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The Nikola Tesla Constant and Its Relation to the Circumference Inscribed in a Square

Javier Mendoza Navarrete[1], José Ismael Ojeda Campaña[2], Huetzin Perez[3], Gabriel Luna-Sandoval[4], Victor Verdugo[2], Ricardo Jiménez Garcia[5]

[1]Departamento de Matemáticas, CBTis 256 DGETI, Cabo San Lucas, México
[2]División de Ingeniería en Sistemas Computacionales, Tecnológico Nacional de México/ITES de Los Cabos, Cabo San Lucas, México
[3]DCI Departamento de Física Médica, Universidad de Guanajuato, León, México
[4]Departamento de Ingeniería Industrial en Manufactura, Universidad Estatal de Sonora, Navojoa, México
[5]Departamento de Eléctrica-Electrónica, Tecnológico Nacional de México Campus Mexicali, Mexicali, México
Email: javier.mendoza.cb256@dgeti.sems.gob.mx, jismael.oc@loscabos.tecnm.mx, ha.perez@igto.mx, Gabriel.luna@ues.mx, Victor.VM@loscabos.tecnm.mx, ricardojimenezg@itmexicali.edu.mx

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Abstract

This research work relates the surface of a square and the area circumscribed by a circle, resulting in a value called Nikola Tesla constant. This constant starts with the calculation of the areas of the square and the inscribed circle, giving a ratio of 9/40 and from which a residual area of the area proportions of the geometric figures described is obtained. Plotting smooth curves, particularly those in round shapes, can be represented efficiently with the use of Nikola Tesla constant, reducing complex mathematical calculus.

Keywords

Tesla Numbers, Prime Number, Circle, Binary, Area

1. Introduction

At all times, man has used geometric shapes that he has observed in nature, and based on these shapes he has been able to create tools and useful objects. The circle has had a remarkable preeminence since mankind has been aware of the world around him, this is observed in the circular shape of the Sun and the Moon and in the circular motion of the stars around the Earth. These are probably the most important reasons why the circle was present in the cosmological conceptions of ancient civilizations. In Book I of Euclid's Elements, it is defined: "A circle is a plane figure comprised by a single line (called circumference) in such a way that all the straight lines drawn on it that fall from a point within the figure are equal to each other".

Clemens *et al.* (1998) define circle in their geometry book as the set of all points in a plane that are at a fixed distance from a given point in the plane [1].

Nikola Tesla (1856-1943). Brilliant scientist of Serbian origin (born in the village of Smijan, Lika region, Austro-Hungarian Empire). He emigrated to the United States at the age of 28 and after a prolific scientific life, he died in New York at the age of 87. He was the second of five children born to Milutin Tesla, an Orthodox priest of Serbian origin, and Djuka Mandic [2].

Tesla studied physics and mathematics at the University of Graz and then philosophy in Prague.

Nikola Tesla once said: "If you only knew the magnificence of 3, 6 and 9, then you would have the key to the universe". The present work proposes the discovery of a new constant, which in honor of this scientist has been called the Nikola Tesla constant.

The Nikola Tesla constant relates the surface area of a square with 40 units on a side, and the area circumscribed by a circle with a diameter of 40 units, as shown in **Figure 1**.

A square of side 40 units is taken, whose area is equal to 1600 square units. The area of the inscribed circle is equal to the area of the square minus the residual area. The residual area consists of four squares, each with an area of 90 square units, resulting in a total of 360 square units.

The total residual area ($360u^2$) divided by square area of $1600u^2$ gives us a ratio of 9/40.

