matrix} \\ \lambda = 2n \quad \text{with } n \in \mathbb{N}. \end{cases}$$

This function has three components $\mathbb{N} \subset \mathbb{R}^3$ without reversing the order and builds an unreal rectangle. Due to the triangle law, which states that the necessity of the summation of the two sides is more than the third side $A + B > C$ is not available ($A + B = C$) and this is evidence that this shape will not be able to describe in the euclidean or non-euclidean geometry unless it is considered to be actually a straight line and the eigenvalue refers to a differential equation that controls prime numbers.

This is the hypothesis that will guide the study and notice how the vector function explains the gaps. for instance, the number 73 is the initial value with λ equal to 6.

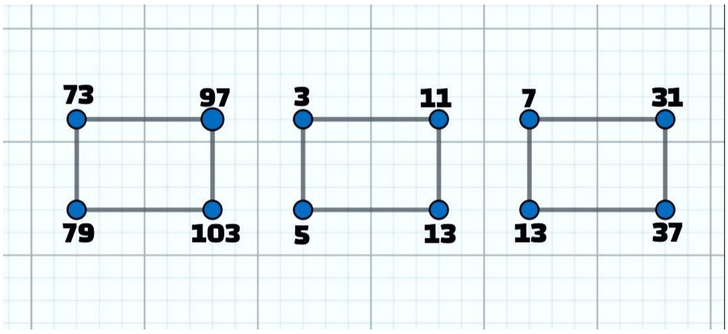

Figure 1: The vector function and the gaps

While the eigenvalue is equal to zero, the neutral value is exactly two.

2 Geometric Analysis :

After converting to the straight line (see below) and forming a group of segments, make sure that the distance between the first two primes is equal to the last two primes ($AB = CD$). Since the effect of the number has been transformed into this form, there is no need to write them again (point on the straight line), also the beginning and end of the geometric shape are just represented by the first and last points. The others inside are the places where each triangle's height passes to find the regular variable by the area of real rectangles that will be enclosed inside the circle.

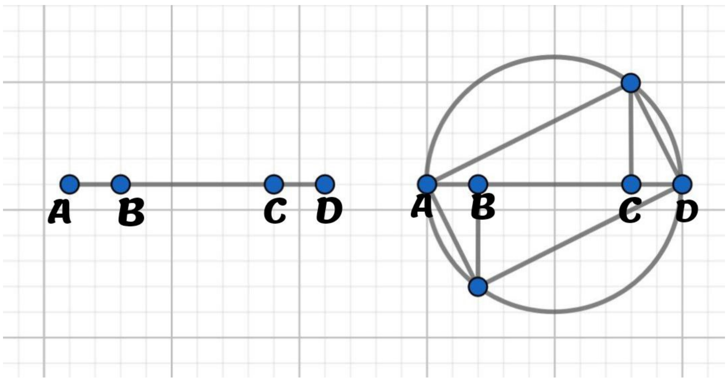

Figure 2: converting to a cyclic rectangle

To calculate the area of this rectangle, we must use the distances between each prime number (the differences). By using Pythagorean's theorem, we will find a constant relationship between the areas of all rectangles. Additionally, we will discover that the triangle that connects the second prime in the group to the center of the circle includes Pythagorean numbers (3, 5, and 4) and their multiples. The constant relationship between the areas of any rectangle and their diameters (D) / radius(R):

$$l(x) \cdot L(y) = \int_{a(x)}^{b(x)} \int_{c(y)}^{d(y)} f(x,y)\, dy\, dx = 0,4D^2 \quad \vee \quad \int_{a(x)}^{b(x)} \int_{c(y)}^{d(y)} f(x,y)\, dy\, dx = 1.6R^2$$

a(x), b(x), c(y) and d(y) is considered a variable boundary. With the aim of controlling them in dynamic and varied ways, we must add functions or data to modify them.

3 Numerical Analysis :

We need to identify a common technique or link that rises consistently to transform this discrete dynamical system into a continuous one. Nevertheless, if we attempt to examine each rectangle, we will discover that every property relies in a challenging and nonindependent way on the value of the unknown eigenvalue, which shows unpredictable nonlinear behavior. The midpoint O_l, for example, is equal to $\frac{7}{2}\lambda + 2P_1 - P_2 = O_l$.

So, we will apply Goldbach's conjecture with an additional condition attached, but this does not mean that we take its correctness for granted. Upon evaluation, we will discover that several numbers fail to meet Goldbach's criteria alongside the new condition, and this issue intensifies as we extend our exploration along the number line, and this condition is outlined as follows:

$$\begin{bmatrix} \sum_{i}^{2n} P_{i,1} \\ \sum_{i}^{2n} P_{i,2} \\ \sum_{i}^{2n} P_{i,3} \\ \sum_{i}^{2n} P_{i,4} \end{bmatrix} = \begin{bmatrix} N_1 \\ N_2 \\ N_3 \\ N_4 \end{bmatrix} \quad \text{with} \quad \begin{cases} 2N_1 = N_2 \\ 5N_1 = N_3 \\ 6N_1 = N_4 \end{cases}$$

It can be concluded that $N_1 = 8$ and many others don't achieve this condition.

Example for n=1 :

$$\begin{bmatrix} 3 \\ 5 \\ 11 \\ 13 \end{bmatrix} + \begin{bmatrix} 3 \\ 7 \\ 19 \\ 23 \end{bmatrix} = \begin{bmatrix} 6 \\ 12 \\ 30 \\ 36 \end{bmatrix} \qquad \begin{bmatrix} 3 \\ 7 \\ 19 \\ 23 \end{bmatrix} + \begin{bmatrix} 7 \\ 13 \\ 31 \\ 37 \end{bmatrix} = \begin{bmatrix} 10 \\ 20 \\ 50 \\ 60 \end{bmatrix}$$

by calculating the summation of the whole matrix, that is equal to $14N_1$, we be aware that there are two patterns. When subtracting P_4 and P_3, that is, A, and additionally subtracting all the numbers in every group separately, that is B, we discover that the pairs (A:B) develop in keeping with $56k$ for every step,$(A + 56k)$ and $(B + 56k)$, this is a sequence that occurs when a previous group interacts with another, unlike the other, which involves a completely new interaction. In the second prime matrix for $n = 1$, notice that there is a number that remains the same, while the other increases by $12k$.

we get this relationship $\frac{N_1 - N_1'}{4} = k$

Application:

$$\frac{N_1 - N_1'}{4} = k \Rightarrow \frac{10 - 6}{4} = 1$$

$$N_1 + N_2 + N_3 + N_4 = 14 \cdot 10 = 140 \qquad N_1' + N_2' + N_3' + N_4' = 84$$

$$A = 140 - 23 - 19 = 98 \tag{1}$$

$$B = 88 \tag{2}$$

$$A' = 42 \tag{3}$$

$$B' = 84 - 23 - 19 - 7 - 3 = 32 \tag{4}$$

So we have $(32 + 56 \cdot 1)$ and $(42 + 56 \cdot 1) \Rightarrow 88$ and 98

In the same way, we will find $12 + 60 = 72$ when subtracting the total summation from the remaining numbers of second group, and 52 does not change in this case.

4 conclusion:

This work represents an initial phase of a larger research project to which we have dedicated considerable time. The methods presented here are new, and what we have discovered required a year and a half of intense effort and moments of frustration. We hope that will contribute to the advancement of scientific research and prove useful to other researchers in the future.