The ratio of residual area with square area:

$$\frac{360u^2}{1600u^2} = \frac{9 \cdot 40u^2}{40 \cdot 40u^2} = \frac{9}{40} = 0.225$$

The ratio of the area of Nikola Tesla's binary circle to a square:

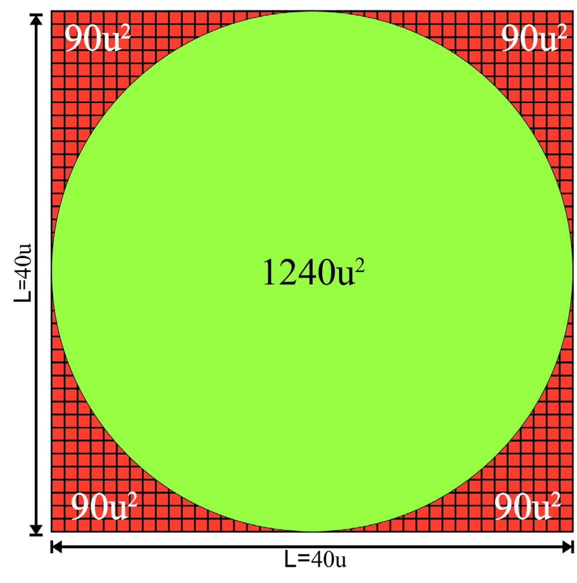

Figure 1. Nikola Tesla's binary circle.

$$\frac{1240u^2}{1600u^2} = \frac{31 \cdot 40u^2}{40 \cdot 40u^2} = \frac{31}{40} = 0.775$$

Figure 2 demonstrates that only in a square with a side length of 40 units, the quotient of the residual area divided by its digital root equals 40, which corresponds to the value of the side of the square. Dividing the residual area by this value generates the ratio of 9/40.

$$360 \begin{array}{l} \nearrow \\ \rightarrow \\ \searrow \end{array} \begin{array}{c} 360 \\ \hline 360 \\ \hline 360 \end{array} = \frac{360}{\frac{360}{3+6+0}} = \frac{3+6+0}{\frac{9(40)}{9}} = \frac{9}{40}$$

So, it follows that the area of the inscribed circle that we will call "Nikola Tesla's binary circle" is $\frac{31}{40}u^2$ and the corners with a residual area of $\frac{9}{40}u^2$ with this area another circle is formed that we will call "Nikola Tesla's energy circle".

The purpose of using the Nikola Tesla constant is to introduce a new way of rendering figure in computer graphics. The arrangement and grid structure used in graphics are raster or grid-based and vector-based. Most digital images use a raster or grid-based structure, where pixels are arranged in rows and columns. Each pixel contains color information (RGB, Red, Green, and Blue) that collectively forms the image when displayed.

Plotting smooth curves, particularly those in round shapes, can present challenges. These challenges include visualizing shapes with less detail or definition than ideal, which can require complex and mathematically intensive calculations. These calculations can slow down real-time performance in 3D graphics or applications that require high accuracy.

2. Ratio of the Powers of the Binary System and the Numbers of Nikola Tesla

The binary number system (base 2) has only two symbols or possible digit values: 0 and 1. However, this base 2 system can be used to represent any quantity in the decimal system or in other systems. The binary and decimal systems are positional systems, in the case of the decimal system it uses the number ten as a base and for the binary system the number two, in which each binary digit has its own value or weight expressed as a power of two [3].

Tesla understood how the numbers 3, 6 and 9 were part of a numerical pattern

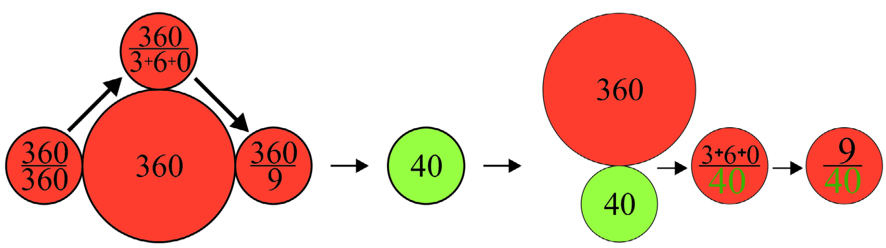

Figure 2. Deduction of the origin of the value of the side from which the circle comes from.

that occurs in the universe as in star formations, embryonic cell development and many others. Binary numbers is the most important in the digital systems, the powers of the binary system.

2^4	2^3	2^2	2^1	2^0
16	8	4	2	1

$= 1 + 2 + 4 + 8 + 16$
$= \mathbf{31}$

8+16	8+4	4+2	2+1
24	12	6	3
36	18	9	

$= 3 + 6 + 12 + 24$
$= 45 \rightarrow 4 + 5$
$= \mathbf{9}$

And by adding $31 + 9 = 40 \rightarrow \frac{31}{40} + \frac{9}{40}$.

From here, we can observe that thirty-one fortieths of the area of the square corresponds to the binary circle of Nikola Tesla, and nine fortieths to the energy circle of Nikola Tesla (where the number 9 represents energy). $360 = 3 + 6 + 0 = 9$ (where the number 9 represents energy).

Figure 3 shows how the following notable points have been identified on the circumference of Nikola Tesla's binary circle.

Intersection areas between the binary and energy circles are visible at every significant point, which are identified as follows.

1° quadrant: $B(16, 12)$; $C(12, 16)$;

2° quadrant: $G(-12, 16)$; $H(-16, 12)$;

3° quadrant: $L(-16, -12)$; $M(-12, -16)$;

4° quadrant: $Q(12, -16)$; $R(16, -12)$.

When calculating the square's area, consider that its side measures 40 units.

$$\text{Square area} = L^2 = (40u)^2 = 1600u^2$$

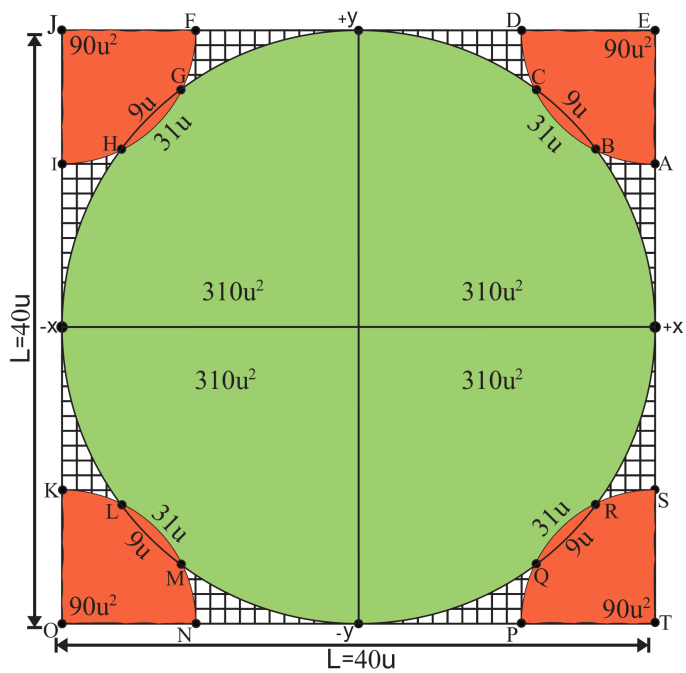

Figure 3. Distribution of the area of the circle in its four quadrants.

A quart of square area is:

$$\frac{\text{Square area}}{4} = \frac{1600u^2}{4} = 400u^2$$

We can establish a relationship between a quarter of the area of a square and the circular quadrant (a quarter of the area of a circle, shown in **Figure 4**) because the length of the side of the square is equal to the diameter of the circle. This will be demonstrated in the following sections:

$$\text{Circular quadrant} = \frac{\text{area of circle}}{\text{side length}}$$

The length of circle arch, is $31u$

$$\frac{\text{Circle Perimeter}}{4} = \frac{\text{circle area}}{\text{diameter}} = \frac{1240u^2}{40u}$$

$$\frac{\text{Circle Perimeter}}{4} = 31u$$

$$\frac{\text{Circle Perimeter}}{4} = 2^0 + 2^1 + 2^2 + 2^3 + 2^4$$

$$\frac{\text{Circle Perimeter}}{4} = 31u$$

$$\text{Circle Perimeter} = 4 \times 31u = 124u$$

$$C_{NT} \cdot \text{diameter} = \text{Circle Perimeter}$$

Therefore, the definition of the constant of Nikola Tesla is:

$$C_{NT} = \frac{\text{Circle Perimeter}}{\text{diameter}}$$

$$C_{NT} = \frac{124u}{40u}$$

$$C_{NT} = 3.1$$

Taking the side of the square (L) as the diameter of the circle (d), the formula becomes:

$$\text{Circle Perimeter} = 3.1\text{diameter}$$

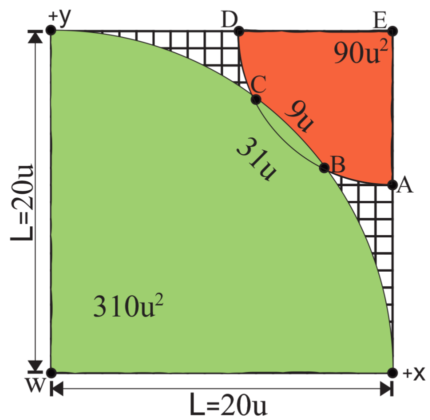

Figure 4. Circular quadrant.

The following formula is used to calculate the area:

$$\text{Area}_{\text{circle}} = \frac{31}{40} \cdot \text{Area}_{\text{square}}$$

Since the formula for calculating the area of a square is equal to the value of the side squared, we substitute and obtain the following formula:

$$A_{\text{circle}} = \frac{31}{40} \cdot L^2$$

Taking the side of the square (L) as the diameter of the circle (d) and diameter is the double of radius the formula becomes:

$$A_{\text{circle}} = \frac{31}{40} \cdot d^2 = \frac{31}{40} \cdot (2r)^2$$

$$A_{\text{circle}} = \frac{31 \cdot 4r^2}{4 \cdot 10}$$

$$A_{\text{circle}} = \frac{31}{10} \cdot r^2$$

$$A_{\text{circle}} = 3.1 \cdot r^2$$

By substituting the value of the Nikola Tesla constant, the expression can be simplified.

$$A_{\text{circle}} = C_{NT} \cdot r^2$$

The perimeter of the inscribed circle of the square of 40 units of side maintains the binary proportion 31/40 of the perimeter of the square.

$$\text{Perimeter}_{\text{circle}} = \frac{31}{40} \cdot \text{Perimeter}_{\text{square}}$$

Since the formula for computing the perimeter of a square equals four times the length of one of its sides squared, we can substitute and derive the subsequent formula:

$$\text{Perimeter}_{\text{circle}} = \frac{31 \cdot 4L}{40} = \frac{31 \cdot 4L}{4 \cdot 10}$$

$$\text{Perimeter}_{\text{circle}} = \frac{31 \cdot L}{10} = 3.1L$$

Taking the side of the square (L) as the diameter of the circle (d) the formula becomes:

$$\text{Perimeter}_{\text{circle}} = 3.1d$$

Using the proposals constant of Nikola Tesla, and substituting the diameter with double of radius (r) the expression become:

$$\text{Perimeter}_{\text{circle}} = 2 \cdot C_{NT} \cdot r$$

The perimeter of a circle of 40 units in diameter is equal to the sum of the prime numbers from 5 to 29.

$$5 + 7 + 11 + 13 + 17 + 19 + 23 + 29 = 124$$

By quadruple the diameter of the circle ($160u$), it is now the sum of the prime numbers from 5 to 61.

$$\underbrace{5+7+11+13+17+19+23+29}_{\text{First octet}}+\underbrace{31+37+41+43+47+53+59+61}_{\text{Second octet}}$$

The sum of the first octet and second the octet is 496.

3. Applications

The Nikola Tesla constant has many applications in computer graphics, this constant simply uses the calculus of figures by using only rational number, which reduces trunk errors and round errors.

4. Conclusion

The prime numbers used to calculate the dimensions of the circumference do not include the numbers two and three, so it is concluded that the numbers 2 and 3 are no longer considered prime numbers since they do not lie on the circumference contour.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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